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POLARPACK HANDBOOK







For Units up to 18 kW

**THANK YOU FOR CHOOSING THE HEATCRAFT POLARPACK CONDENSING UNIT.
TO ENSURE TROUBLE FREE INSTALLATION AND COMMISSIONING, PLEASE REFER TO THE
CONTENTS OF THIS HANDBOOK.**



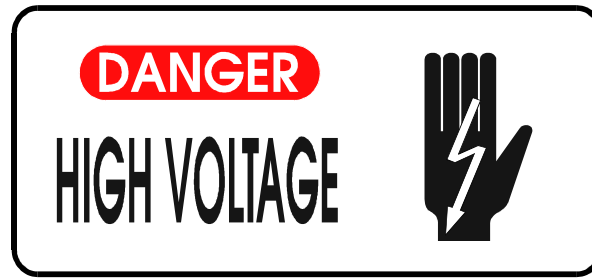
**IMPORTANT INFORMATION-
REFER TO THE SECTIONS ON “WARNINGS AND SAFEGUARDS”, AND
“INSTALLATION INSTRUCTIONS” BEFORE ATTEMPTING TO COMMISSION THIS
CONDENSING UNIT.**

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End User Notes



General Notes

PolarPack condensing units fall under the requirements for commercial electrical equipment as per Standards Australia guidelines. Installation and major service of this unit must be carried out by a licensed contractor and in accordance with local regulatory guidelines.

PolarPack condensing units are supplied with a main isolation switch on the front panel. To ensure safety, electrical control components cannot be accessed while the isolation switch is on. The switch is pad-lockable in the "OFF" position.



Under no circumstances should anyone other than a qualified person attempt to gain access to the interior of the unit without first ensuring electric power is disconnected.

PolarPack condensing units have been designed for use in an outdoor environment. PolarPack condensing units are not suitable for mobile and explosion-proof applications.



Auto Start-Up

PolarPack condensing units may start automatically without any warning. The unit is fitted with a fan speed controller as standard, fan(s) will rev up and down, even turn on and off on demand in response to variations in condensing pressure. Please see "Installation Instructions" for further details.



Auto Reset

PolarPack condenser fans and compressors are thermally protected. When tripped, these components will not operate. Once sufficiently cooled however, the component will automatically reset and may operate without warning.

The unit is equipped with a High/Low pressure switch as standard. The switch is either a universal selectable auto or manual reset or fixed auto/auto-reset type on both high and low sides. If universal switch used then it is set to auto/auto at the factory. Please check the unit regarding the appropriate pressure switch.



Routine Maintenance of Unit

Condenser:

Condenser should be cleaned at 3 monthly intervals.

System operation:

System operation should be checked every 6 months. Checks should include:

- Operating conditions such as condensing and evaporating temperatures, compressor discharge temperature, superheat and sub-cooling, etc.
- Refrigerant charge, oil level and quality
- Electrical connections, current draw and voltage level, etc.

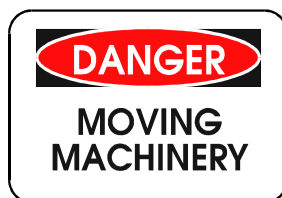


Warnings and Safeguards

Heatcraft Australia is very conscious of safety issues when designing and manufacturing these products, but it is essential that the end user, installer or service personnel also exercises care when working with the units.

 Warning	This indicates contents for which, if disregarded, the possibility of human death or severe injury can be assumed.
 Caution	This indicates contents for which, if disregarded, the possibility of human injury or the possibility of material damage can be assumed.

Important Notes



- Do NOT remove access panels without isolating power.
- Do NOT operate unit with access panels removed due to the presence of rotating equipment.
- Do NOT operate unit with access panels removed as there will be no air flow over the condenser.
- All controls are 230/240V.



No Smoking

Heatcraft Australia recommends No Smoking within a distance of 15 metres of the unit.



Warning – Electrical Hazard

A qualified Electrician must carry out all electrical work. All field wiring must conform to the requirements of the equipment and all applicable National and Local Codes. Always isolate the power to the unit before checking and / or diagnosing the units. Never work on any electrical item without isolating or disconnecting the power supply.



Caution – Unit Pressurized

All units are pressurised with dry air or Nitrogen gas. Care must be taken to discharge the pressurized gas prior to installing or commissioning the equipment.



Caution – Refrigerant Type

All units are designed to work effectively with fluorocarbon refrigerants including R404A, R507, R22, R407C and R134a. Under no circumstances can a refrigerant such as Ammonia, Hydrocarbon, Water or Glycol be used in this product.

