Airedale by MODINE

LogiCool InRak™

Technical Manual
Original Instructions

bsi. ISO 9001 Quality Management FM00542 ISO 14001 Environmental Management EMS52086

Customer Services

Warranty, Commissioning & Maintenance

As standard, Airedale guarantees all non consumable parts only for a period of 12 months, variations tailored to suit product and application are also available; please contact Airedale for full terms and details.

To further protect your investment in Airedale products, Airedale can provide full commissioning services, comprehensive maintenance packages and service cover 24 hours a day, 365 days a year (UK mainland).

For a free quotation contact Airedale or your local Sales Engineer.

All Airedale products are designed in accordance with EU Directives regarding prevention of build up of water, associated with the risk of contaminants such as Legionella.

For effective prevention of such risk it is necessary that the equipment is maintained in accordance with Airedale recommendations.

SafeCool

In addition to commissioning, a 24 hour, 7 days a week on-call service is available throughout the year to UK mainland sites. This service will enable customers to contact a duty engineer outside normal working hours and receive assistance over the telephone. The duty engineer can, if necessary, attend site, usually within 24 hours or less.

Full details will be forwarded on acceptance of the maintenance agreement.

CAUTION ⚠	Warranty cover is not a substitute for maintenance. Warranty cover is conditional to maintenance being carried out in accordance with the recommendations provided during the warranty period. Failure to have the maintenance procedures carried out will invalidate the warranty and any liabilities by Airedale International Air Conditioning Ltd.

Spares

A spares list for 1, 3 and 5 years will be supplied with every unit and is also available from our Spares department on request.

Training

As well as our comprehensive range of products, Airedale offers a modular range of Refrigeration and Air Conditioning Training courses, for further information please contact Airedale.

Customer Services

For further assistance, please e-mail: enquiries@airedale.com or telephone:

UK Sales Enquiries	+ 44 (0) 113 239 1000	enquiries@airedale.com
International Enquiries	+ 44 (0) 113 239 1000	enquiries@airedale.com
Spares Hot Line	+ 44 (0) 113 238 7878	spares@airedale.com
Airedale Service	+ 44 (0) 113 239 1000	service@airedale.com
Technical Support	+ 44 (0) 113 239 1000	tech.support@airedale.com
Training Enquiries	+ 44 (0) 113 239 1000	enquiries@airedale.com

For information, visit us at our web site: www.airedale.com

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Health and Safety

IMPORTANT

The information contained in this manual is critical to the correct operation and maintenance of the unit and should be read by all persons responsible for the installation, commissioning and maintenance of this Airedale unit.

Safety

The equipment has been designed and manufactured to meet international safety standards but, like any mechanical/ electrical equipment, care must be taken if you are to obtain the best results.

CAUTION ⚠	When working with any air conditioning units ensure that the electrical isolator is switched off prior to servicing or repair work and that there is no power to any part of the equipment. Also ensure that there are no other power feeds to the unit such as fire alarm circuits, BMS circuits etc. Electrical installation commissioning and maintenance work on this equipment should be undertaken by competent and trained personnel in accordance with local relevant standards and codes of practice.

The refrigerant used in this range of products is classified under the COSHH regulations as an irritant, with set Workplace Exposure Levels (WEL) for consideration if this plant is installed in confined or poorly ventilated areas.

A full hazard data sheet in accordance with COSHH regulations is available should this be required.

Personal Protective Equipment

Airedale recommends that personal protective equipment is used whilst installing, maintaining and commissioning equipment.

Refrigerant Warning

The Airedale LogiCool InRak unit uses R410A refrigerant which requires careful attention to proper storage and handling procedures.

Use only manifold gauge sets designed for use with R410A refrigerant. Use only refrigerant recovery units and cylinders designed for high pressure refrigerants.

R410A must only be charged in the liquid state to ensure correct blend makeup.

The refrigerant must be stored in a clean, dry area away from sunlight. The refrigerant must never be stored above 50°C.

Manual Handling

Some operations when servicing or maintaining the unit may require additional assistance with regard to manual handling. This requirement is down to the discretion of the engineer. Remember do not perform a lift that exceeds your ability.

Environmental Policy

It is our policy to:

- Take a proactive approach to resolve environmental issues and ensure compliance with regulatory requirements.
- Train personnel in sound environmental practices.
- Pursue opportunities to conserve resources, prevent pollution and eliminate waste.
- Manufacture products in a responsible manner with minimum impact on the environment.
- Reduce our use of chemicals and minimise their release to the environment.
- Measure, control and verify environmental performance through internal and external audits.
- Continually improve our environmental performance.

CE Directive

Airedale certify that the equipment detailed in this manual conforms with the following EC Directives:

Electromagnetic Compatibility Directive (EMC)	2014/30/EU
Machinery Directive (MD)	89/392/EEC version 2006/42/EC
Pressure Equipment Directive (PED)	2014/68/EU

To comply with these directives appropriate national & harmonised standards have been applied. These are listed on the Declaration of Conformity, supplied with each product.

Minimum and Maximum Operation Temperature (TS) and Pressure (PS)

Refrigeration

Allowable Temperature Range (TS) = Min -20°C* to Max 120°C**

Maximum Allowable Pressure (PS) = High Side 40.7 Barg, Low Side 30 Barg

*Based on the refrigerant temperature in the unit off state in the lowest permitted ambient temperature.

**Based on the maximum allowable super-heated refrigerant temperature.

Pressure System Safety Regulations 2000

Refrigeration assemblies/systems may constitute a Pressure System as defined in the Pressure System Safety Regulations 2000.

Global Warming Potential

The R410A refrigerant has a GWP of 2088, (Based on EN378-1:2016, 100 year life)

Dangerous Substances and Explosive Atmospheres Regulations

The completion of a DSEAR (Dangerous Substances and Explosive Atmospheres Regulations) risk assessment must be completed as a legal requirement by the employer of the business where this equipment will be installed. This is not the responsibility of Airedale International Air Conditioning Ltd to undertake as the manufacturer of the equipment.

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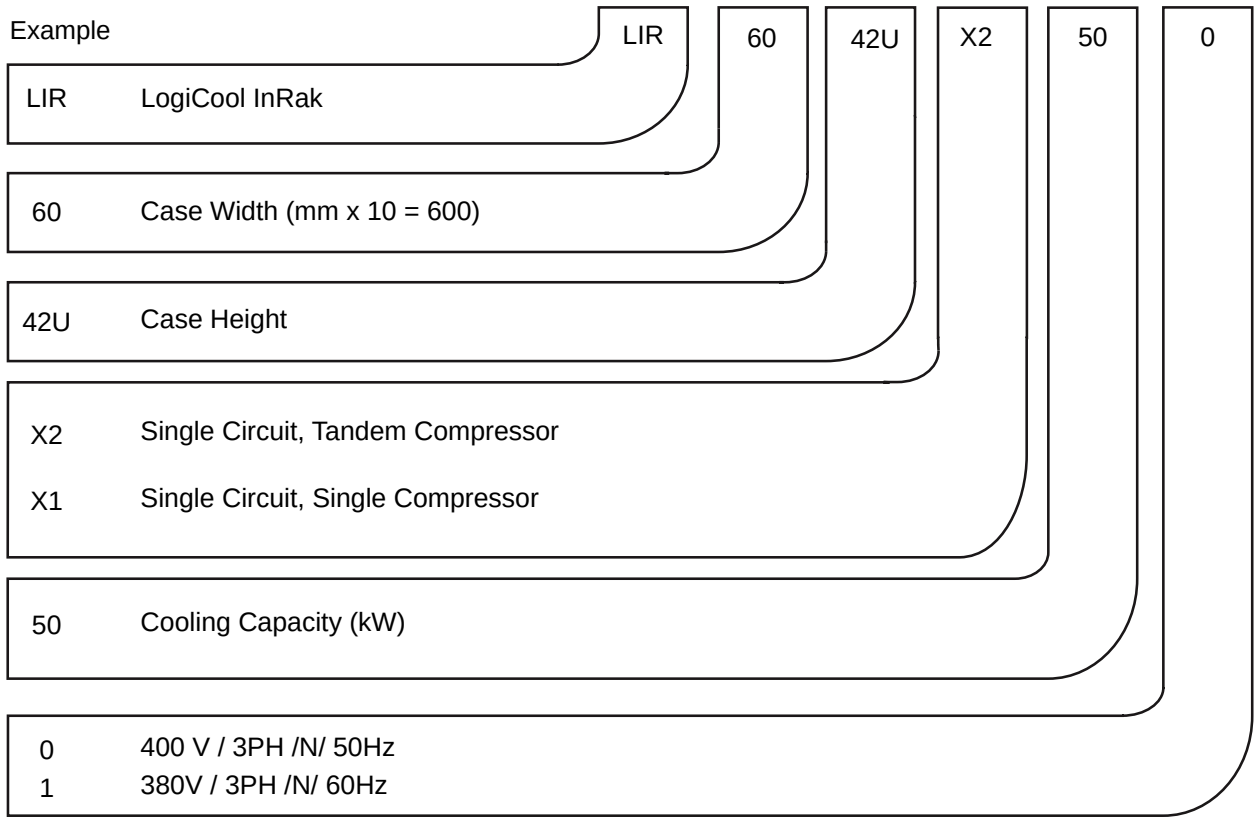
Contents

Specifiers Guide

Nomenclature



Introduction

The LogiCool InRak is an efficient in-row IT cooling solution for data centre applications.
The InRak delivers complete confidence, with redundancy features such as hot swappable fans and dual power supplies. It is extremely efficient, offering the latest fan technology coupled with sophisticated controls logic designed to optimise operation.

Providing industry-leading cooling for its footprint, the InRak offers the ultimate in scalable solutions for the modern data centre. The InRak is designed to fit in between industry standard server racks and offer “plug and play“ connectivity.

The InRak is available for 50 Hz and 60 Hz power supplies as follows:-

	X1	X2
400 V / 3PH / 50 Hz Supply	●	●
380 V / 3PH / 60 Hz Supply	●	–

This system has been designed to be connected to a TN type distribution system. For alternate distribution type systems, contact Airedale.

Construction

The cabinet shall be manufactured with galvanised sheet steel to provide a smooth aesthetically pleasing finish. The galvanised sheet steel panels shall be coated with an epoxy baked powder paint to provide a durable finish.
Standard unit colours shall be Black Grey (RAL 7021) or Light Grey (RAL 7035).

Standard and Optional Features

		C0	CC
Door	Hot Swappable Fan Assembly	●	●
	Independent Fan Isolation	●	●
	Discharge Grille	●	●
	Removable Access Panel	●	●
	Secure Door Locks	●	●
	Return Air Grille	●	●
	Mains Isolator	●	●
	G4 Return Door Air Filter	○	○
	Levelling Feet	●	●
	Castors	●	●
	Anti-Recirculation Brush Seal	●	●
Electrical	Electrical Switch Gear	●	●
	Door Electric Isolator	●	●
	Controller Capacitive Backup	●	●
	Energy Manager	○	○
	Phase Rotation Monitoring	○	○
	Thyristor Controlled Electric Heat	○	○
	IEC 60309 Plug and Socket	○	○
	Dual Power Change Over Switch	○	○
	Airflow Switch	●	●

● Standard Feature ○ Optional Feature — Not Available

Standard and Optional Features

		C0	CC
Controls	Microprocessor Control	●	●
	Graphical Display	●	●
	Unit Status LED	●	●
	LCD Display	●	●
	Filter Change Monitoring	○	○
	Rack Pressure Management	○	○
	Dynamic Air Volume Control	○	○
	Fire / Smoke Detection	○	○
	Refrigerant Leak Detection	—	—
	Drip Tray Level Detection	○	○

Refrigeration	Efficient Fixed Speed Scroll Compressor	—	—
	Efficient EC Inverter Scroll Compressor	—	—
	Electronic Expansion Valve	—	—
	Refrigeration Sight Glass	—	—
	Oil Separator	—	—
	Liquid Line Solenoid Valve	—	—
	Refrigerant Pump down	—	—

● Standard Feature ○ Optional Feature — Not Available

Unit Overview

Standard Front Door Features

- Hot Swappable Fan Assembly
- Independant Fan Isolation
- Discharge Grille
- Removable Access Panel
- Secure Door Lock

Standard Construction Features

- Levelling Feet
- Castors
- Anti-Recirculation Brush Seal
- Side Access Panels

Standard Control Features

- Microprocessor Control
- Graphical Display
- Unit Status LED
- LCD Display

Optional Control Features

- Filter Change Monitoring
- Rack Pressure Management
- Dynamic Air Volume Control
- Fire / Smoke Detection
- Refrigerant Leak Detection

Unit Overview

Standard Rear Door Features
- Secure Door Lock
- Return Air Grille
- Mains Isolator

Optional Rear Door Features
- ISO-C-80 Return Door Air Filter

Standard Electrical Components
- Electrical Switch Gear
- Door Electric Isolator
- Controller UPS Backup

Optional Electrical Components
- Condensate Pump
- Energy Manager
- Phase Rotation Monitoring
- Thyristor Controlled Electric Heat
- IEC 60309 Plug and Socket

Standard Refrigeration Features
- Efficient Fixed Speed Scroll Compressor
- Efficient EC Inverter Scroll Compressor
- Electronic Expansion Valve
- Refrigeration Sight Glass
- Oil Separator
- Liquid Line Solenoid Valve

Optional Refrigeration Features
- Refrigerant Pump down

Front Door Assembly

Standard Features

EC Fan motor

310mm diameter backward curved centrifugal fans with EC motors mounted with inlet ring shall be provided to ensure optimum efficiency. The fan section shall be designed as a hot swap assembly which can be changed quickly minimising downtime during replacement or maintenance. The assembly incorporates a fan isolation switch to interrupt power before removal.

N+1 Fan Redundancy

The InRak has the option for N+1 redundancy. This runs the unit at 75% airflow under normal conditions. If a fan fails the remaining healthy fans speed up to 100% achieving the full design airflow.

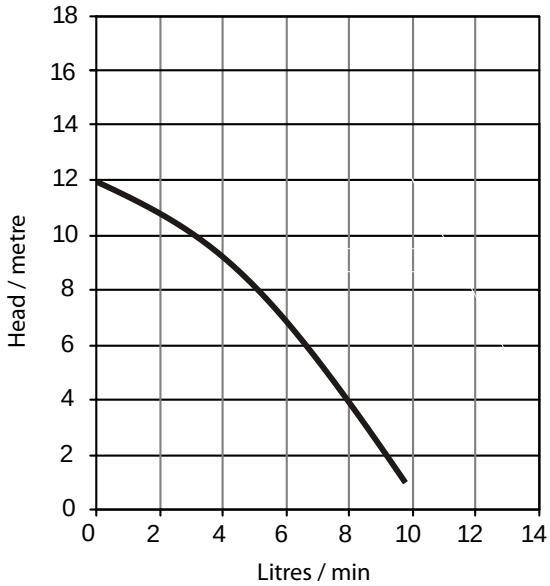
Air Flow Switch

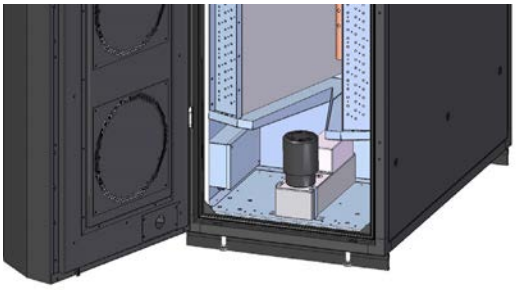
An adjustable differential pressure switch shall activate a visual alarm at the status panel and break the power supply in the event of a fan or motor failure.

Optional Features

Condensate Pump

The following graphs illustrate the TOTAL static (head) pressure available. The system horizontal pipe losses and vertical lift should be factored in when calculating the condensate pump performance.





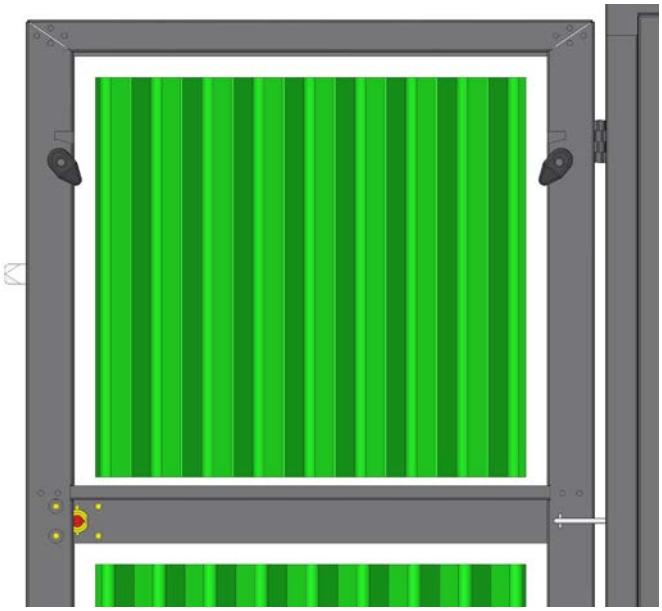
IMPORTANT ⚠	Use only 10mm (3/8”) copper tube when connecting the discharge stub to the condensate pump. The discharge line from the pump should rise no more than 6 metres vertically and no more than 8 metres in total length before being interrupted with a swan neck air break and tundish.

Rear Door Assembly

Standard Features

ISO16890 (ISO-C-80) filtration

The unit shall be fitted with ISO16890 (ISO-C-80) Filtration.



Packaging

For specific markets units shall be shipped, mounted on wooden pallet and covered with polythene. The pallet shall be mechanically fixed to the unit for transportation only.

Optional Features

Sterling Board LAT (Wooden Case) Packing

Units shall be supplied complete with additional LAT corner protection and cross braces to afford extra transit protection. Sterling board heat treated man made material shall be used (including pallet) to comply with phytosanity import regulations (please contact Airedale for this option).

Refrigeration Components

Standard Features

Oil Separator

Fitted to ensure higher than usual levels of circulatory oil of the variable speed compressor stay within the unit, and are not lost to external pipe work causing damage to the compressor. The component is fitted in the discharge line of the compressor and used to separate the oil from the unit's refrigerant. The separated oil is then fed back into the suction line to ensure adequate amounts return to the compressor.

Sight Glass

A liquid line sight glass is fitted to give an indication of the state of the refrigerant within the system. If the sight glass becomes yellow it is an indication that the filter drier requires changing.

Optional Features

Refrigerant Leak Detection

If the leak detector reaches the alarm set point, a leak alarm will be set and a message displayed. By default after detecting a leak, the unit will give an alarm but will continue to run normally. This can be changed to give an alarm and also shut down the unit and isolate it by closing the liquid line solenoid valve.

If pump-down features are present on the unit, it can be set to give an alarm and also pump-down when a leak is detected.

Indirect Detection

As well as optional direct leak detection the unit also has indirect refrigerant leak detection as standard. This uses intelligent monitoring in the software to establish if there is a leak.

If all the following conditions are present then a leak alarm will be generated:

- High superheat with the expansion valve fully open and superheat not reducing.
- High discharge superheat.
- Low sub cool.

Pump-down

Pump-down is used to pump all the refrigerant in the circuit into the outdoor coil and contain it there either when a leak is detected or when the unit turns off. Containing all the refrigerant in one outdoor area is good practice for safety reasons as well as being the best way of preventing liquid flood-back to the compressor on restart.

Electrical

Standard Electrical features include

- Mains Isolator
- MCB's
- Withdrawable Main Control Panel

This system has been designed to be connected to a TN type distribution system. For alternate distribution type systems, contact Airedale.

Ultracap UPS

The Ultracap module is an external backup device for the controller. The module guarantees temporary power to the controller in the event of power failures and allows for enough time to keep the controller running with time to change power supplies. The module is made using Ultracap storage capacitors (EDLC = Electric Double Layer Capacitor), which are recharged independently by the module.
These ensure reliability in terms of much longer component life than a module made with lead batteries: the life of the Ultracap module is at least 10 years.

Optional Features

Dual Power Switch

Dual supply for redundancy and backup in the event of mains supply failure shall be provided. The dual power supply switch ensures that the InRak always has an incoming power supply.

For the dual power supplies to operate effectively, the incoming power supplies must have the same voltage and frequency and be within 120° phase angle.
The dual power switch does not provide protection to the external condenser. Further provision must be made for this.

Energy Manager

Three-phase compressors can rotate in either direction depending upon phasing of the power.
Since there is a 50-50 chance of connecting power in such a way as to cause rotation in the reverse direction, phase rotation is monitored on a digital input to the controller to prevent start-up of the compressor upon detection of reverse phase rotation.
The power meter within the InRak products is capable of monitoring many different electrical parameters:

- Phase Voltages
- Line Voltages
- Phase Currents
- Unit Power
- Unit Power Factor

Thyristor Controlled Electric Heat

Finned electric heating elements complete with auto and manual reset overheat cut-out protection. Standard electric heating elements are phase balanced for increased efficiency. The thyristor control offers precision control between 0 to 100% via the microprocessor

IEC 60309 Plug and Socket

A IEC 60309 plug and socket shall be fitted enabling quick connection of power to the unit.

Controls

Display/Keypad

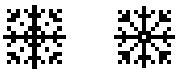
The display keypad features a simple array of keys to navigate through the in built menus.

With an 8 x 22 character (132 x 64 pixel) screen size, back lit in white for improved contrast, the large screen shall provide for user friendly viewing and easy status recognition by displaying a combination of text and icons.

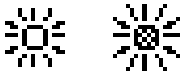
The default screen shall show the unit status and room condition (°C/RH %) without the need for interrogation and an easy to navigate menu structure for further interrogation and adjustment shall be provided.

Display for illustration only.

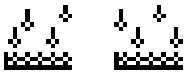
Display Symbols



Cooling Indication



Heating Indication



Dehumidification

Fans

Controls

Standard Features

Temperature/ Humidity Sensor

Unit mounted temperature and humidity sensor shall be supplied as standard. This shall be mounted at the inlet side of the unit monitoring return air conditions.

Tri colour LED for Easy Fault Detection

LED indication for alarm status shall be incorporated in the front face of the InRak unit which signals Healthy, Non Critical and Critical Alarm respectively (Green, Yellow and Red.)

Optional Features

Smoke Detector

Shall be fitted into the roof of the unit to shut down the unit and activate the alarm upon sensing the presence of smoke.

Fire Detector

Shall be installed in the return air stream to shut down the unit in the event of an unusually high return air temperature.

Filter Change Monitoring

A filter change software timer is included to record the time since the filter was changed and give an alarm if the time is exceeded. This must be manually reset when the filters are changed.

Aisle Pressure Management

The InRak shall be fitted with Aisle pressure management, which allows the differential pressure across the IT equipment to be monitored and controlled to achieve:

- Positive air pressure in the cold aisle.
- Negative air pressure in the hot aisle at the server outlet, to prevent backwash of hot air (behind InRak coil guard).
- Controlled differential pressure across the IT hardware so that air is not ‘forced’ through the IT equipment

Dynamic Air Volume

The compressor will maintain the “air off” temperature while the fans control to the air volume as long as the evaporating temperature remains within the operating band. However, if the evaporating temperature changes beyond the high or low differential limits, the fans will modulate to bring the evaporating temperature back within the band, up to the minimum or maximum air volume band limits. If the evaporating temperature changes beyond that, the compressor will modulate to bring the evaporating temperature back within the control band. The evaporating temperature set point can be changed in the controls.

The unit will try to maintain the evaporating temperature as close as possible to the set point whilst maintaining the cooling demand and the air volume.

Note that at 12°C evaporating temperature the inverter will limit the compressor maximum speed to 90rps from 120rps. This is to protect the inverter against high currents.

Energy Manager

Analysis of system energy consumption can be monitored via a dedicated LCD display. Unit parameters can be adjusted via the unit microprocessor control to affect energy usage in line with the system need.

BMS Interface Card

BMS Interface Cards can be factory fitted and interfaced with most BMS. A wide range of protocols can be accommodated through the use of interface devices, with ModBus/Jbus and Carel available as standard options. BMS Interface Cards can be set up and connected by following the setup guides supplied with the unit. Please contact Airedale to discuss the licensing requirements for other interfaces such as SNMP, LonWorks, Metasys and BACnet. Airedale’s own supervisory plug-in BMS card, pCOWEB, is also available and is based on Ethernet TCP/IP secure technology with SNMP features. It requires no proprietary cabling or monitoring software and can be supplied preprogrammed with an IP address for ease of set up. Cables to the BMS to be supplied by others.

Controls

Lon BMS Connection

The Airedale controllers, using special serial cards, shall be integrated into LonWorks® networks. The RS485 and the FTT10 standards shall be supported by the LonWorks® serial cards.

The types of LonWorks® serial cards shall be FTT-10A 78 kbs (TP/FT-10) on the LonWorks® network.

pCOWeb

pCOWeb is a new generation of Airedale supervisory plug-in cards which make communicating with an Airedale unit simply a matter of logging onto the office Intranet or via the web. Based on Ethernet TCP/IP secure technology, pCOWeb shall require no proprietary cabling. It shall have little or no set-up on site and can be pre-programmed with an IP address prior to dispatch from airedale.

BACnet Protocol

The BACnet protocol option shall be supplied either with a pCOWeb (Ethernet) or pCONet (RS485) interface card.

Modbus/Carel BMS Connection

The Airedale controllers shall be able to communicate directly using the Modbus® protocol.

The Modbus® card shall be a small PCB (60mm x 30mm), which can be plugged into the controller to provide it with the following protocol support

- Modbus® - JBus slave
- RTU mode (Remote Terminal Unit) with 8 bit encoding and error handling using 16 bit CRC
- Communication standard connection options of RS485 (multipoint) or RS232 (point-point)
- Maximum Baud Rate of 19200

The data communication shall be asynchronous serial, 8 data bits, 2 stop bits and no parity (in total 11 bits/datum).

The data/parameters from the controller shall be represented within Modbus® registers, each register containing information pertaining to temperatures, pressures, setpoint, status, etc and is available to the site integration company in a spreadsheet format

Programming Smart Key

A smart key shall be supplied to offer software back-up of the control strategy. The key shall feature simple plug in operation and allow transfer of software programs from the key to the microprocessor and vice versa. The use of a service laptop shall not be necessary.

Expansion Board

An expansion board can be added as an option to add up to 4 additional supply or return air temperature sensors to the unit. These can be placed on server racks adjacent to the unit to give better regulation over the controlled temperature and help prevent hot-spots occurring on a server rack or within the room.

Dynamic Pressure Control (DX units)

With DX units the fans will operate with constant pressure control except the fan speed will modulate within predefined upper and lower limits, to maintain the target differential whilst maintaining the evaporating temperature.

Similar to air volume control, the compressor will maintain the “air off” temperature while the fans control to the aisle pressure as long as the evaporating temperature remains within the operating band. However, if the evaporating temperature changes beyond the high or low differential limits, the fans will modulate to bring the evaporating temperature back within the band, up to the minimum or maximum aisle pressure band limits. If the evaporating temperature changes beyond that, the compressor will modulate to bring the evaporating temperature back within the control band.

Heating

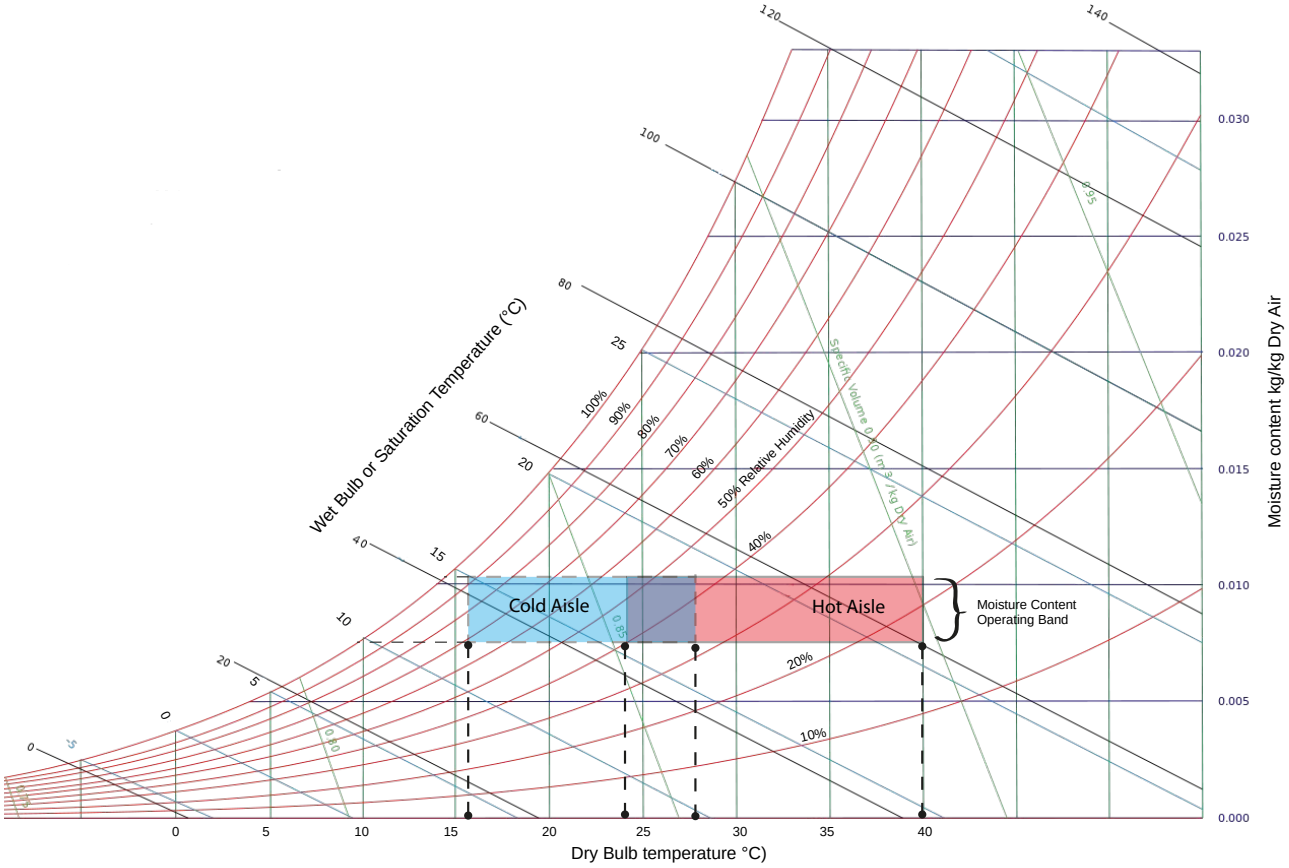
The InRak has the option of thyristor heating to give continuous analogue control to the heating produced.

The heating loop will be activated when the return air temperature falls below the set point, as with fan control the heating present within the unit will modulate to satisfy the unit heating demand.

Technical Data - Direct Expansion

Operating Limits

Cooling		Min	Max
Room Temperature	°C	16	28
Room RH at 24°C	%	40	55
Return Air Temperature	°C	25	40
Outdoor Ambient	°C	-20	48



CAUTION ⚠	Low humidity in a data centre may cause static electricity build up.

Technical Data - Direct Expansion

Performance Data - Single Compressor (X1)

Full Load (X1)

Unit	Air On DB / RH		Ambient (°C) 25	30	35	40	46
LIR6042U-X123-0	25°C / 42%	Gross Total Cooling (kW)	18.83	18.83	21.13	20.27	20.33
		Power Input (kW)	4.43	4.43	6.20	6.89	9.69
		EER	4.25	4.25	3.40	2.94	2.10
	30°C / 32%	Gross Total Cooling (kW)	26.86	26.60	29.18	28.04	28.23
		Power Input (kW)	6.79	7.03	9.76	10.83	14.99
		EER	3.95	3.78	2.99	2.59	1.88
	35°C / 24%	Gross Total Cooling (kW)	33.93	35.25	34.07	32.78	30.13
		Power Input (kW)	8.16	10.91	12.16	13.50	15.08
		EER	4.16	3.23	2.80	2.43	2.00
	40°C / 18%	Gross Total Cooling (kW)	39.61	38.50	36.01	33.38	30.30
		Power Input (kW)	9.92	11.11	12.24	13.44	15.00
		EER	3.99	3.46	2.94	2.48	2.02
LIR6042U-X130-0	25°C / 42%	Gross Total Cooling (kW)	24.81	24.64	23.73	22.74	24.60
		Power Input (kW)	7.14	7.29	8.08	8.95	12.41
		EER	3.47	3.38	2.94	2.54	1.98
	30°C / 32%	Gross Total Cooling (kW)	35.88	34.74	33.46	32.07	29.54
		Power Input (kW)	10.05	11.18	12.43	13.76	15.30
		EER	3.57	3.11	2.69	2.33	1.93
	35°C / 24%	Gross Total Cooling (kW)	39.54	37.24	35.02	32.78	30.13
		Power Input (kW)	10.21	11.24	12.35	13.53	15.09
		EER	3.87	3.31	2.84	2.42	2.00
	40°C / 18%	Gross Total Cooling (kW)	40.89	38.50	36.01	33.38	30.30
		Power Input (kW)	10.10	11.15	12.25	13.43	14.99
		EER	4.05	3.45	2.94	2.49	2.02

Note: The shaded area indicates that the Compressor speed is modulated to achieve dew point control.
All the performance data is based on a SHR of 1.0.
Maximum duty data is based on achievable duty at maximum air volume
Performance data is based upon a unit with no filtration.