Refrigerant can be harmful if it is inhaled and/or makes contact with exposed skin. Refrigerant must be used and recovered responsibly. Extreme care must be taken when handling refrigerant, as personnel injury or death may occur.



Caution – Lubricant Oil Type

All compressors are charged with PolyolEster (POE) oil. POE can be used with HCFC refrigerants, such as R22, and HFC refrigerants, such as R404A, R507, R407C and R134a. Use ONLY POE oil, do NOT mix POE with other oils, when using HFC refrigerants.



Caution – Sharp Edges

All units are manufactured with sheet metal and in this process all care is taken to ensure the edges are concealed. Avoid contact with sheet-metal edges and the coil fins. They can be sharp and are a potential personal injury hazard. Please take care when accessing in or around the unit.



Warning – Qualified Personnel

All units may only be installed, commissioned, decommissioned and serviced by qualified and trained personnel (refrigeration mechanics and/or electricians) who have sufficient knowledge in this type of equipment. It is the purchaser's responsibility to co-ordinate with qualified personnel as required.



Personal Protective Equipment

Heatcraft Australia recommends as a secondary safety precaution that all personnel working with the unit wear appropriate Personal Protective Equipment (PPE) such as gloves, eyewear and footwear.



Caution – Lifting of Unit



The compressor end of the unit is to the right looking from the front (electrical box) side. Particularly on 2 fan units, forks should be placed toward the right hand mounting foot when lifting. Slings may be placed through the mounting feet but care must be taken to adjust the lengths appropriately to account for the weight distribution.

Always take care to ensure a proper weight balance before lifting and moving unit.



Caution – High and Low Temperatures

Compressor housing and discharge line temperatures may reach 150°C due to failure of system components. Wiring and other materials which could be damaged by these temperatures should not come into contact with the housing or discharge line.

Moreover, even in normal working operation, the unit can generate very high (may exceed 100°C) and very low (below -40°C) temperatures on compressor housing and tubing surfaces resulting in the possibilities of severe contact burns. Special caution must be taken when working around the unit.



Caution – Deep Vacuum

Do NOT operate compressors in deep vacuum conditions as this can cause electrical failure. Compressors should never be used to evacuate refrigeration or air conditioning systems.



Caution – Motor Protection

WARNING: Do not insert any object into operating fans. Ignoring this warning may result in personal injury and/or severe equipment damage and consequences.

Kulthorn Kirby and Danfoss Maneurop reciprocating hermetic compressors, and external rotor motor fans, are fitted with inherent internal line break motor protection. After opening, the protector may not reset for several hours until the motor cools sufficiently. Do not assume that the motor has suffered an open circuit failure without first allowing it to cool.

Dorin compressors are fitted with **Thermik motor protection** or a **Thermistor motor protection module** which is wired in series with the other control devices to form the control circuit. The overload type is listed on the compressors serial plate **THERMIC** or **PTC THERMISTOR**.

NEVER apply 240V across thermistor terminals. Maximum test Voltage = 3V.
The thermistor control module is a “Fail-Safe” design. The control contact opens when power to the module is cut, and closes when power is returned only if the thermistors signal correct operating conditions. The thermistors should never be disconnected from the module, and the module should never be bypassed, when the unit is in operation.

In addition to the above, thermal over-current protection is fitted to the compressor contactor(s), and MP15 PhaseFale phase failure protection is available, *on three phase compressors only*. Please contact your Heatcraft sales representative for details.

The MP15 start delay function has been utilised as follows-

HP/LP alarm to pin 5- delay with memory function and light

Compressor contactor K1 Thermal Overload N/O 97-98 to pin 8 (start delay without memory or light).

Compressor restart will be delayed by 15 minutes when activated by these 2 fault conditions.

Restarting the MP15 (toggle Circuit Breaker CB1 Off/On) will re-initialize the MP15 timer.



Caution – Internal Pressure Relief (IPR) Valve

Some hermetic compressors include an IPR valve. The IPR valve will open when the discharge pressure exceeds the suction pressure by a certain value which is set by the compressor manufacturer. When it has opened, the compressor sump will become warm and the compressor will trip out on the motor protector. The unit may take 2 to 3 hours to reset and restart automatically if this happens.

Kulthorn Kirby “AW” and Danfoss “Maneurop” compressors have an IPR valve.

Dorin compressors do NOT have an IPR valve.

Do NOT assume that a compressor that is running, but not pumping, is faulty.
Stop the compressor and allow the pressures to balance, then start the compressor again.

Purpose

PolarPack condensing units are standard OEM products of Heatcraft Australia including both “medium” and “low” temperature application ranges. They are designed for continuously supplying and receiving the refrigerant to and from the evaporator(s), and rejecting the heat extracted from the cold space to surrounding atmosphere where the units are installed.

PolarPack condensing units are intended for installing in a typical ventilated indoor or outdoor environment (Refer to the General Arrangement Drawing section for details) with the condensing temperature no greater than 60 °C and compressor return vapour temperature no greater than 20 °C.

They are not intended for environments that may have harmful, corrosive or flammable atmospheres. Marine environments are considered corrosive; please consult Heatcraft before installing in this environment.

Standard Design Conditions

Medium temperature range condensing units are typically designed, for primary refrigerant R404A, to be used in commercial cool room applications ranging from -20 °C to +10 °C saturated suction temperature for Kulthorn Kirby compressors, -25 °C to +5 °C for Maneurop compressors, and -35 °C to +5 °C for Dorin compressors. R507/R404A and R22 are recommended refrigerants. For R134a usage, please refer to other sections of this booklet for control setting information etc.

Low temperature range condensing units are designed, for primary refrigerant R404A, to be used in commercial freezer room applications ranging from -35 °C to -15 °C saturated suction temperature for Kulthorn Kirby, and -40 °C to -20 °C for Maneurop compressors. R507 or R404A are the recommended refrigerants.

Please refer to sales data sheet CL225 for standard PolarPack condensing unit configurations, options offered and other detailed information such as capacity variations for other refrigerants.

For special design requirements (non standard conditions and/or refrigerants), please inquire with your local representatives and/or Heatcraft Australia local branches, or call our national telephone number 13 23 50 for your nearest available information resources.



Installation Instructions

Unpacking of Unit

When unpacking, check for any damage to packing material or the unit itself which may affect the unit's performance. **If any such damage is evident, please contact your local Heatcraft branch.**

Installation Location (Refer to the General Arrangement Drawing section)

If the unit is to be located in close proximity to a wall or similar obstruction, the minimum distance from the coil face to the obstruction shall be complied with. The unit shall be mounted on a horizontal plane surface.

The liquid sight glass is located to the right hand side of the unit (viewed from the front). Sufficient room should be allowed to the side to view the sight glass in operation.

Connection of gauges can be achieved from the front of the unit, refer to the section on pressure settings for more detail.

It is particularly important for the units to allow sufficient unobstructed vertical air-discharge space above the unit to prevent warm air recirculation to the condenser.

Refrigeration Piping

Refrigeration piping work shall be carried out professionally by qualified refrigeration mechanics in accordance with applicable national and local regulations and in conformance with good engineering practices required for the proper operation of the refrigeration system.

All PolarPack condensing units manufactured by Heatcraft Australia are supplied clean and internally charged with dry air or nitrogen to prevent oxidation and ingress of moisture or foreign matter. Care shall be taken during installation of the piping to prevent entrance of foreign matter or moisture by minimising the time that the piping is uncapped.

The interconnecting refrigeration pipe size is not necessarily the same size as the outlet on the unit. The pipe sizes shall be selected / calculated based on the best compromise of minimizing refrigerant pressure drop and refrigerant velocity to ensure efficient oil return. Heatcraft can provide a software program to assist in the calculation of pipe sizes.

Horizontal suction lines shall slope towards to the units to allow the oil return freely to the compressor by gravity. A 1:100 slope is considered sufficient. The use of oil trap and double risers may be necessary on vertical sections. Suction line piping shall be insulated to minimise the superheat effect to the vapour.

If in doubt during the installation, please consult with your local sales representatives and/or application engineers from Heatcraft Australia for technical support.

Electrical Connection

DANGER
HIGH VOLTAGE



All electrical connections must be carried out by a licensed electrical contractor and in accordance with the relevant regulations.

Both the mains supply and the control cabling must be brought into the electric box section from the side of the unit. The cables should be passed through the glands provided before being run to the terminals (Refer to Wiring Schematic inside electrical box cover). Refer to the name plate for all the information regarding voltage and current for the unit.

Mains supply cabling must be in accordance with relevant standards and / or codes, eg. AS3100. Control circuit is 240 volts. Terminals are supplied for connection of control circuit (Refer to Wiring Schematic inside electrical box cover).

The fitted isolation switch is pad-lockable in the "OFF" position. The door is interlocked in the "ON" position. This interlock may be defeated by depressing a small countersunk pin on the bevelled edge, close to the "OFF" label.