Technical - Direct Expansion

Performance Data - Tandem Compressor (X2)

Full Load (X2)

Unit	Air On DB / RH		Ambient (°C) 25	30	35	40	46
LIR6042U-X240-0	25°C / 42%	Gross Total Cooling (kW)	28.19	27.90	29.47	28.07	29.43
		Power Input (kW)	7.45	7.65	9.92	10.93	16.33
		EER	3.78	3.65	2.97	2.57	1.80
	30°C / 32%	Gross Total Cooling (kW)	40.60	42.48	42.54	40.55	37.97
		Power Input (kW)	11.05	14.29	18.38	20.26	22.66
		EER	3.67	2.97	2.31	2.00	1.68
	35°C / 24%	Gross Total Cooling (kW)	50.21	48.52	46.67	43.41	39.57
		Power Input (kW)	15.32	17.00	18.81	20.35	22.41
		EER	3.28	2.85	2.48	2.13	1.77
	40°C / 18%	Gross Total Cooling (kW)	54.92	51.51	47.91	44.42	40.88
		Power Input (kW)	15.71	17.06	18.50	15.58	17.06
		EER	3.49	3.02	2.59	2.85	2.40
LIR6042U-X250-0	25°C / 42%	Gross Total Cooling (kW)	32.55	32.55	31.43	33.87	31.81
		Power Input (kW)	9.51	9.51	10.29	14.57	16.29
		EER	3.42	3.42	3.05	2.32	1.95
	30°C / 32%	Gross Total Cooling (kW)	47.09	48.51	46.73	44.78	42.19
		Power Input (kW)	13.29	15.96	17.64	19.45	21.79
		EER	3.54	3.04	2.65	2.30	1.94
	35°C / 24%	Gross Total Cooling (kW)	55.02	53.58	50.44	46.87	43.10
		Power Input (kW)	14.85	16.19	17.47	18.57	20.58
		EER	3.70	3.31	2.89	2.52	2.09
	40°C / 18%	Gross Total Cooling (kW)	58.46	55.32	51.83	48.14	43.99
		Power Input (kW)	14.08	15.27	16.67	18.19	15.87
		EER	4.15	3.62	3.11	2.65	2.77

Note: The shaded area indicate that the Compressor speed is modulated to achieve dew point control.
All the performance data is based on a SHR of 1.0.
Maximum duty data is based on achievable duty at maximum air volume
Performance data is based upon a unit with no filtration.

Technical - Direct Expansion

Performance Data - Single Compressor (X1)

Max EER (X1)

Unit	Air On DB / RH		Ambient (°C) 25	30	35	40	46
LIR6042U-X123-0	25°C / 42%	Gross Total Cooling (kW)	9.50	9.50	10.78	10.33	11.63
		Power Input (kW)	2.02	2.02	2.20	2.51	4.14
		EER	4.70	4.70	4.90	4.10	2.82
	30°C / 32%	Gross Total Cooling (kW)	14.48	14.48	14.87	14.29	14.27
		Power Input (kW)	3.06	3.06	3.26	3.67	4.26
		EER	4.73	4.73	4.58	3.89	3.36
	35°C / 24%	Gross Total Cooling (kW)	17.89	17.89	17.59	17.11	15.33
		Power Input (kW)	3.06	3.06	3.31	3.74	4.24
		EER	5.85	5.85	5.31	4.57	3.62
	40°C / 18%	Gross Total Cooling (kW)	20.23	20.23	19.70	19.66	15.75
		Power Input (kW)	4.15	4.15	4.55	3.78	4.22
		EER	4.87	4.87	4.33	5.21	3.73
LIR6042U-X130-0	25°C / 42%	Gross Total Cooling (kW)	13.51	13.51	13.30	12.73	12.37
		Power Input (kW)	3.09	3.09	3.23	3.64	4.21
		EER	4.37	4.37	4.12	3.51	2.94
	30°C / 32%	Gross Total Cooling (kW)	19.25	19.25	16.83	16.22	14.93
		Power Input (kW)	4.20	4.20	3.39	3.82	4.30
		EER	4.58	4.58	4.96	4.25	3.47
	35°C / 24%	Gross Total Cooling (kW)	20.01	20.01	17.59	17.11	15.33
		Power Input (kW)	4.16	4.16	3.30	3.73	4.24
		EER	4.81	4.81	5.33	4.59	3.62
	40°C / 18%	Gross Total Cooling (kW)	21.72	20.23	19.70	19.66	15.75
		Power Input (kW)	4.14	4.14	4.54	3.77	4.22
		EER	5.25	4.87	4.33	5.23	3.73

All the performance data is based on a SHR of 1.0.
Max EER data is based on a part load condition (i.e. required duty of 50% of the maximum achievable duty of the unit).
Performance data is based upon a unit with no filtration.

Technical - Direct Expansion

Performance Data - Tandem Compressor (X2)

Max EER (X2)

Unit	Air On DB / RH		Ambient (°C) 25	30	35	40	46
LIR6042U-X240-0	25°C / 42%	Gross Total Cooling (kW)	14.41	14.41	14.73	14.14	15.78
		Power Input (kW)	3.16	3.16	3.38	3.79	5.74
		EER	4.55	4.55	4.36	3.73	2.75
	30°C / 32%	Gross Total Cooling (kW)	21.28	21.28	21.37	20.56	19.50
		Power Input (kW)	4.30	4.30	4.81	5.36	6.05
		EER	4.95	4.95	4.43	3.84	3.22
	35°C / 24%	Gross Total Cooling (kW)	26.39	26.30	24.05	22.49	20.40
		Power Input (kW)	5.40	5.47	4.86	5.28	5.86
		EER	4.89	4.81	4.95	4.26	3.48
	40°C / 18%	Gross Total Cooling (kW)	29.09	26.75	24.57	23.82	21.29
		Power Input (kW)	5.33	5.43	4.67	5.22	5.82
		EER	5.45	4.93	5.26	4.55	3.65
LIR6042U-X250-0	25°C / 42%	Gross Total Cooling (kW)	16.40	16.40	15.87	17.51	16.02
		Power Input (kW)	4.05	4.05	3.64	4.94	5.53
		EER	4.05	4.05	4.36	3.54	2.90
	30°C / 32%	Gross Total Cooling (kW)	24.05	25.25	23.55	22.72	21.32
		Power Input (kW)	5.42	5.45	5.06	5.62	7.50
		EER	4.45	4.63	4.65	4.05	2.85
	35°C / 24%	Gross Total Cooling (kW)	28.05	28.05	25.87	24.90	21.81
		Power Input (kW)	5.38	5.38	5.77	6.54	5.69
		EER	5.21	5.21	4.49	3.81	3.83
	40°C / 18%	Gross Total Cooling (kW)	31.95	29.09	26.34	24.18	23.21
		Power Input (kW)	6.41	5.30	5.74	4.93	5.63
		EER	4.98	5.49	4.59	4.90	4.12

Max EER data is based on a part load condition (i.e. required duty of 50% of the maximum achievable duty of the unit).
Unit duty based on a SHR = 1.0
Performance data is based upon a unit with no filtration.

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Technical - Direct Expansion

Mechanical Data - Single Compressor (X1)

			LIR6042U-X123	LIR6042U-X130
Standard Condenser Match			**CR50**	**CR50**
Capacity				
Nom Cooling (Gross)	(1)	kW	34.24	35.21
Nom Power Input	(1)	kW	11.98	12.16
Nom EER	(1)		2.86	2.90
Capacity Steps			10 - 100% Modulation	
Dimensions – H x W x D		mm	600 x 1334 x 1994	600 x 1334 x 1994
Weight – Machine / Operating		kg	391 / 395	391 / 395
Construction			Panels: Galvanised Sheet Steel, Epoxy Baked Powder Coated	
Material			Frame: Aluminium Frame with Aluminium Corners, Epoxy Baked Powder Coated	
Colour			Optional: RAL7021 (Black Grey) or RAL7035 (Light Grey)	
Evaporator			Rifled Copper Tube / Turbulated Hydrophilic Coated Aluminium Fins	
Cooling/Dehum Stages			Modulating / 1	Modulating / 1
Fan Redundancy Configuration			N+1	N
Fan Motor			Backwards Curved, Centrifugal Direct Drive	
Motor Type			EC	EC
Quantity x Motor Size		kW	4 x 0.15	4 x 0.15
Maximum Speed		rpm	1925	1925
Minimum Airflow	(2)	m^3/s	0.70	0.70
Maximum Airflow		m^3/s	1.50	1.90
Compressor			EC Inverter Driven Scroll	
Configuration			Single Circuit – Single Compressor (1 x Variable)	Single Circuit – Single Compressor (1 x Variable)
Quantity			1	1
Oil Charge Volume		l	1 x 2.3	1 x 2.3
Seperator Oil Charge		l	0.4	0.4
Oil Type			Polyvinylether (PVE)	
Refrigeration			Single Circuit	
Refrigerant Control and Type			Electronic Expansion Valve	
Refrigerant Type			R410A	
Holding Charge			Inert Gas	
Refrigerant Charge		kg	3.8	3.8
Connections				
Liquid (sweat)		in	1/2	1/2
Discharge (sweat)		in	5/8	5/8
Condensate Drain Hose (ID)		mm	22	22
OPTIONAL EXTRAS				
Filtration			Disposable to ISO 16890:2016 (ISO-C-80)	
Quantity			3	3
Depth		mm	50	50
Electric Heating (Total)		kW	10.5	10.5
Type			Thyristor Controlled (Fully Modulating)	
Condensate Pump				
Head		m	8	8
Flow		l/min	5	5
Drain			10mm Stainless Steel Stub Connection	

(1) Nominal data based on 35°C/24% RH Air On condition, 35°C Ambient temperature, and without optional filtration.
(2) Minimum air volume increases to $1m^3/s$ if electric heat option is selected.

Technical - Direct Expansion

Electrical Data - Single Compressor (X1)

			LIR6042U-X123	LIR6042U-X130
Standard Condenser Match -			**CR050**	**CR050**
Unit Data Cooling only	(1)			
Nominal Run Amps		A	20.1	21.2
Maximum Start Amps		A	27.3	27.3
Recommended Mains Fuse Size	(4)	A	40	40
Max Mains Incoming Cable Size	(5)	mm²	16	16
Mains Supply 50Hz (-0)		V	400V / 3PH + N / 50Hz	
Mains Supply 60Hz (-1)		V	380V / 3PH + N / 60Hz	
Control Circuit		VAC	24	24
Evaporator Fan - Motor - Per Fan				
Motor Type			EC	EC
Quantity x Motor Size	(2)	kW	4 x 0.15	4 x 0.15
Full Load Amps		A	1.2	1.2
Locked Rotor Amps		A	N/A	N/A
Compressor 1	(3)			
Motor Size		kW	5.25	5.25
Nominal Run Amps		A	18.8	18.8
Max Run Amps		A	24.9	24.9
Type of Start			Soft Start	Soft Start
Compressor 2	(3)			
Motor Size		kW	N/A	N/A
Nominal Run Amps		A	N/A	N/A
Locked Rotor Amps		A	N/A	N/A
Type of Start			N/A	N/A
Standard Condenser Match – AC Motor Per Fan				
Quantity x Motor Size (50Hz Supply)		kW	2 x 0.6	2 x 0.6
Full Load Amps (50Hz Supply)		A	2.6	2.6
Quantity x Motor Size (60Hz Supply)		kW	2 x 0.5	2 x 0.5
Full Load Amps (60Hz Supply)		A	2.2	2.2
OPTIONAL EXTRAS				
Electric Heating				
Stage of Reheat			Variable	Variable
Number of Elements			3	3
Rating (Total)		kW	10.5	10.5
Current Per Phase (50Hz Supply)		A	15.2	15.2
Current Per Phase (60Hz Supply)		A	16.0	16.0
Standard Condenser Match - EC Motor-Per Fan				
Mains Supply 50Hz (-0)		V	230V / 1PH + N / 50Hz	
Mains Supply 60Hz (-1)		V	220V / 1PH + N / 60Hz	
Quantity x Motor Size (50Hz Supply)		kW	2 x 0.72	2 x 0.72
Full Load Amps (50Hz Supply)		A	3.2	3.2
Quantity x Motor Size (60Hz Supply)		kW	2 x 0.77	2 x 0.77
Full Load Amps (60Hz Supply)		A	3.3	3.3
SCAF Condenser Match - Motor - Per Fan				
Quantity x Motor Size (50Hz Supply)		kW	2 x 1.4	2 x 1.4
Full Load Amps (50Hz Supply)		A	6.0	6.0
Quantity x Motor Size (60Hz Supply)		kW	2 x 1.75	2 x 1.75
Full Load Amps (60Hz Supply)		A	7.8	7.8

(1) Values given for Cooling Only unit variants at 11°C evaporating and 46°C condensing.
(2) Stated motor power is based on maximum electrical power absorbed.
(3) Values are per compressor.
(4) Values may change based on additional selections (i.e. Heating).
(5) Values based on Fuse size., May change based on unit selections.

Technical - Direct Expansion

Mechanical Data - Tandem Compressor (X2)

			LIR6042U-X240-0	LIR6042U-X250-0
Standard Condenser Match			**CR65**	**CR80**
Capacity				
Nom Cooling (Gross)	(1)	kW	48.17	50.75
Nom Power Input	(1)	kW	17.34	17.17
Nom EER	(1)		2.78	2.95
Capacity Steps			10 - 100% Modulation	
Dimensions – H x W x D		mm	600 x 1334 x 1994	600 x 1334 x 1994
Weight – Machine / Operating		kg	438 / 442	438 / 442
Construction			Panels: Galvanised Sheet Steel, Epoxy Baked Powder Coated	
Material			Frame: Aluminium Frame with Aluminium Corners, Epoxy Baked Powder Coated	
Colour			Optional: RAL7021 (Black Grey) or RAL7035 (Light Grey)	
Evaporator			Rifled Copper Tube / Turbulated Hydrophilic Coated Aluminium Fins	
Cooling/Dehum Stages			Modulating / 1	Modulating / 1
Fan Redundancy Configuration			N+1	N
Fan Motor			Backwards Curved, Centrifugal Direct Drive	
Motor Type			EC	EC
Quantity x Motor Size		kW	4 x 0.5	4 x 0.5
Maximum Speed		rpm	2360	2360
Minimum Airflow	(2)	m^3/s	0.70	0.70
Maximum Airflow		m^3/s	2.30	3.05
Compressor			EC Inverter Driven Scroll	
Configuration			Single Circuit – Tandem Compressors (1 x Variable, 1 x Fixed)	Single Circuit – Tandem Compressors (1 x Variable, 1 x Fixed)
Quantity			2	2
Oil Charge Volume		l	1 x 1.7, 1x 2.3	1 x 1.7, 1 x 2.3
Seperator Oil Charge		l	0.4	0.4
Oil Type			Polyvinylether (PVE)	
Refrigeration			Single Circuit	
Refrigerant Control and Type			Electronic Expansion Valve	
Refrigerant Type			R410A	
Holding Charge			Inert Gas	
Refrigerant Charge		kg	4.2	4.2
Connections				
Liquid (sweat)		in	5/8	5/8
Discharge (sweat)		in	7/8	7/8
Condensate Drain Hose (ID)		mm	22	22
OPTIONAL EXTRAS				
Filtration			Disposable to ISO 16890:2016 (ISO-C-80)	
Quantity			3	3
Depth		mm	50	50
Electric Heating (Total)		kW	10.5	10.5
Type			Thyristor Controlled (Fully Modulating)	
Condensate Pump				
Head		m	8	8
Flow		l/min	5	5
Drain			10mm Stainless Steel Stub Connection	

(1) Nominal data based on 35°C/24% RH Air On condition, 35°C Ambient temperature, and without optional filtration.
(2) Minimum air volume increases to $1m^3/s$ if electric heat option is selected.

Technical - Direct Expansion

Electrical Data - Tandem Compressor (X2)

			LIR6042U-X240-0	LIR6042U-X250-0
Standard Condenser Match -			**CR065**	**CR080**
Unit Data Cooling only	(1)			
Nominal Run Amps		A	27.9	29.4
Maximum Start Amps		A	89.3	89.3
Recommended Mains Fuse Size	(4)	A	50	50
Max Mains Incoming Cable Size	(5)	mm²	16	16
Mains Supply 50Hz (-0)		V	400V / 3PH + N / 50Hz	
Mains Supply 60Hz (-1)		V	380V / 3PH + N / 60Hz	
Control Circuit		VAC		24
Evaporator Fan - Motor - Per Fan				
Motor Type			EC	EC
Quantity x Motor Size	(2)	kW	4 x 0.5	4 x 0.5
Full Load Amps		A	2.2	2.2
Locked Rotor Amps		A	N/A	N/A
Compressor 1	(3)			
Motor Size		kW	5.25	5.25
Nominal Run Amps		A	18.8	18.8
Max Run Amps		A	24.9	24.9
Type of Start			Soft Start	Soft Start
Compressor 2	(3)			
Motor Size		kW	4.28	4.28
Nominal Run Amps		A	6.2	6.2
Locked Rotor Amps		A	60.0	60.0
Type of Start			Direct On Line	Direct On Line
Standard Condenser Match – AC Motor Per Fan				
Quantity x Motor Size (50Hz Supply)		kW	2 x 0.6	3 x 0.6
Full Load Amps (50Hz Supply)		A	2.6	2.6
Quantity x Motor Size (60Hz Supply)		kW	2 x 0.5	3 x 0.5
Full Load Amps (60Hz Supply)		A	2.2	2.2
OPTIONAL EXTRAS				
Electric Heating				
Stage of Reheat			Variable	Variable
Number of Elements			3	3
Rating (Total)		kW	10.5	10.5
Current Per Phase (50Hz Supply)		A	15.2	15.2
Current Per Phase (60Hz Supply)		A	16.0	16.0
Standard Condenser Match - EC Motor-Per Fan				
Mains Supply 50Hz (-0)		V	230V / 1PH + N / 50Hz	
Mains Supply 60Hz (-1)		V	220V / 1PH + N / 60Hz	
Quantity x Motor Size (50Hz Supply)		kW	2 x 0.72	3 x 0.72
Full Load Amps (50Hz Supply)		A	3.2	3.2
Quantity x Motor Size (60Hz Supply)		kW	2 x 0.77	3 x 0.77
Full Load Amps (60Hz Supply)		A	3.3	3.3
SCAF Condenser Match - Motor - Per Fan				
Quantity x Motor Size (50Hz Supply)		kW	2 x 1.4	3 x 1.4
Full Load Amps (50Hz Supply)		A	6.0	6.0
Quantity x Motor Size (60Hz Supply)		kW	2 x 1.75	3 x 1.75
Full Load Amps (60Hz Supply)		A	7.8	7.8

(1) Values given for unit variants at 11°C evaporating and 46°C condensing.
(2) Stated motor power is based on maximum electrical power absorbed.
(3) Values are per compressor.
(4) Values may change based on additional selections (i.e. Heating).
(5) Values based on Fuse size., May change based on unit selections.