Warning – Electrical Hazard

Only qualified personnel should attempt to bypass the interlock. Caution must be exercised when working on the unit if the interlock is bypassed.

Lubrication

PolarPack compressors use PolyolEster (POE) oil. Heatcraft Australia approves the use of POE oil for both PolarPack hermetic and semi-hermetic reciprocating compressors.

OIL LEVELS:

Kulthorn Kirby Reciprocating Hermetic Compressors: Do NOT have oil sight glasses fitted. Oil levels on these compressors can only be checked upon removal of the compressor.

Maneurop Hermetic Compressors: The oil level should be maintained at the mid-point of the sightglass.

Dorin Reciprocating Semi-Hermetic Compressors: The oil level should be 2 – 4 mm above the centre of the sight glass during operation.



Caution - Notes on POE Oils

Use only POE oil with HFC refrigerants. Do NOT mix POE oil with other oils when using HFC refrigerants (eg R404A). Small quantities of other oil types may be mixed with POE oil when using HCFC refrigerants (eg R22).

Compressor Starting

All PolarPack condensing units use Direct-On-Line starting compressors, in single and/or three phase, depending on size. Care should be taken to establish starting requirements for the larger compressors due to high in-rush current.

Maximum compressor starts per hour

Kulthorn Kirby and Maneurop reciprocating hermetic compressors = 10

Dorin reciprocating semi-hermetic compressors = 15

“Soft Start” Kits

All PolarPack condensing units have the option of starting the compressor with one of the Danfoss electronic “soft start” devices depending on the compressor’s power supply mode.

Single phase compressors: Danfoss TCI 25 Starting Torque Limiter.

Three phase compressors: Danfoss MCI 15C CI-Tronic Softer Starter.

“Soft Start” kits are designed to enable smooth starting of AC induction motors and hence to eliminate the damaging effects on motors due to required high starting torque or high current surge. During ramp up or soft starting, the Danfoss controller will gradually increase the voltage to the compressor motor from the preset initial torque until it reaches full line voltage. For details please refer to Danfoss product specifications.

System Holding Charge

The system as supplied is pressurised at the factory with Dry Air or Nitrogen gas.

If the system is not pressurised on delivery, please contact your Heatcraft branch. Care must be taken to release the pressure before attempting to gain access to any part of the refrigeration system.

The unit should be evacuated to a pressure of 500 microns (μmHg) prior to commissioning.

Pressure Settings

PolarPack condensing units have a maximum operating pressure of 32 Bar(abs) determined on pressure vessels (such as liquid receivers). Thus any pressure relief device setting must be 32 bar(abs) or lower.

Pressure limiting device settings such as the HP control must be 29 Bar(abs) or lower in accordance with AS1677.2 that the pressure limiting device setting is no greater than 0.9 times the maximum operating pressure.

In general, Heatcraft Australia recommends 60°C condensing temperature as the maximum operating condition. The corresponding saturation pressures from respective refrigerants shall be regarded as HP cut-out points for safety protection purpose. For example, approximately 28 Bar(g) for R404A, and 23 Bar(g) for R22, are acceptable.

Heatcraft Australia also recommends the LP switch to be used as a safety protection device. Depending on the application and compressor, LP cut-in and differential points should be set with the following considerations:

- Set the cut-out points at 3–5 K below the respective minimum design saturated suction temperatures (Refer to the Standard Design Conditions section for saturated suction temperature ranges).
- Set the differential to no more than 2 Bar.
- The cut-out pressure shall be in the positive pressure region.
- When the unit is installed in a cold ambient, the cut-out pressure shall be lower than the pressure corresponding to the ambient temperature.

Access points for gauges are located on the compressor rotolock valve, base valve, discharge and / or suction lines depending on the model of the unit. They may be accessed either from the fan compartment access panel, or right hand side access panel. Gauge lines can be run through holes in the base, and the access panel re-fitted to prevent air bypass.