Technical - Direct Expansion

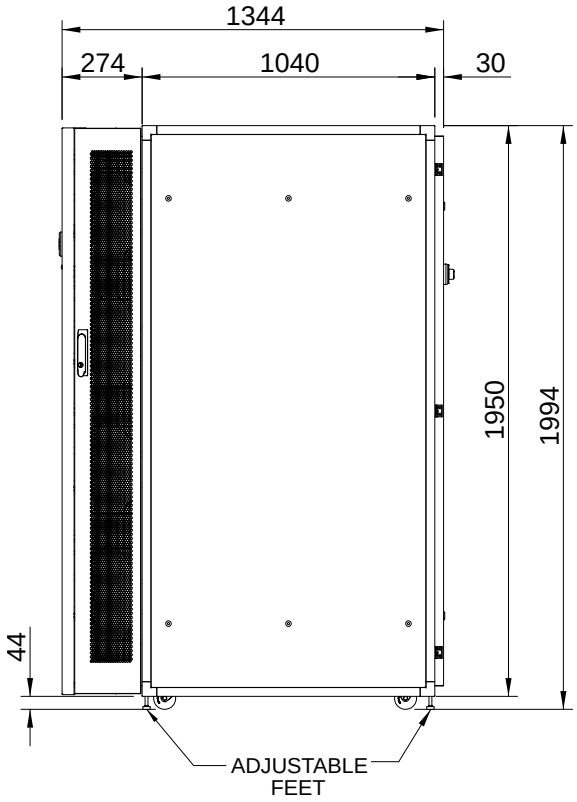
Sound Data - (X1 / X2)

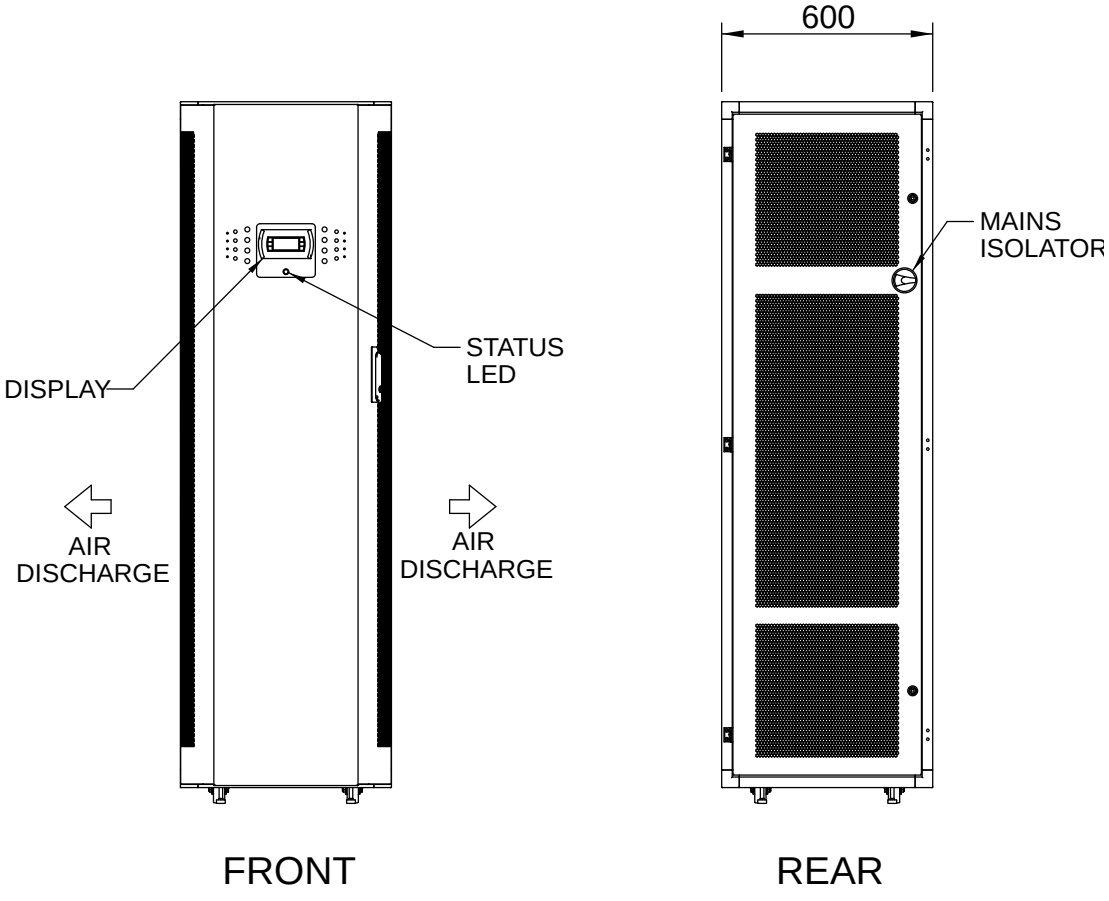
					Frequency (Hz) dB							
		Fan load %	Sound Measurement	Overall dB(A)	63	125	250	500	1000	2000	4000	8000
LIR6042U-X123	N+1	100	Overall Lw	85	84	97	79	72	72	72	68	71
			Sound Pressure @ 1m	77	76	89	71	64	64	64	60	63
		50	Overall Lw	82	69	92	65	68	71	72	67	71
			Sound Pressure @ 1m	74	61	84	57	60	63	64	59	63
LIR6042U-X130	N	100	Overall Lw	91	92	103	87	78	75	73	68	71
			Sound Pressure @ 1m	82	84	95	79	70	67	65	60	63
		50	Overall Lw	82	74	93	69	68	71	72	67	71
			Sound Pressure @ 1m	74	66	85	61	60	63	64	59	63
LIR6042U-X240	N+1	100	Overall Lw	88	68	77	79	75	78	77	71	71
			Sound Pressure @ 1m	79	60	69	71	67	70	69	63	63
		50	Overall Lw	82	58	92	68	68	71	72	67	71
			Sound Pressure @ 1m	73	50	84	60	60	63	64	59	63
LIR6042U-X250	N	100	Overall Lw	92	75	79	86	81	82	78	72	72
			Sound Pressure @ 1m	83	67	71	78	73	74	70	64	64
		50	Overall Lw	82	65	92	74	69	71	72	68	71
			Sound Pressure @ 1m	74	57	84	66	61	63	64	60	63

N+1 (75% Max fan speed) 100% fan load refers to 4 fans operating at this N+1 fan speed
N+1 (75% Max fan speed) 50% fan load refers to 4 fans operating at 50% of N+1 Max fan speed.
N (100% Fan speed) 100% fan load refers to 4 fans operating at 100% of N Max fan speed.
N (100% Fan speed) 50% fan load refers to 4 fans operating at 50% of N Max fan speed.

Installation

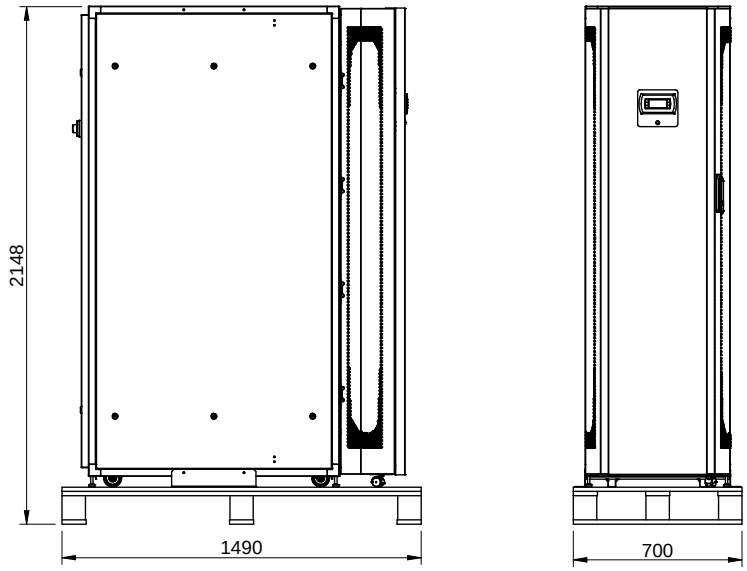
Dimensions





Installation

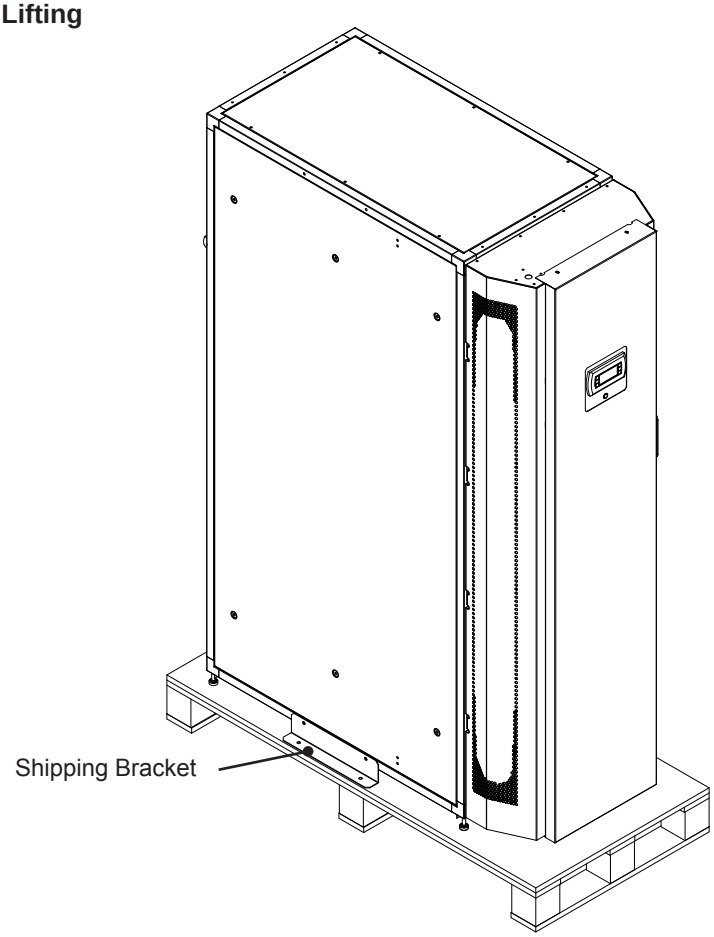
Packed Dimensions



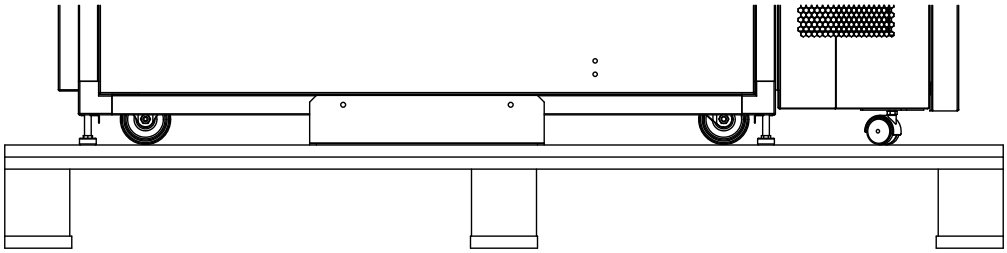
For specific markets units shall be shipped, mounted on wooden pallet and covered with polythene. The pallet shall be mechanically fixed to the unit for transportation only (Please contact Airedale for this option). Add 50mm to length and width and 160mm to height.

Installation

Unpacking and Lifting



CAUTION ⚠	The unit is to be carefully unpacked, inspected and any damage reported to Airedale immediately. All packaging is to be recycled accordingly.



Moving the Unit

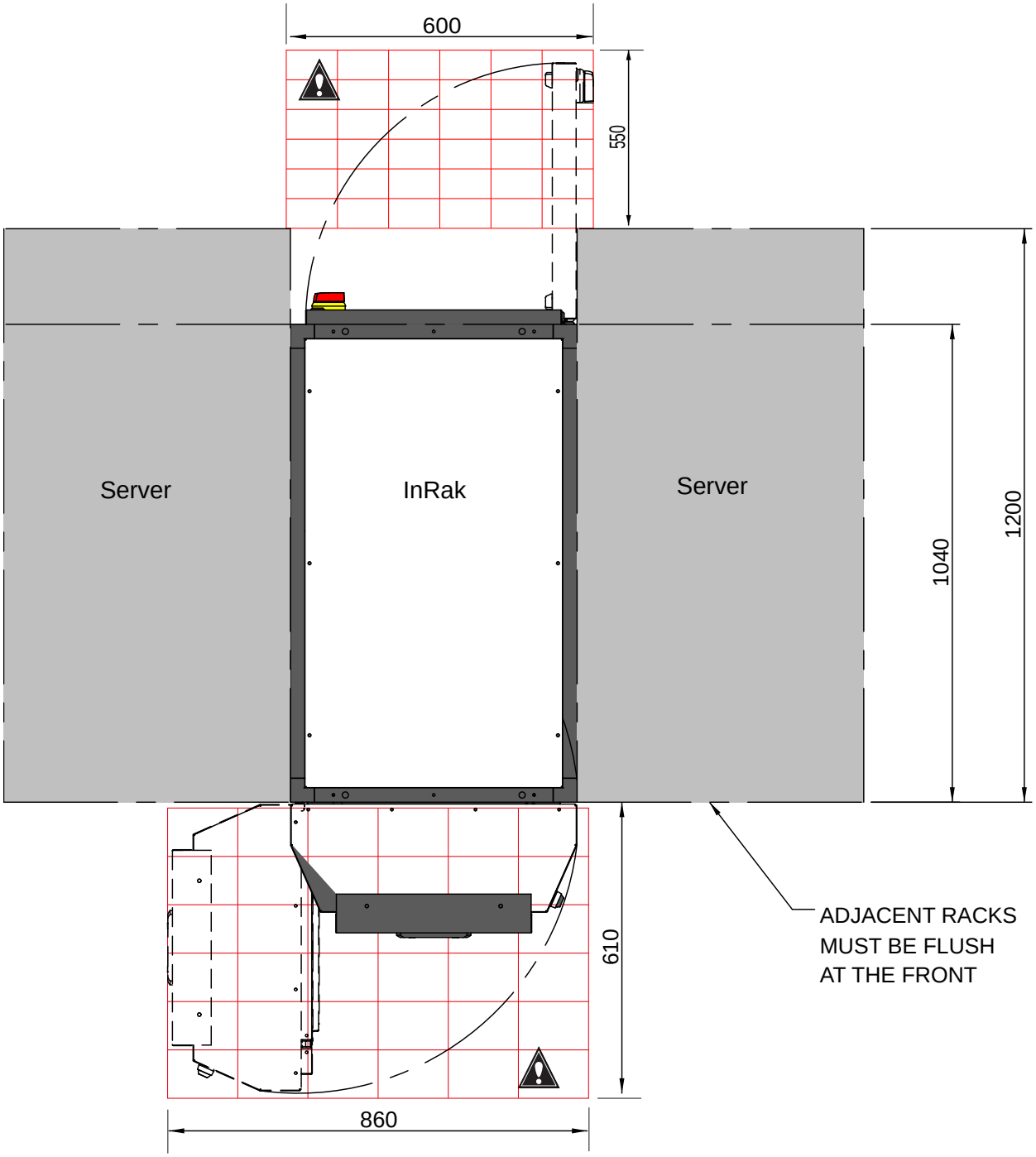
Move packaged unit with mechanical handling equipment into position adjacent to data racks.
Then:-

- Cut strapping, unwrap, remove shipping bracket and position moving equipment either side.
- Carefully lift unit up.
- Remove pallet.
- Attach loose door wheel and adjust to the same height as unit wheels.
- Lower unit to floor (raise feet up) so that the wheels are used.
- Then manoeuvre into position by using the InRak wheels.
- Extend the adjustable leveling feet down so that the wheels are off the ground.
- Extend the adjustable door wheel so that it meets the ground and is able to support the door.
- Level the unit.

CAUTION ⚠	Take care when moving unit with door wheel fitted and ensure all wheels are approximately even height.

Installation

Positioning

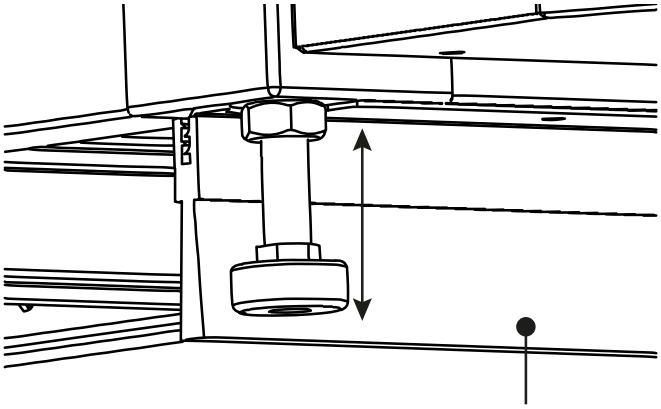


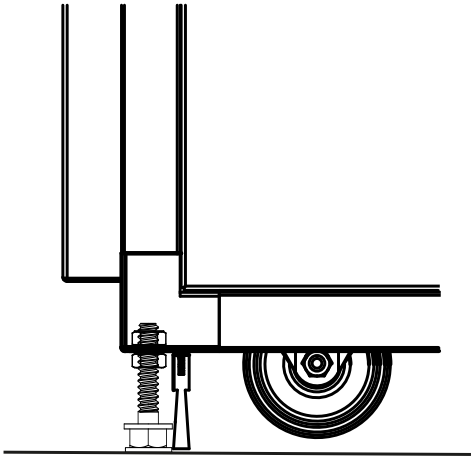
The InRak requires space at the front and rear of the unit for maintenance purposes. This is highlighted above.

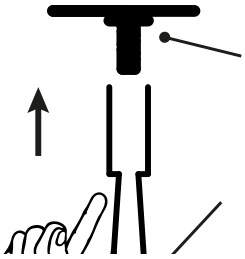
Installation

Levelling

The unit once positioned shall be levelled. This ensures that the unit has an air tight seal between the InRak and any adjacent server racks. Unit need to be level to ensure that any condensate collected is disposed of correctly.





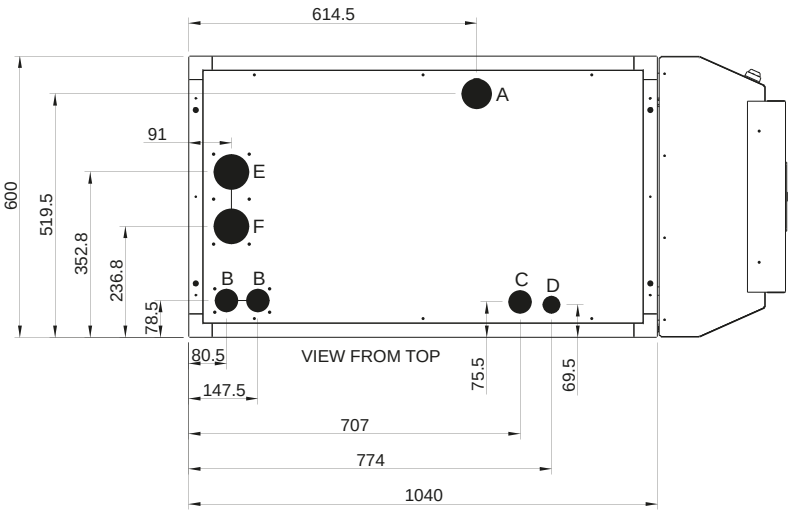


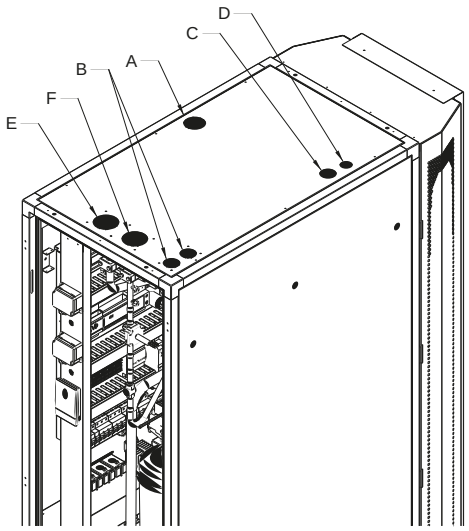
Note: The brush seal compresses when the feet are adjusted creating a tight seal to the floor. The seal is supplied loose for easy fitment.

Installation

Incoming Services

Top Entry - Direct Expansion

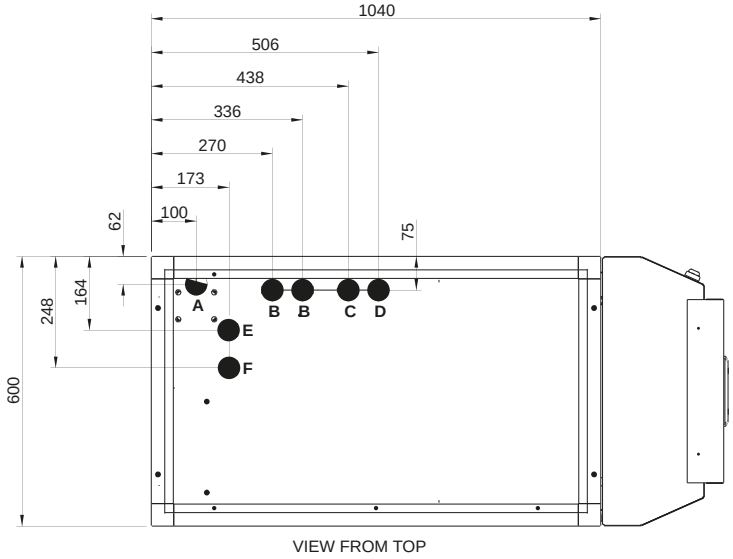


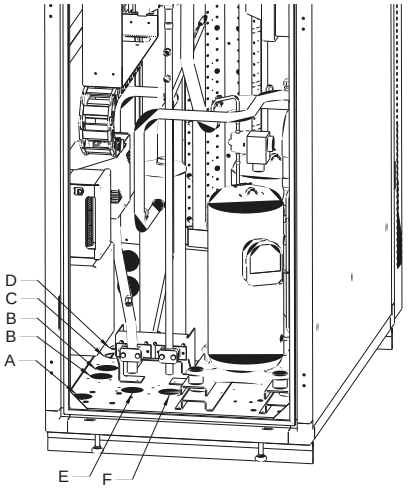


HOLE 'A' Ø65mm CONTROLS IN/OUT
HOLES 'B' Ø50mm MAINS POWER SUPPLY
HOLE 'C' Ø50mm
HOLE 'D' Ø38mm CONDENSATE DRAIN
HOLE 'E' Ø76mm DISCHARGE LINE
HOLE 'F' Ø76mm LIQUID LINE

HOLES 'B','E' AND 'F' TO BE SUPPLIED WITH GLAND PLATES FITTED .
ALL OTHER HOLES TO BE FITTED WITH BLIND GROMMETS

Bottom Entry - Direct Expansion





HOLE 'A' Ø50mm CONTROLS IN/OUT
HOLES 'B' Ø50mm MAINS POWER SUPPLY
HOLE 'C' Ø50mm
HOLE 'D' Ø50mm CONDENSATE DRAIN
HOLE 'E' Ø38mm 7/8" DISCHARGE LINE
HOLE 'F' Ø38mm 5/8" LIQUID LINE

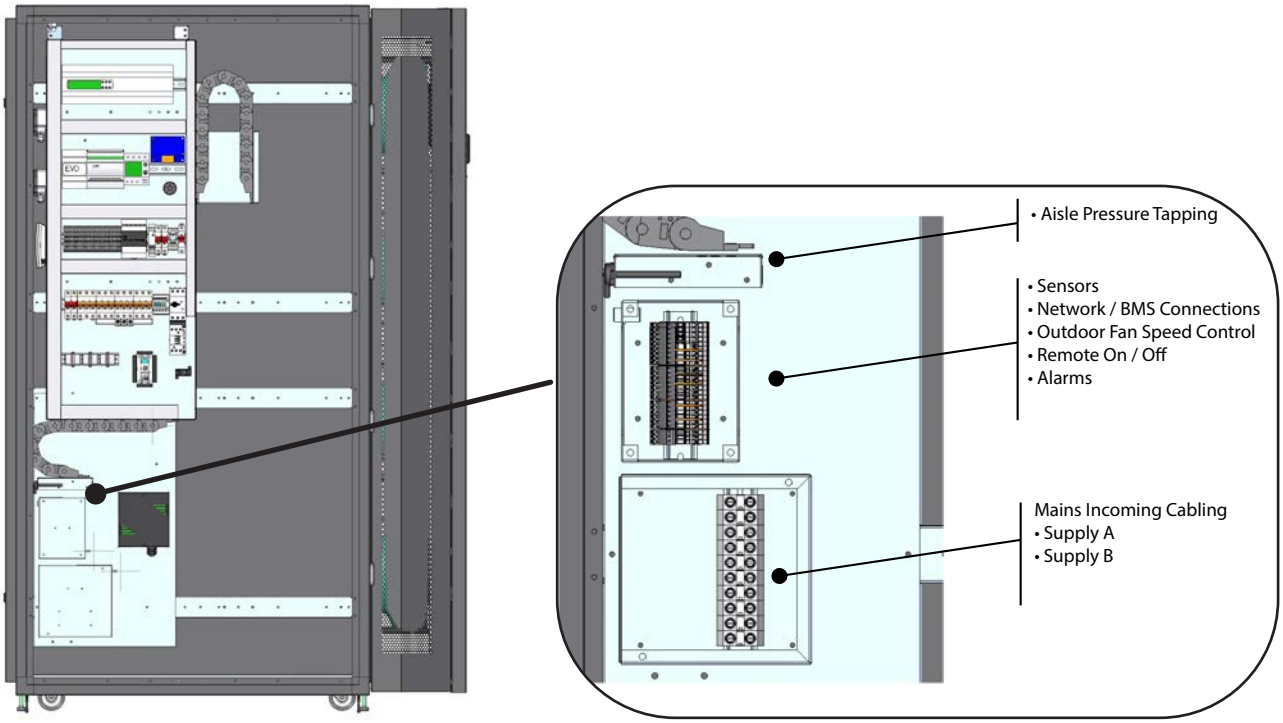
HOLE 'B', 'E' AND 'F' TO BE SUPPLIED WITH GLAND PLATES FITTED.
ALL OTHER HOLES TO BE FITTED WITH BLIND GROMMETS.

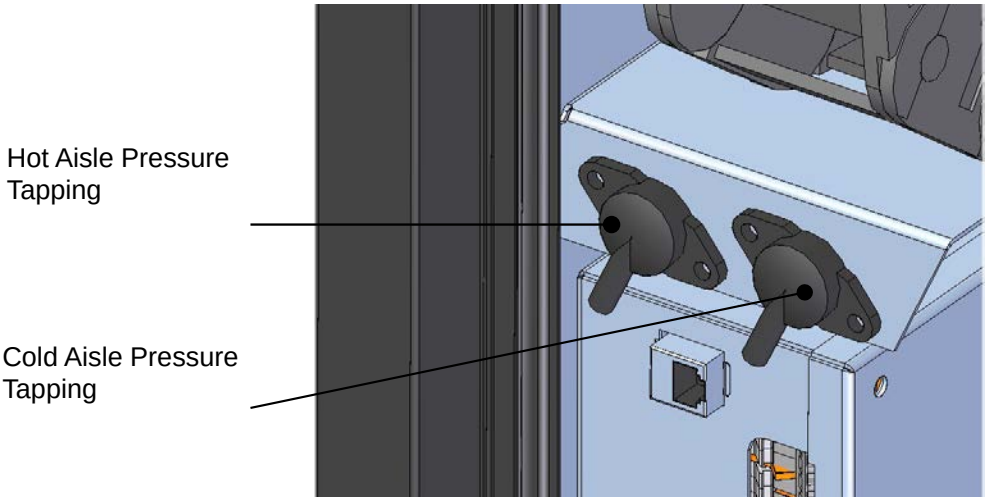
Cable and pipe work passing through floors / ceilings are required to be sealed by integral grommets to ensure efficient unit operation.

Installation

Electrical Services Incoming Cabling

The electrical services enter the unit through either the base or the roof of the unit. Termination is via a terminal box at the base of the unit (bottom connections only, top connection direct to isolator).





Connections are to be made between the tappings above (located in control panel) and pressure points in the aisles. The tappings above are linked to the differential pressure sensor in the unit making easier customer termination.

Installation

Interconnecting Wiring

InRak		N1	O	←		Mains incoming supply 1 400V/3~/50Hz 380V/3~/60Hz
		201	O	←	L1	
		202	O	←	L2	
		203	O	←	L3	
		PE	O	←		
		N2	O	←		Mains incoming supply 2 400V/3~/50Hz 380V/3~/60Hz
		204	O	←	L1	
		205	O	←	L2	
		206	O	←	L3	
		PE	O	←		
		860	O	←		Supply Air Temperature Sensor 1
		861	O	←		
		862	O	←		Supply Air Temperature Sensor 2
		863	O	←		
		864	O	←		Supply Air Temperature Sensor 3
		865	O	←		
		522	O	←		Remote On/Off
		502	O	→		24 Vac
		833	O	→		Outdoor Fan Speed Control 0 -10 Vdc
		500	O	→		0 Vdc
		560	O	→	NO	Non-Critical Alarm Normally Open
		561	O	←	Common	Common
		562	O	→	NC	Non-Critical Alarm Normally Closed
		563	O	→	NO	Critical Alarm Normally Open
		564	O	←	Common	Common
		565	O	→	NC	Critical Alarm Normally Closed

CAUTION ⚠	The InRak does not support condenser sub fusing. To ensure full system uninterrupted power compatibility the external condenser must have its own UPS.

Installation

Interconnecting Wiring

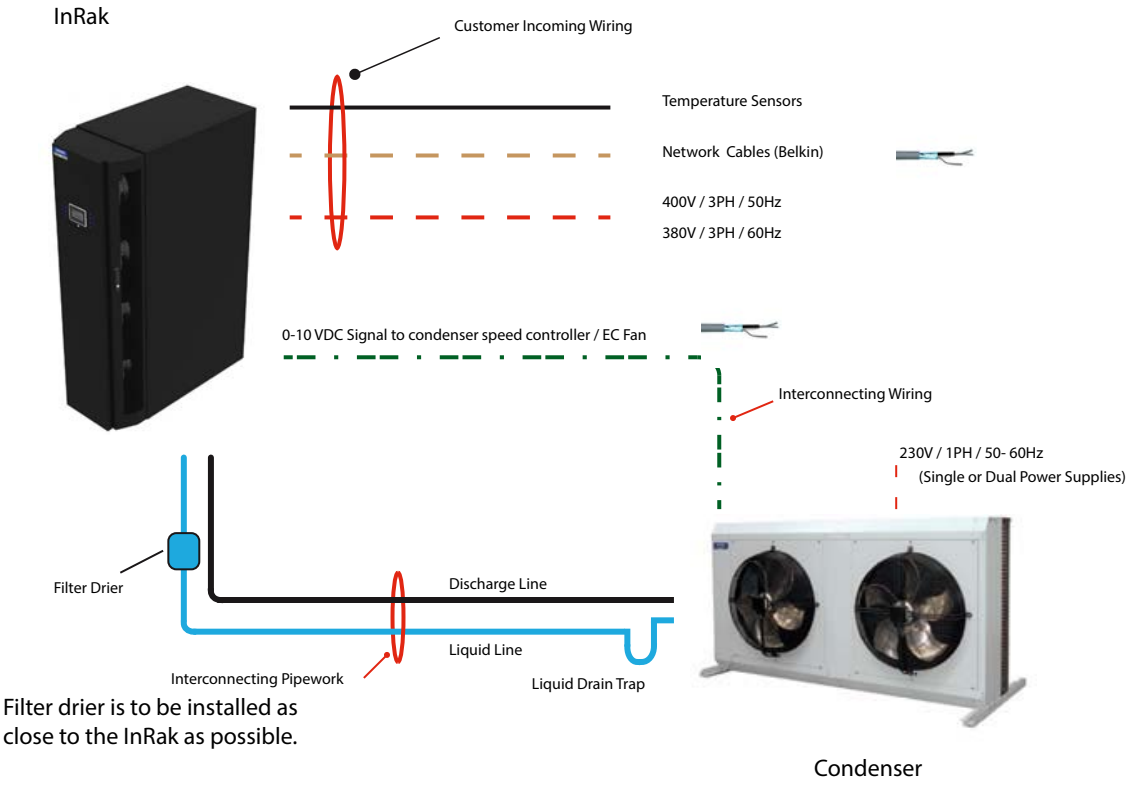
InRak		**Rx-Tx-**	○	←		Network Connections (Incoming connection)
		Rx+Tx+	○	←		
		GND	○	←		
		Rx-Tx-	○	→		Network Connections (Outgoing connection)
		Rx+Tx+	○	→		
		GND	○	→		

	881	○	↔	Wired BMS connection (ModBUS, BACNet, LON, RS485)	BMS Network Connections
	882	○	↔		
	883	○	↔		

	N/A	○	↔	Ethernet BMS connection	BMS Network Connections

Installation

Refrigeration Pipework



Filter drier is to be installed as close to the InRak as possible.