Fan Speed Control

A fan speed controller is fitted as standard to all PolarPack condensing units. **It may be a Saginomiya or a Johnson brand controller.**

“XGE-4CC30” from SAGINOMIYA SEISAKUSHO

- This controller varies the supply voltage to the condenser fan motor from 30% to at least 95% over the proportional condensing pressure band which is factory fixed at 6 Bar.
- The set point is defined at 90% supply voltage to the fan motor, and is set at 19 Bar by the control manufacturer. By turning the setting screw clockwise, the pressure setting increases. Turn anti-clockwise to decrease the pressure setting. It is approximately 1.5 Bar per full (360°) turn.
- The cut-off point is defined at 30% supply voltage to the fan motor, and corresponds to 13 Bar depending on actual load and / or power supply.
- When the condensing pressure reduces to the cut-off condition, the controller will cut off the supply to the fan and the fan will stop. The fan restarts at low speed when the pressure rises. [For details, please refer to Saginomiya product specification.](#)
- Heatcraft factory set point for primary refrigerant R404A is 19 Bar(g) for M/T and 14 Bar(g) for L/T units. Heatcraft Australia recommends 10 Bar(g) for R134a units.

“P215PR-9200” from Johnson Controls,

- This controller varies the supply voltage to the condenser fan motor from 30% to at least 95% over the proportional condensing pressure band which is factory fixed at 4.5±1 Bar.
- The set point is defined at 90% supply voltage to the fan motor, and is set at 19 Bar by the control manufacturer. By turning the setting screw clockwise, the pressure setting increases. Turn anti-clockwise to decrease the pressure setting. It is approximately 2.5 Bar per full (360°) turn.
- The cut-off point is defined at 30% supply voltage to the fan motor, and corresponds to 14.5±1 Bar depending on actual load and / or power supply.
- When the condensing pressure reduces to the cut-off condition, the controller will cut off the supply to the fan and the fan will stop. The fan restarts at low speed when the pressure rises. For details, please refer to Johnson Control's product specification.
- Heatcraft factory set point for primary refrigerant R404A is 19 Bar(g) for M/T and 14 Bar(g) for L/T units. Heatcraft Australia recommends 16 Bar(g) for R22 and 10 Bar(g) for R134a units.



Warning – Setting for Other Refrigerants

It is the installer's responsibility to set the control correctly for use with refrigerants other than R404A.



General Commissioning & Decommissioning Guide



Warning – Commissioning

Refrigeration system commissioning shall be carried out professionally by qualified refrigeration mechanics in conformance with good engineering practices required for the proper operation of the refrigeration system.

After all installation and electrical work is completed, the entire refrigeration system must be leak tested. After satisfactory testing of the refrigeration system, then refrigeration lines shall be insulated as necessary. The insulation located in outdoor environments shall be protected from UV exposure.

Before charging the refrigerant, the entire refrigeration system shall be evacuated by connecting a good, high vacuum pump to both the high-pressure side and low-pressure side service valves or ports.

Refrigerant charging shall be in liquid form at the high-pressure side of the system such as condenser or liquid receiver. If the refrigerant charging must be carried out through the suction side of the compressor, charge in vapour form only.

Double check all field wiring connections and factory terminations. Factory connections can vibrate loose during shipment. Ensure correct fan motor rotation, airflow is induced from coil side and forced out of fan motor side.

If fitted, ensure that the crankcase heater has been energised for a minimum 12 hours before initial start-up and / or after prolonged shutdown periods.

After the successful start up of the system, generally check:

- Current draw and voltage levels.
- Suction superheat settings and discharge temperatures.
- Abnormal refrigeration piping vibrations.
- Oil level and refrigerant charge.



Warning – Decommissioning

In order to remove the unit from its mounting place, the following procedures need to be carried out professionally by qualified personnel. Failure to do so may result in personal injury or death, property damage by fire or explosion. Discharge of refrigerant to atmosphere is illegal and may result in heavy fines by relevant regulatory authorities.

- Pump down the entire refrigerant charge into the liquid receiver or appropriate container such as reclaim cylinder, and shut related valves. **All reclaimed refrigerant that is not re-used must be taken to an approved refrigerant recycling or destruction facility.** Heatcraft Branches will accept the used refrigerant.
- Disconnect the power supply. Remove all necessary field electrical wiring and related components, leaving the earth wire to the last.
- Care must be taken when disconnecting the refrigeration piping because of unbalanced pressure between the unit and ambient. There may be a small amount of refrigerant trapped in the oil, the pressure rise in the system will boil and vaporise the refrigerant resulting in a potential personal injury hazard.
- Cut and solder seal the refrigeration liquid line and suction line pipe connections.
- Remove the unit from its mounting place. Adequate equipment must be provided as per lifting notes.

Material Safety Data Sheets – M.S.D.S.

These are available from your nearest Heatcraft Branch for all refrigerants that PolarPack condensing units are approved for, and for oils and other materials as needed.