IMPORTANT

The pipe sizes/refrigerant charges quoted are for guidance only. It is the responsibility of the installing contractor/site engineer to check the pipe sizes/refrigerant charges are correct for each system installation and application.

Split systems may require additional oil which should be added to the low side of each compressor.

Design should be in accordance with accepted refrigeration practice to ensure good oil return to the compressor(s) under all normal operating conditions.

Refrigerant Pipe Sizing Guide

			0-20m			20-40m			40-60m			60-80m		
	Unit Connection Sizes (“)		Liquid (“)	Discharge (“)		Liquid (“)	Discharge		Liquid (“)	Discharge		Liquid (“)	Discharge	
Unit	Liquid	Discharge	(H / V)	(H)	(V)	(H / V)	(H)	(V)	(H / V)	(H)	(V)	(H / V)	(H)	(V)
LIR6042U-X250	5/8	7/8	5/8	1 1/8	5/8	5/8	1 1/8	5/8	3/4	1 1/8	5/8	7/8	1 1/8	5/8
LIR6042U-X240	5/8	7/8	5/8	1 1/8	5/8	5/8	1 1/8	5/8	3/4	1 1/8	5/8	3/4	1 1/8	5/8
LIR6042U-X130	1/2	5/8	1/2	1 1/8	5/8	5/8	1 1/8	5/8	5/8	1 1/8	5/8	3/4	1 1/8	5/8
LIR6042U-X123	1/2	5/8	1/2	7/8	5/8	5/8	7/8	5/8	5/8	1 1/8	5/8	3/4	1 1/8	5/8

- All pipe sizing is based on capacities approaching the system minimum as this represents worst case scenario for oil return.
- Discharge lines with vertical components greater than 10m should be given great consideration.
- If the vertical component of the discharge line is greater than 10m then pressure drop will be excessive when approaching full load. In this instance, the option of carefully designed double risers should be considered to minimise this high pressure drop at full load whilst maintaining good oil velocities at minimum load.

Installation

Refrigeration Pipework

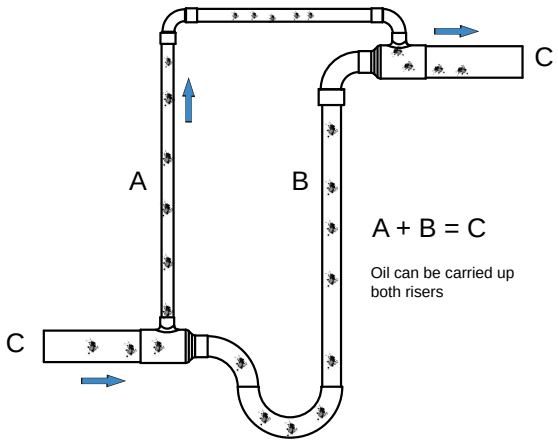
Oil Traps

For long vertical rises in both liquid and discharge lines, it is essential that oil traps are located every 4m to ensure proper oil movement/entrapment. In addition there should be an oil trap at the exit of the air handling unit before a vertical riser is applied (refer to example below).

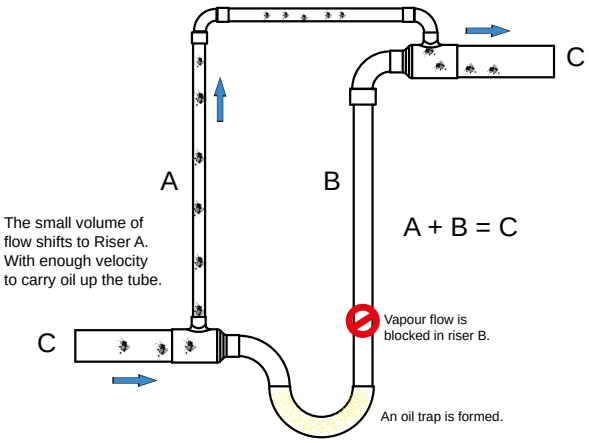
Discharge Risers

Consideration must be taken when designing vertical risers. Refrigerant velocity must be ensured in vertical risers at a minimum of 8m/s.

If required double risers must be designed into the system. Pipework must be sized based upon a reduction in unit capacity as low as 30% of design. The double riser must be sized so that the refrigerant still maintains adequate velocity for the oil to travel around the system. At part load the velocity is reduced in the larger diameter pipe (and cannot carry oil). An oil trap is formed forcing vapour up the smaller tube which still has adequate velocity due to its size to continue carrying oil around the system. The trap at the base of the riser must be as small as possible. This ensures that the trap causes a pressure drop causing vapour to pass up the smaller tube. When the load increases the velocity of the refrigerant ensures that oil carries up both tubes.



Full refrigerant velocity



Low refrigerant velocity

Pipe Supports

The following table identifies the maximum distance between pipe supports on vertical and horizontal pipe runs.

Pipe O/D (inches)	Support Centres (m)
3/8 - 7/8”	1.0
1 1/8 - 2 1/8”	2.0

CAUTION ⚠	All pipe work should be clamped prior to insulation being applied. Clamping over insulation is not acceptable.

Lines passing through walls

Refrigerant lines that rub against solid objects wear holes in the copper pipework and cause leaks, the lines must pass through sleeved openings in such a manner that the lines do not touch.

Horizontal Sections

It is good practice to ensure a slight gradient toward the compressor in the direction of the refrigerant flow for suction lines running horizontal. This assists oil return to the compressor. A gradient of approximately 1:200 (0.5%) shall be used.

Installation

Liquid Line

If the system is configured with the InRak higher than the condenser unit it may be required to increase the degree of sub cooling to prevent flashing gas occurring in the liquid line. This flashing is due to excess pressure drop caused by the static head of liquid refrigerant and can result in poor operation of the evaporator and expansion device.

Careful pipe sizing is recommended to ensure that the liquid line does not have excessive pressure drop

Increasing the liquid line tube size can minimize pipe pressure drop.

However as a fail safe it is recommended that the condenser is installed above the indoor unit to allow for correct liquid drain.

Pipe insulation

The liquid line of the system must be insulated if passing through extremely warm places (boiler houses etc). Ensuring that the refrigerant does not become flash gas.

Refrigerant Charging Guide

The following information can be used to estimate the refrigerant quantity required in a typical split system installation.

Charging should be carried out with the compressors at 50% inverter speed (X1) or with a tandem compressor set (X2) 100% fixed speed and 50% variable inverter compressor operation.

Unit Refrigerant Charge

(kg / Circuit)

The following table shows the refrigerant charge/circuit for the indoor and outdoor units based on nominal capacity conditions.

Indoor Unit		Outdoor Unit	
InRak	**kg/circuit**	**Standard CR Match**	**kg/circuit**
LIR6042U-X250-0	4.2	CR80	8.4
LIR6042U-X240-0	4.2	CR65	9.8
LIR6042U-X130-0	3.8	CR50	4.9
LIR6042U-X123-0	3.8	CR50	4.9
LIR6042U-X130-1	3.8	CR50	4.9
LIR6042U-X123-1	3.8	CR50	4.9

Liquid Line Refrigerant

The following table shows the refrigerant charge/metre for the liquid line, using R410A and assuming a liquid line temperature of 40°C.

Liquid Line (m)	kg/m
3/8”	0.05
1/2”	0.09
5/8”	0.15
3/4”	0.21
7/8”	0.30
1 1/8”	0.53

Installation

Calculation of System Refrigerant Charge (kg)

The system refrigerant charge can be calculated using the following equation:

SR = LR + IR + OR

Where:

SR	=	Total System Refrigerant Charge (kg)
LR	=	Total Liquid Line Refrigerant Charge. (As calculated from above)
IR	=	Indoor Unit Refrigerant Charge.
OR	=	Outdoor Unit Refrigerant Charge.

Example

Indoor Unit Model Ref. = LIR6042U-X250-0
Outdoor Unit Model Ref = CR080 Condenser
Interconnecting Pipework = 10 metres

From the Refrigerant Pipe Sizing Guide, the liquid line size given for pipework length of 10 metres is: 0.15kg/m

LR = L x m
Where:

L	=	10 metres
m	=	0.15 kg/m (Liquid Line Size = 5/8”)
LR	=	10 x 0.15 = 1.5kg

System Refrigerant Charge

SR = LR + IR + OR

Where:
LR = 1.5 kg. (As calculated from above)
IR = 4.2 kg
OR = 3.3 kg

SR = 1.5 + 4.2 + 3.3
Therefore System Refrigerant Charge
= 9.0 kg / Circuit

Installation

Liquid Sub Cooling

The degree of liquid sub cooling required to prevent flashing of liquid refrigerant can be calculated by the following method.

Subcooling = Condensing temperature — Saturation temperature (Nett pressure at expansion valve)
Given the following as an example:

- Refrigerant R410A
- Condensing temperature (54.4°C) equivalent condensing pressure at 54.4°C = 34 Bar
- Liquid lift 20m
- Piping friction loss 0.21 bar
- Losses through valves and fittings 0.5 Bar

Pressure Loss due to Liquid Lift

= H x spl
Where
H = Height (m)
spl = Static pressure loss

= 20 x 0.115 = 2.3 bar

Total Pressure Loss in Liquid Line

TPL Liquid = PFL + Valves

Where
PFL = Pipe friction loss (0.21Bar)
Valves = Losses through Valves and fittings

= 0.21 +0.5 + 2.3
Total pressure loss in liquid line = 3.01 Bar

Nett Pressure at Expansion Valve

= Condensing pressure - Total pressure loss in liquid line

= 34 - 3.01 = 30.99 bar

Saturation temperature at the nett pressure at expansion valve (30.99 bar) = 52°C
(from refrigerant tables)

Sub Cooling Required

=Condensing temperature - Saturation temperature

= 54.4 - 52 = 2.4 °C

Therefore liquid sub cooling required to prevent liquid flashing = 2.4 °C

Oil Charging Guide

In order to determine if a system requires additional oil to accommodate for long interconnecting pipe lines and oil traps, a simple calculation can be used to approximate the volume of oil required as follows:

OT = (RC / 200) - (OC x 0.09)
Where
OT = Additional Oil Charge / Circuit (kg)
RC = Total Refrigerant Charge / Circuit (kg)
OC = Total Compressor Oil Charge / Circuit (l)

This calculation is based on the following assumptions:

1) 10% of the total compressor oil charge enters the system
2) A specific gravity of 0.09 between oil and water
3) Oil is added at a rate of 5 grams per kilogram of refrigerant
Example
What is the additional oil charge required per circuit for an LIR6042U-X250-0 matched with a CR080 and a 5/8” 10m interconnecting liquid line?

Refrigerant charge of an LIR6042U-X250-0= 4.2 kg

Refrigerant charge of a CR080 = 3.3 kg

Interconnecting pipe line = 10 x 0.15 = 1.5kg

Total system refrigerant charge = 4.2 + 3.3 + 1.5 = 9.0 kg

Compressor oil charge(s) = 4.4 litre

So,

OT = (RC / 200) - (OC x 0.09)

OT = (9.0 / 200) - (4.4 x 0.09)

OT = -0.351 litre

A negative value (as above) suggests that there is already sufficient oil in the system. You can calculate the maximum refrigerant charge for this system when additional oil charge is required as follows:

OT = (RC / 200) - (OC x 0.09)
RC = OT + (OC x 0.09 x 200)
RC = 0 + (4.4x 0.09 x 200)
RC = 79.2 kg

System Refrigerant Charging

System Evacuation

Perform a deep evacuation of the system. Ensure all valves are open and that there are no parts of the system are isolated. Replace any Schrader caps to ensure no leaks through the core. A Schrader core may open due to the evacuation.

Once the evacuation is complete perform a vacuum check. Any loss of vacuum must be investigated.

Breaking the System Vacuum

Break the vacuum of the system until the standing pressure of the refrigerant is achieved. Charge through the liquid line until 75% of the refrigerant is in the system.

Carefully remove the vacuum gauge.

Before running a system, check that the controller is measuring values correctly. Ensure the correct refrigerant is programmed into the strategy. Check with manifold gauges and temperature sensors that they read consistent.

When satisfied that the system measurements are correct turn the system on and continue charging through the expansion line.

Charge the system in the liquid state. In no more than 0.5kg increments.

Any more refrigerant charge in any one step could overcharge the system very rapidly and cause liquid flood back to the compressor.

Operation Checks

When operating a refrigeration system that uses inverter technology the following checks are required.

The system can be checked to ensure correct operation by measuring the following:

- Evaporator Superheat
- EEV Sub cooling
- Condenser Liquid Drain Sub cooling
- Oil Sump Temperature

Evaporator Superheat

The evaporator superheat ensures that liquid refrigerant does not enter the compressor. The superheat value is programmed into the expansion valve. Too high superheat indicates a low refrigerant charge. Too low superheat could indicate the system being overcharged.

Condenser Liquid Drain Subcooling

Check that the liquid drain sub cooling is constant. If the sub cooling temperature fluctuates it indicates signs of the condenser filling and draining. Too high sub cooling could indicate that the condenser is backing up with liquid. The condenser heat rejection performance is reduced and could cause high pressure trips.

EEV Subcooling

This is the true sub cooling on a system. Subcooling ensures a full column of liquid to the expansion valve.

If a sight glass is available check that the indicator is clear and not flashing. If a sight glass is not fitted check with your stethoscope.

You will hear a steading flow of refrigerant. Pulsing indicates that the liquid line is flashing.

The EEV sub cooling could be higher if the system has gained sub cooling from the ambient.

Sub cooling will be affected by the ambient temperature. If the temperature is low the provision of a LAK or ELAK may be required. See LAK / ELAK documentation.

Oil Sump Temperature

Ensure the compressor sump has a minimum of 10K discharge superheat*.

When the system is running at full load the superheat will be higher. At part loads the superheat will be lower.

Below 10K discharge superheat the compressor may be slugging liquid. Liquid flood back can cause the oil in the compressor to dilute causing foaming in the compressor causing bearing wash and seizure.

Above 35K the system may be undercharged. Oil within the compressor could break down with the heat.

Always ensure the discharge gas superheat can reduce when the system goes into part load no lower than 10K.

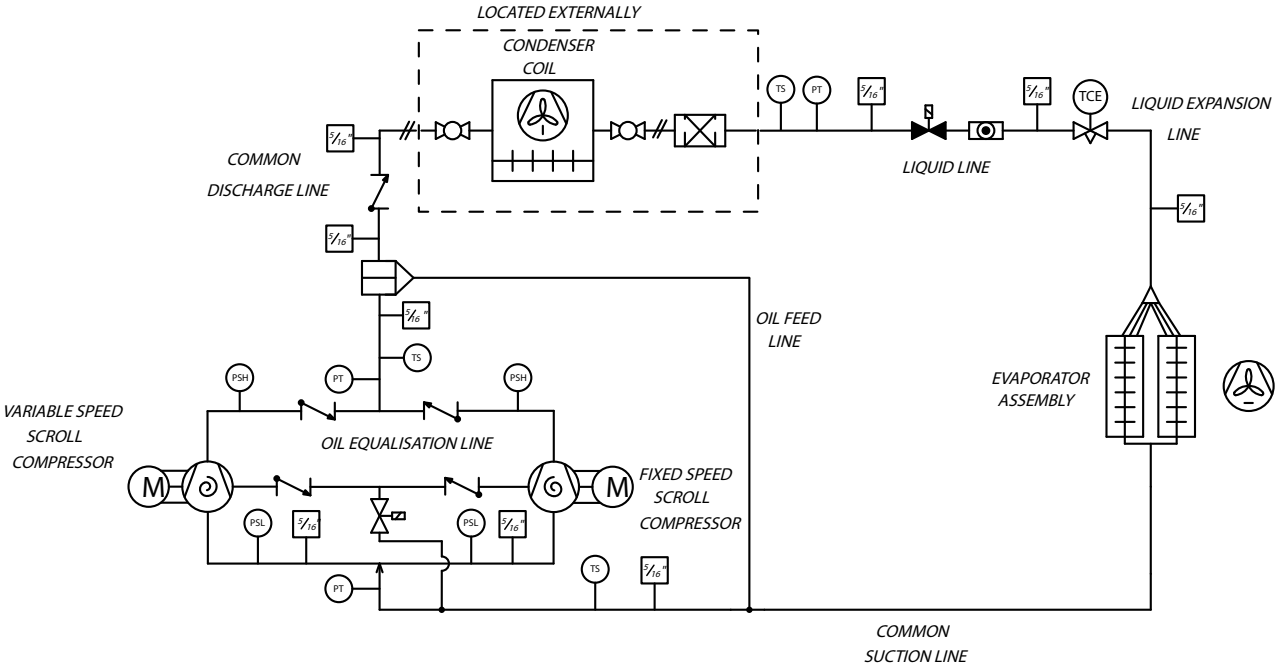
*Discharge superheat = Condensing Temperature – Discharge Line Temperature

For example: 45°C Condensing Temperature – 70°C Discharge Line Temperature = 25K Discharge Superheat

Installation

Pipework Schematics

X2



KEY: ALL ITEMS

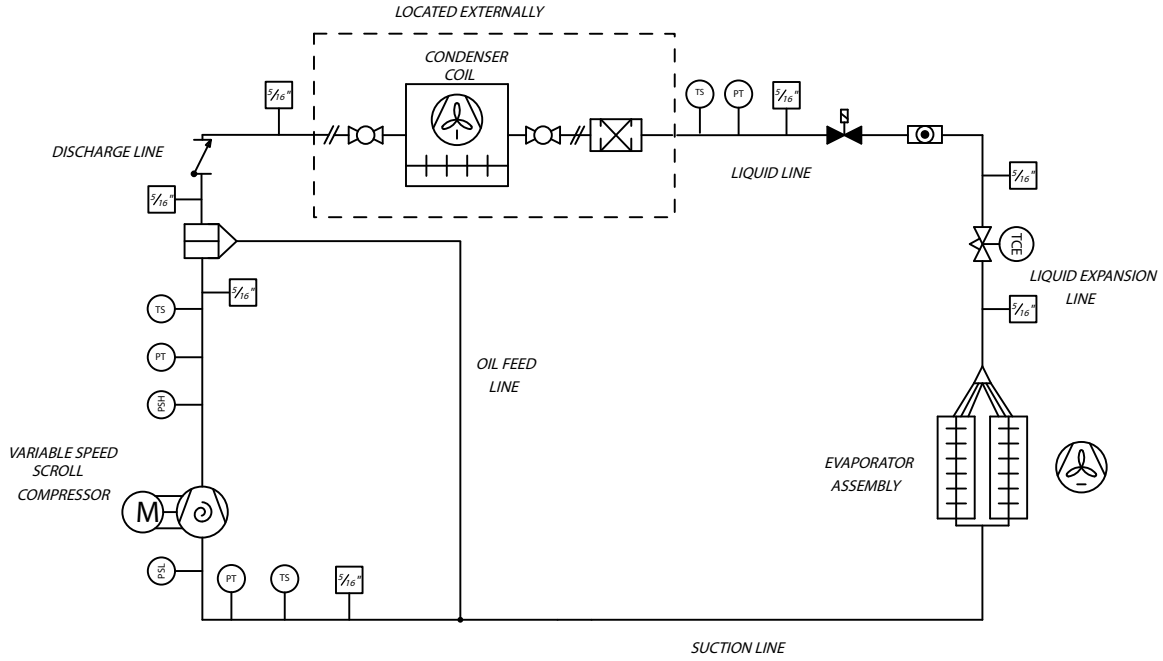
- CENTRIFUGAL FAN
- AXIAL FAN
- SCROLL COMPRESSOR
- ELECTRONIC EXPANSION VALVE
- NORMALLY OPEN SOLENOID VALVE
- NORMALLY CLOSED SOLENOID VALVE
- FILTER DRIER (SUPPLIED LOOSE)
- SIGHT GLASS
- PRESSURE TRANSDUCER
- TEMPERATURE SENSOR
- CHECK VALVE
- LOW PRESSURE SWITCH
- HIGH PRESSURE SWITCH
- SCHRADER VALVE (SIZE SHOWN INDIVIDUALLY ON EACH VALVE)
- SHUT OFF VALVE (OPTIONAL - SUPPLIED LOOSE)
- OIL SEPARATOR

⚠ The liquid line filter drier must be installed as close to the indoor unit as possible.

Installation

Pipework Schematics

X1



KEY: ALL ITEMS

- CENTRIFUGAL FAN
- AXIAL FAN
- SCROLL COMPRESSOR
- ELECTRONIC EXPANSION VALVE
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- NORMALLY CLOSED SOLENOID VALVE
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- PRESSURE TRANSDUCER
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- HIGH PRESSURE SWITCH
- SCHRADER VALVE (SIZE SHOWN INDIVIDUALLY ON EACH VALVE)
- SHUT OFF VALVE (OPTIONAL - SUPPLIED LOOSE)
- OIL SEPARATOR

⚠ The liquid line filter drier must be installed as close to the indoor unit as possible.

Commissioning

CAUTION ⚠	Please ensure all documents have been completed correctly and returned to Airedale Technical Support to validate warranty.

General		To be read in conjunction with the commissioning sheets provided.
CAUTION		**Please ensure all documents have been completed correctly and returned to Airedale technical support to validate warranty.**
CAUTION		**All work MUST be carried out by Technically Trained and competent personnel.** The equipment contains live electrical and moving parts, Isolate prior to maintenance or repair work.
General		Visually inspect the unit for any mechanical damage that could have occurred during installation.
Applying Mains Voltage		Apply mains electrical supply to the unit. Check the mains incoming voltage (230 Volts) carry this procedure out with all MCB's turned off. Turn on the MCB that supplies the transformer. Measure both the primary and secondary tapping. (230 Volts and 24 Volts respectively) Turn on the remaining MCB.
Turning Unit On		Use the display to turn the unit on. Using the display to enter maintenance mode. Within the parameters sub menu increase/ decrease the fan output voltage. Check the current and fan speed with the unit running at full output. Record on commissioning sheet.
Solenoid Valve		Ensure that the solenoids de-energise on alarm (making them close).
Resetting Alarms		Reset any alarms to ensure correct alarm monitoring.
Door Open Alarm		Ensure that the Door open alarm is activated when the door is opened, following delay.
Leak Detection Alarm		Check that the leak detection alarm operates. Apply a small controlled leak to verify that the alarm operates.
Dual power Supply		Check that the two power supplies are live. Ensure that the Dual power supply LED illuminate with correct power source.
Uninterrupted Power Supply		The UPS requires charging for a period of 8 hours before the internal battery can supply the rated backup time. The UPS charges the battery as soon as it is connected to the AC power supply. Following its initial charge the UPS can be changed over to operate on battery power. During battery operation an audible alarm beep will sound every 10 seconds. Low battery warning the alarms beeps every 3 seconds. Automatic shutdown is imminent. Upon return of AC input power the UPS will restart automatically (unless the restart function has been disabled via UPS personalisation).
Static Transfer Switch		The static transfer switch is to be commission as per the manufacturer's instructions.

Commissioning

Fan Removal Alarm	Check alarm state when a fan goes offline.
Differential Pressure	The differential pressure switch should cause the fans to increase / decrease when the server fans are active. One of the fans can be removed to allow the differential pressure to be recognised if the server load is low. If the server discharge temperature is high the differential pressure feature becomes second priority, ensuring that the cooling demand is satisfied.
Rack Support Wheel	Ensure that the rack support wheel turns freely and supports the door when full of water.

Maintenance

Operational Maintenance checks

Owner's Responsibility

To ensure that the unit can be maintained correctly ensure the following requirements are met.
Maintain a safe working environment around the unit, free from obstructions and debris.
The unit shall observe the following maintenance regime as a minimum.

CAUTION ⚠	The equipment contains live electrical and moving parts, ISOLATE prior to maintenance or repair work. Ensure Lock off procedures are carried out accordingly.

CAUTION ⚠	Inputs or outputs not required will not be connected, nor will they appear on the display keypad.

SERVICE INDICATOR

The maintenance of key components such as compressors, fans and air filters can be monitored via a service indicator which visually demonstrates the status relative to the component service intervals.

Inputs and outputs can be located by the labels to the microprocessor controller.

Maintenance

General Inspections

	Task	Frequency		
		3 Months	12 Months	60 Months
General Inspections	Check for visible mechanical damage to unit	•		
	Visually inspect the unit for general wear and tear, treat metalwork	•		
	Rust should be inhibited, primed and touched up with matching paint	•		
	Check for excess vibration from other rotating equipment	•		

Service Tools/Test Equipment
- Touch up paint
- Stiff Brush

Safety Equipment
- Safety Glasses / Goggles

Maintenance

Electrical Inspection

	Task	Frequency		
		3 Months	12 Months	60 Months
Electrical Inspections	Check main power supply voltages		•	
	Check electrical terminals are tight		•	
	Check for signs of hotspots/discolouration on power cables		•	
	Check amperages are as per design	•		

Service Tools/Test Equipment
- Voltmeter
- Screwdrivers / Allen Keys
- Ammeter

Safety Equipment
- Safety Glasses / Goggles

Procedures

Electrical Connections
Ensure all electrical connections are tight and correctly terminated.

Electrical Earthing
Check that the unit is correctly earthed.

Voltage
Measure the voltage at the following points and record on the maintenance sheet:
- Voltage at busbar.
- Dedicated power supply.
- Voltage at permanent supply.
- Control voltage at transformer (min 22.5V, max 25V).

The voltage measurements should be carried out with the unit MCB's turned off.

EC Fan Interrogation
The EC fans can be interrogated by connecting a hardware interface kit to the fan and PC. The kit comprises of a USB to RS232 9-pin "D-type" adapter. This should be installed on the PC with the software supplied with the kit. The "COM" port of the USB to RS232 adapter should be assigned to a free COM port between COM 1 and COM 4 via the system device manager.

Connect the RS232 to RS485 interface converter to the USB port of your PC via the USB to RS232 serial interface lead and connect the RS485 output to the fan.
Tx += RS A Tx - = RS B

Maintenance

Refrigeration

	Task	Frequency		
Refrigeration	Compare the following and compare results with commissioning records:	3 Months	12 Months	60 Months
	Suction, Liquid and Discharge pressures	•		
	Refrigeration system temperatures, Suction, Liquid and Discharge. Record superheat and subcooling temperatures	•		
	Check each circuit sight glass for dryness and bubbles for indication of leaks	•		
	Head pressure control is maintained	•		
	Record details on F-Gas record	•		
	Check compressor oil level	•		
	Pressure relief valves			•

Service Tools/Test Equipment

- Refrigerant Manifold gauges
- Spanners
- Voltmeter

Safety Equipment

- Safety Glasses / Goggles
- Gloves
- Overalls

Procedures

HP/LP Safety Pressure Switch Settings

Check operating of HP / LP cut-out,

Settings

LP cut-out – (Auto reset for 3 times when the Low Pressure is detected over a period of 1 hour).
Has a 2 minute delay on start-up (similar to a Low ambient kit).
Low pressure cut-out 0.5 +/- 0.2 Barg.
HP switch (manual reset): High pressure switch 40.25 bar +/- 1 Barg
HP limiting function 35 barg / 2 barg differential (this reduces the number of compressors operating i.e. 2 comp and down to 1 comp.

Compressor Oil Level (Full load)

Check the compressor oil level at full load. (record oil level)

Maintenance

Controls

	Task	Frequency		
		3 Months	12 Months	60 Months
Controls	Change controller battery. The controller will keep the strategy for a short period of time with no battery		•	

Service Tools/Test Equipment

- Small Terminal Screwdriver

Safety equipment

- Electrostatic Wristband

Procedures

The following controller settings are to be recorded on the maintenance sheet.

- Head pressure differential (bar)
- Minimum suction pressure (bar)

Maintenance

System

	Task	Frequency		
System	Check the following against the commissioning records:	3 Months	12 Months	60 Months
	Record operating conditions	•		

Unit Operation Checks

Record the following operating conditions of the unit at stable conditions.

- Suction pressure (bar)
- Liquid pressure (Bar)
- Discharge pressure (Bar)
- Suction temperature (°C)
- Liquid temperature (°C)
- Discharge temperature (°C)
- Superheat (K)
- Sub cooling (K)

Liquid line sight glass

Record the status of the liquid line sight glass

- Clear/Flashing
- Wet/Dry

The sight glass is used to indicate

- The condition of the refrigerant in the system
- Lack of Refrigerant
- Moisture content of the refrigerant

The colour of the sight glass depends on the moisture content of the refrigerant. The recommended moisture levels of a system should be below 75ppm.
An indication of green/dry are to be considered as perfect conditions meaning full protection by the filter drier against effects from moisture.
If the green colour starts to fade, the colour change from green to yellow has begun and the indicator should therefore be watched carefully. If the colour changes to yellow it is a clear signal that the capacity of the filter drier is exceeded and should be replaced as soon as possible.

F-Gas Leak Detection Checks

Perform an F-Gas refrigerant leak detection on the unit and ensure no refrigerant leaks are visible.

Troubleshooting

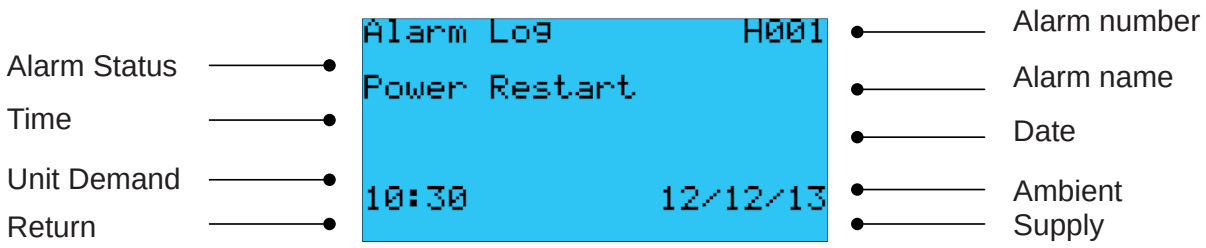
FAULT	POSSIBLE CAUSE	REMEDY / ACTION
Compressor not operating.	No power to compressor.	Check isolator, fuses, MCBs, contactor and control circuit wiring.
	Seized compressor, possibly due to lack of oil, broken valve.	Replace compressor - investigate oil trapping and general installation.
	Defective compressor motor.	Check winding resistances - replace compressor. If burnt out follow burn out procedure using suction line burn-out drier.
	Compressor phase loss.	Check 3 phase supply to compressor.
	Klixon out and does not reset.	Sometimes it takes up to 4 hours to reset. Replace compressor if necessary.
	Low pressure switch operated (large or complete loss of refrigerant charge).	Repair leak and recharge system - if completely out evacuate before charging.
	Condenser fan motor thermal trip open circuit	Investigate and correct.
Noisy compressor.	Lack of oil.	Repair leaks if any, add oil if required but not too much - remember too much is as bad as too little. Investigate pipe system and trapping.
		Best method to pump down to see if oil can be encouraged back. If no oil still, drain compressor and measure in correct quantity.
	Expansion valve stuck in open position (abnormally cold suction line).	Ensure bulb is tight on suction and superheat is correct (normally 5 to 6°C).
		Replace power assembly or valve as necessary.
	Damaged or worn compressor bearing (excessive knocking).	Replace compressor.
Head pressure too high.	Condenser coil clogged or dirty.	Clean condenser coil.
	Air or other non-condensable gas in system.	Evacuate system and re-charge with new refrigerant.
		Always install new drier before evacuating.
	Overcharge of refrigerant.	Reclaim excess refrigerant from system (liquid only).
	Head pressure controller faulty.	Check fan speed controller - if faulty - replace.
Head pressure too low.	Fan not operating or operating inefficiently.	Check motor - if faulty - replace.
	Fan operating too fast in low ambient conditions.	Check fan speed controller adjustment - if faulty - replace.
Compressor short cycles or LP cut-out operated.	Dirty filters.	Replace.
	Dirty or icing evaporator (reduced airflow).	Defrost and/or clean. Check gas charge and expansion valve.
	Lack of refrigerant (bubbles in sight glass only as indication).	Check for leaks - repair and recharge system.
	Clogged filter drier (pressure / temperature drop across it).	Replace.
	Condenser fan running at full speed in winter (full airflow).	Check fan speed controller setting - if faulty - replace.
	Start up problems in very low ambients.	Check for low suction pressures on start-up and fit a low ambient start kit if required, or check operation of system if already fitted.