Important Notes

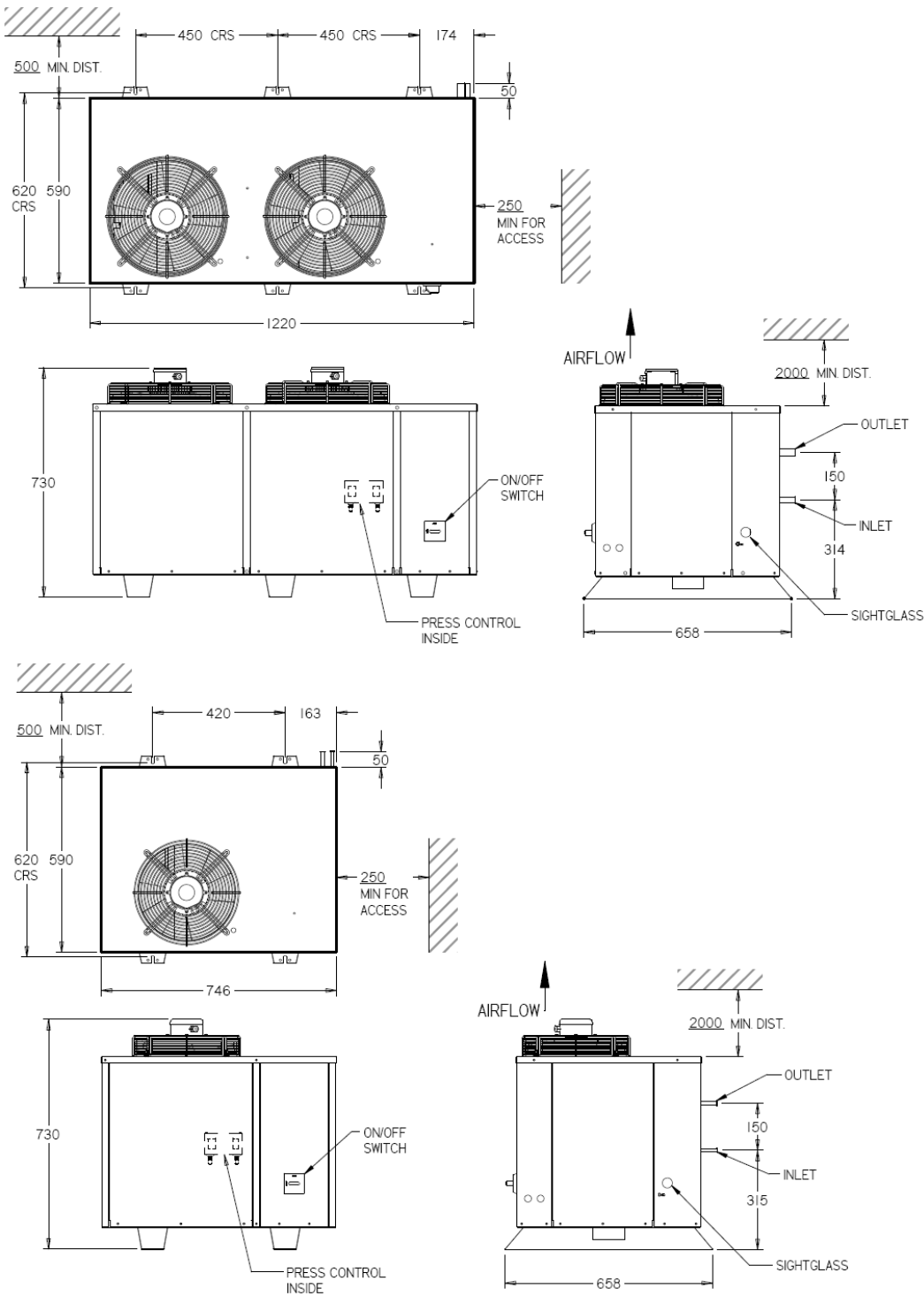
To ensure PolarPack condensing units operate efficiently and for a long working life, always obtain genuine replacement parts from your local Heatcraft Wholesale Branch. Genuine replacement parts are covered by the warranty. Refer to the Standard Terms & Conditions of Sale in the Price Guide for warranty statements.

Continuous product improvement is our company policy. Heatcraft Australia reserves the right to make changes in product specifications and/or this instruction manual without notice.

Heatcraft Australia is dedicated to providing safe products and protecting the environment by complying with all applicable national laws and regulations governing environmental protection. New and used refrigerants cannot be vented into atmosphere. Reclaim all used refrigerants. EPA regulations are constantly updated. Ensure your refrigerant handling procedure complies with the relevant regulations.