Troubleshooting

FAULT	POSSIBLE CAUSE	REMEDY / ACTION
Suction pressure too low.	Low evaporator airflow.	Depending on model: Check fan motor speed set point or Check fan motors, belts and drives
	Flash gas (bubbles in sight glass) at expansion valve.	Investigate for refrigerant leaks, repair and re-charge system.
	Clogged filter drier (pressure / temperature drop across it).	Replace.
	Obstruction in expansion valve.	Inspect, clean or replace.
Condenser fan not operating - power on.	Motor / fan assembly jammed.	Isolate unit and check free rotation of motor / fan assembly. If faulty - replace.
	Fault at motor terminal box supply terminals.	Isolate and check electrical connections are secure.
	Motor internal overheat protector tripped.	Carry out continuity check at terminals “TK” in motor terminal box. If tripped and motor hot - check bearings. If tripped and motor cold - replace motor.
	Power supply failure.	Check power supply at circuit breaker.
	Wiring to motor.	Check voltage at motor terminals.
	Faulty motor windings / capacitor.	Motor humming would indicate fault in motor or capacitor.
	Minimum speed set too low.	Adjust head pressure controller to suit.
	Faulty pressure sensor.	Check electrical connections are secure at controller and pressure sensor. Replace controller and sensor (as they are matched sets).
	Faulty Controller.	Link wires “line” and “load” to bypass controller. If motor runs full speed - replace unit.
Condenser fan runs too fast. Condenser fans runs only slowly.	High ambient condition or excessive re-circulation of air around condenser coil.	Check installation against design.
	Minimum set speed setting incorrect.	Adjust as necessary.
	Incorrect pressure setting.	Adjust sensor screw as necessary.
	Faulty Fan Speed Controller.	Replace controller and sensor (as they are matched sets).
	Faulty pressure sensor.	Replace controller and sensor (as they are matched sets).
	Motor wired incorrectly.	Check against wiring diagram - correct as required.
	Motor / capacitor faulty.	Replace.

Alarms

Alarm Menu Display



Alarm Log

The alarm page offers a log of the last 100 alarm messages in a scrolling log, pressing the alarm button will enter the alarm page. Consequently the most recent alarm has the lowest log number (001) and will be displayed upon entering the alarm page. As another alarm occurs, the alarm number increases until 100 alarms have occurred. From this point on, alarm 001 moves to 002 and any new alarm will reside in position 001. As new alarms are generated and cleared, the highest number logs (100) in the scroll will be lost.

Viewing the Alarm Log

By using the arrow keys, the last 100 alarms generated can be reviewed in chronological order. The display provides the alarm type information and the time and date of each alarm occurrence.

Alarm Detection

When the controller detects an alarm an output is generated to the relevant alarm relay which in turn illuminates the button. To see which alarm has accrued press the  button and the most recent alarm will be displayed. If the alarm light is on, the alarm page can be interrogated to identify which alarm is active.

Resetting the Alarm

The auto reset alarms will automatically reset once the conditions are within the set parameters. To clear a manual alarm press the  button twice and the red LED will disappear.

Alarms

Code	Description	Auto Reset	Unit Disabled	Component Disabled	Cause	Action
AL02	Clock board fault or not connected	●		●	Indicates an error with the real time clock on-board the controller. During alarm any time zones set up would be ignored.	Once the clock returns to functioning correctly the alarm will be automatically reset and any time zones set up will be restored.
AL03	Extended memory fault	●		●	Controller memory fault	Alarm is generated
AL04	Liquid pressure probe alarm	●		●	Indicates that there is a fault with the corresponding probe/input, possible causes are the sensor going open circuit or there is a wiring fault. All sensor alarms are auto reset once the fault has been rectified.	Head pressure control is disabled and the outdoor coil fan is set to probe alarm level
AL05	Return humidity probe alarm	●		●		Alarm is generated
AL06	Supply air temperature probe alarm	●		●		
AL07	Return air temperature probe alarm	●		●		
AL08	Differential pressure probe alarm	●	●	●		Alarm is generated. Unit shuts down – airflow fail
AL10	Liquid line temperature probe alarm	●		●		Alarm is generated
AL11	Aisle/differential pressure probe alarm	●		●		
AL13	Low pressure switch alarm	●	●	●	Indicates that the low pressure safety switch has been tripped and the controller has switched off the unit.	Alarm will auto-reset up to 3 times in 24 hours. A further trip will require manual reset.
AL14	Backup power supply active	●		●		Alarm is generated. Heating and humidification are disabled
AL15	Refrigerant leak detector alarm	●			Indicates the unit has detected a refrigerant leak.	Once the refrigerant level in the air has fallen below set point the alarm will reset. Unit will either shutdown or pumpdown depending on setting chosen.
AL16	High pressure alarm	●	●	●	Indicates high liquid pressure. Unit is shut down.	Alarm will auto-reset up to 3 times in 24 hours once the pressure has decreased to a safe level. A further trip will require manual reset.
AL17	High pressure alarm critical trip count		●	●	Indicates high pressure alarm has tripped 3 times in 24 hours.	Unit is disabled. Alarm must be manually reset.
AL18	pLAN offline alarm	●			Indicates that there is a network fault between the units. If the unit is configured as standby then the unit will become active until the network fault is corrected.	The alarm will automatically reset once the network fault is corrected.
AL19	Master unit offline alarm	●			Indicates that the master unit has been lost from the network. If the unit is configured as standby then the unit will become active until the network fault is corrected.	
AL20	High discharge temperature warning	●			Discharge temperature has reached 120°C	Alarm will reset once the temperature is below threshold
AL21	High discharge temperature alarm	●		●	The discharge temperature is over the threshold. Unit is disabled after 3 occurrences in 24 hours	
AL22	Discharge temp. alarm critical trip count	●	●	●	Indicates high discharge temperature alarm has tripped 3 times in 24 hours.	Unit is disabled. Alarm must be manually reset.
AL24	Fan trip alarm	●		●	The alarm is generated if the controller receives a fan trip signal from the fan.	Alarm is generated

Alarms

Code	Description	Auto Reset	Unit Disabled	Component Disabled	Cause	Action
AL25	Inverter compressor tripped	●		●	Inverter compressor trip due to fault on Power+ or system pressures during start-up	The alarm will de-activate the compressor. Alarm will auto-reset if possible or manual reset if not
AL26	Fixed speed compressor contactor status alarm	●		●	This alarm indicates the status of compressor. The alarm is generated if the controller output is active but the feed back from the contactor has not changed.	The alarm will de-activate the compressor.
AL27	Phase failure alarm	●	●	●	The power meter / phase failure relay has detected a phase rotation / fail loss	Alarm is automatically reset once the phase failure has cleared.
AL28	Fire/smoke alarm	●	●	●	Indicates that fire or smoke has been detected	Alarm is generated. Alarm will auto reset if selected to do so
AL29	Water condensate pump status alarm	●	●	●	Indicates that a fault has been detected with the water condensate pump	Alarm is generated and unit is shut down
AL31	Indirect refrigerant leak alarm	●		●	Indicates a possible refrigerant leak	Alarm is generated. Compressor is disabled if selected
AL32	Power meter offline	●	●	●	Indicates the controller cannot communicate with the power meter leading it to believe the power meter is switched off.	The alarm is automatically reset once communications between the controller and the power meter have been re-established.
AL33	EEV driver probe alarm		●	●	Indicates an error with a sensor.	This alarm can be manually reset once the sensor is proven to be working correctly.
AL34	EEV driver low superheat alarm		●	●	Indicates the superheat has exceeded the low superheat limit.	This alarm can be manually reset once the system has brought the superheat above the low super heat limit.
AL35	EEV driver LOP alarm			●	Indicates that the evaporating temperature has exceeded the LOP limit. During alarm the EEV modulates the valve open to increase the operating pressure whilst maintaining superheat.	This alarm can be manually reset once the system has brought the evaporating temperature below the LOP limit.
AL36	EEV driver MOP alarm			●	Indicates that the evaporating temperature has exceeded the MOP limit. During alarm the EEV modulates the valve closed to reduce the operating pressure whilst maintaining superheat.	This alarm can be manually reset once the system has brought the evaporating temperature below the MOP limit.
AL37	EEV driver high condensing temperature			●	Indicates that the condensing temperature has exceeded the HITCOND limit.	This alarm can be manually reset once the system has brought the condensing temperature below the HITCOND limit.
AL38	EEV driver EEPROM error			●	Indicates that there has been an error between the data stored within the EEPROM memory and the data stored in the controller. During the alarm the EEV is closed and the unit is switched off.	This alarm can be manually reset once the problem with the EEV is resolved
AL39	EEV driver motor error			●	Indicates a motor error within the EEV diver. During this alarm the unit is switched off.	
AL40	EVD pLAN communications offline	●	●	●	Indicates an error with the pLAN connection which the controller communicates with the EVD. This alarm will shut down the unit.	This alarm is automatically reset once the pLAN fault is rectified.
AL41	EEV driver suction line temp.	●	●	●	Indicates a low suction line temperature. During alarm the controller will automatically shut down the unit.	This alarm is automatically reset once the suction line temperature increases.
AL42	EVD driver battery alarm			●	Indicates a battery fault on the EVD driver.	This alarm can be manually reset once the problem with the battery is rectified.
AL43	EVD driver tuning alarm	●		●	Indicates that the EVD driver is in tuning mode.	This alarm is automatically reset once the driver has finished tuning.

Alarms

Code	Description	Auto Reset	Unit Disabled	Component Disabled	Cause	Action
AL44	Inverter compressor maintenance alarm	●			Indicates that the run hours for the particular component has exceeded the limit set for its maintenance alarm.	Once maintenance has been performed, the hours run for the component can be reset, which will reset the alarm.
AL45	Fixed speed compressor maintenance alarm	●				
AL46	Condenser fan maintenance alarm	●				
AL47	Evaporator fan maintenance alarm	●				
AL48	Filter maintenance alarm	●				
AL49	Humidifier maintenance alarm	●				
AL50	High humidity alarm	●			Indicates that the particular value has exceeded the high / low limit. This alarm is delayed for 2 minutes on start-up to prevent nuisance alarms. The cooling or heat demand is disabled	Once the value returns below the high/low limit the alarm is automatically reset
AL51	Low humidity alarm	●				
AL52	High return air temperature alarm	●	●	●		
AL53	Low return air temperature alarm	●	●	●		
AL54	High supply air temperature alarm	●	●	●		
AL55	Low supply air temperature alarm	●	●	●		
AL56	Air Flow Calculation Internal Error	●		●	The airflow calculation has gone out of bounds	Constant air volume disabled
AL60	Configuration wizard not completed		●	●	Indicates that the unit configuration wizard has not been completed	Unit configuration must be finished and the controller must be reset
AL61	Inverter compressor start failure	●		●	The inverter compressor may fail to start due to wrong settings or wrong pressure differences during start-up	The compressor will attempt to restart every 30s up to a maximum of 5 times and then it will need to be manually reset
AL62	Inverter compressor envelope alarm			●	The inverter compressor has gone out of the operating envelope for more than 60s	The alarm must be manually reset
AL63	High discharge gas temperature alarm	●		●	The discharge temperature is over the inverter compressor threshold.	Alarm will reset once the temperature is below threshold
AL64	Low pressure differential on inverter	●		●	Pressure difference is lower than minimum alarm (required for lubrication) for more than 60s. Compressor is turned off.	Alarm will reset once the pressure has increased
AL65	Power plus inverter offline	●		●	Indicates communication between the controller and Power+ inverter has failed	Alarm will reset once communication is resumed
AL66	Inverter alarm	●		●	General inverter alarm. Specific alarm will be stated on the alarm screen	Alarm will reset once the condition clears
AL67	Low pressure on inverter	●		●	Low pressure on inverter compressor. Compressor will turn off	Alarm will reset once pressure increases
AL68	High pressure on inverter	●		●	High pressure on inverter compressor. Compressor will turn off	Alarm will reset once pressure reduces
AL69	Pressure differential across inverter drive too high to start	●		●	Inverter compressor cannot start if the pressure differential is too high	Alarm will reset once pressure differential reduces
AL75	Airflow fail alarm	●	●	●	Indicates the air flow has dropped below the limit and the fans are switched on	The alarm will auto reset 3 times and lock out to a manual reset
AL76	Airflow trip count critical		●	●	Indicates airflow fail alarm has tripped 3 times in 24 hours	Unit is disabled. Alarm must be manually reset
AL77	Filter change alarm – high pressure drop	●			Indicates that the filters on the unit possibly need changing.	Alarm will need to be manually reset once the filter has been changed.

Alarms

Code	Description	Auto Reset	Unit Disabled	Component Disabled	Cause	Action
AL78	Power plus check failed – incompatible drive			●	Power+ inverter is not a compatible model	Correct Power+ model must be connected and reconfigured
AL79	CPY board offline alarm	●		●	Indicates the controller cannot communicate with the CPY controller leading it to believe the CPY board is switched off	The alarm is automatically reset once communications between the controller and the CPY board have been re-established
AL80	CPY – Mn – Maintenance required				See the section above **CPY Controller Alarms**	See the section above **CPY Controller Alarms**
AL81	CPY – EC – High supply water conductivity					
AL82	CPY – E0 – Internal error					
AL83	CPY – EH – High current					
AL84	CPY – E1 – Configuration parameters corrupted					
AL85	CPY – EP – Low production					
AL86	CPY – EU – High level & no fill					
AL87	CPY – E3 – Wiring of external demand faulty					
AL88	CPY – EF – Lack of supply water					
AL89	CPY – Ed – Drain					
AL90	CPY – CY – Maintenance time expired					
AL91	CPY – Ec – High supply water conductivity					
AL92	CPY – EA – Foam					
AL93	CPY – CP – Clean cylinder					
AL94	CPY – CL – Replace cylinder					
AL95	CPY – ID Device					
AL96	CPY – Warning match digit					
AL97	CPY – Su – Serial disconnected					
AL98	CPY – E- – Alarm probe high humidity					
AL99	CPY – E_ – Alarm probe low humidity					
AL100	pCOe expansion board offline	●		●	Indicates the controller cannot communicate with the pCOe expansion board	The alarm is automatically reset once communications between the controller and the pCOe board have been re-established
AL101	pCOe supply/return air temp. probe 1 alarm	●		●	Indicates that there is a fault with the corresponding probe/input, possible causes are the sensor going open circuit or there is a wiring fault. All sensor alarms are auto reset once the fault has been rectified.	Alarm is generated. Temperature reading is discounted from any calculations
AL102	pCOe supply/return air temp. probe 2 alarm	●		●		
AL103	pCOe supply/return air temp. probe 3 alarm	●		●		
AL104	pCOe supply/return air temp. probe 4 alarm	●		●		
AL105	pCOe I/O mismatch alarm	●		●	Indicates there is a mismatch between the inputs/outputs	Alarm is generated
AL106	Inverter compressor fast starts limit reached				Fast starts limit reached	Unit reverts to normal start sequence until alarm is manually rest using the “fast start” password
-	No Alarms Active	●			Indicates no alarms are currently active	-

After Sales

Warranty

All Airedale products or parts (non consumable) supplied for installation within the UK mainland and commissioned by an Airedale engineer, carry a full Parts & Labour warranty for a period of 12 months from the date of commissioning or 18 months from the date of despatch, whichever is the sooner.

Parts or Equipment supplied by Airedale for installation within the UK or for Export that are properly commissioned in accordance with Airedale standards and specification, not commissioned by an Airedale engineer; carry a 12 month warranty on non consumable Parts only from the date of commissioning or 18 months from the date of despatch, whichever is the sooner.

Parts or equipment installed or commissioned not to acceptable Airedale standards or specification invalidate all warranty.

Warranty is only valid in the event that

In the period between delivery and commissioning the equipment:

- is properly protected & serviced as per the Airedale installation & maintenance manual provided
- where applicable the glycol content is maintained to the correct level.

In the event of a problem being reported and once warranty is confirmed* as valid under the given installation and operating conditions, the Company will provide the appropriate warranty coverage (as detailed above) attributable to the rectification of any affected Airedale equipment supplied (excluding costs for any specialist access or lifting equipment that must be ordered by the customer).

*Once warranty is confirmed, maintenance must be continued to validate the warranty period.

Any spare part supplied by Airedale under warranty shall be warranted for the unexpired period of the warranty or 3 months from delivery, whichever period is the longer. To be read in conjunction with the Airedale Conditions of Sale - Warranty and Warranty Procedure, available upon request.

Procedure

When a component part fails, a replacement part should be obtained through our Spares department. If the part is considered to be under warranty, the following details are required to process this requirement. Full description of part required, including Airedale's part number, if known. The original equipment serial number. An appropriate purchase order number.

A spares order will be raised under our warranty system and the replacement part will be despatched, usually within 24 hours should they be in stock. When replaced, the faulty part must be returned to Airedale with a suitably completed and securely attached "Faulty Component Return" (FCR) tag. FCR tags are available from Airedale and supplied with each Warranty order.

On receipt of the faulty part, suitably tagged, Airedale will pass to its Warranty department, where it will be fully inspected and tested in order to identify the reason for failure, identifying at the same time whether warranty is justified or not.

On completion of the investigation of the returned part, a full "Report on Goods Returned" will be issued. On occasion the release of this complete report may be delayed as component manufacturers become involved in the investigation. When warranty is allowed, a credit against the Warranty invoice will be raised. Should warranty be refused the Warranty invoice becomes payable on normal terms.

Exclusions

Warranty may be refused for the following reasons.

- Misapplication of product or component
- Incorrect site installation
- Incomplete commissioning documentation
- Inadequate site installation
- Inadequate site maintenance
- Damage caused by mishandling
- Replaced part being returned damaged without explanation
- Unnecessary delays incurred in return of defective component

Returns analysis

All faulty components returned under warranty are analysed on a monthly basis as a means of verifying component and product reliability as well as supplier performance. It is important that all component failures are reported correctly.

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