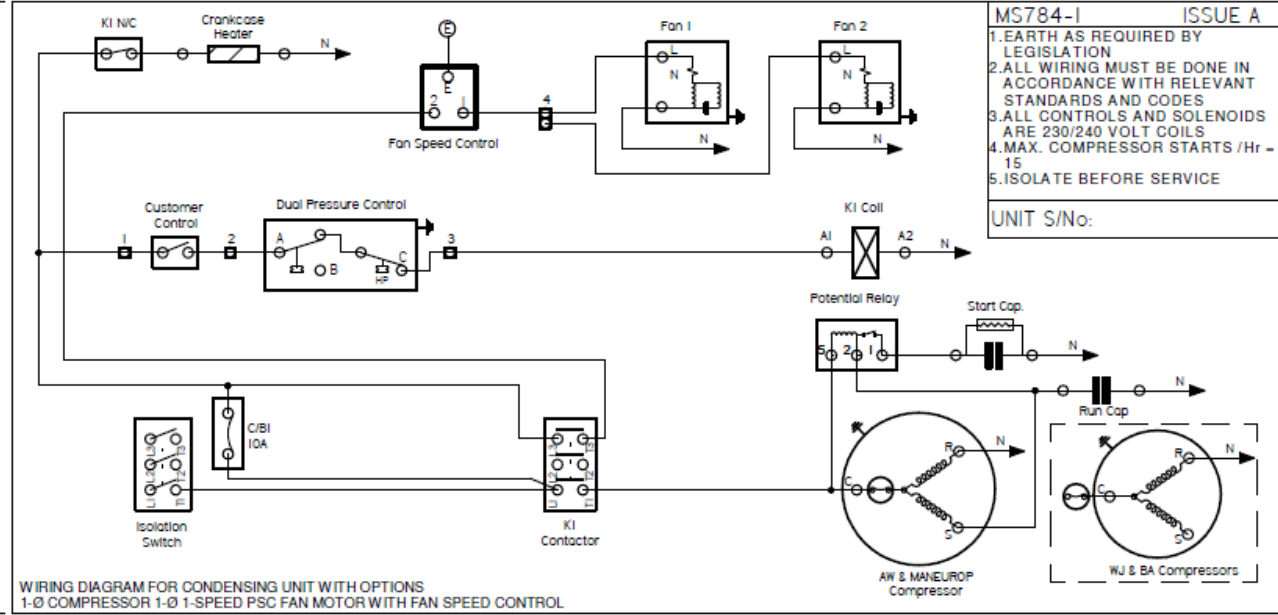
General Arrangement Drawing



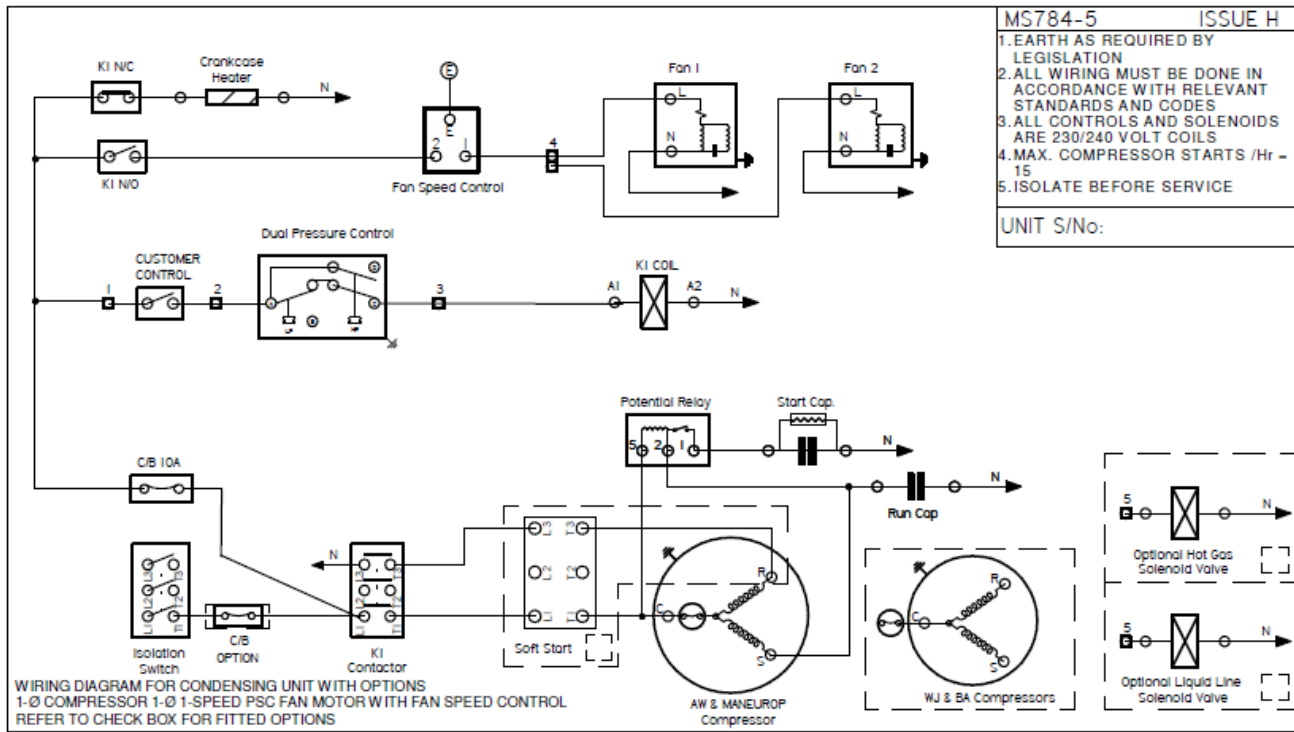


Standard wiring schematics

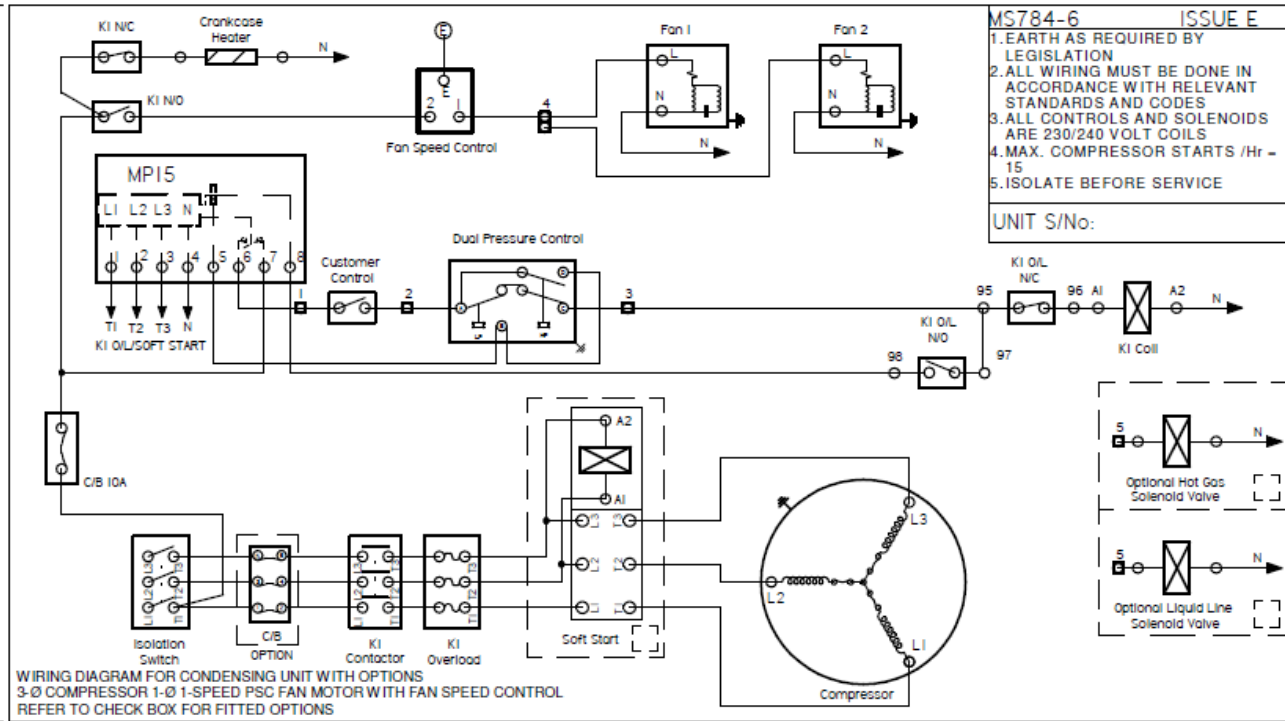
MS784-1 POLAR PACK 1 PH AW / WJ/ BA / MANEUROP COMPRESSOR AND 1 PH PSC FAN MOTOR WITH FSC



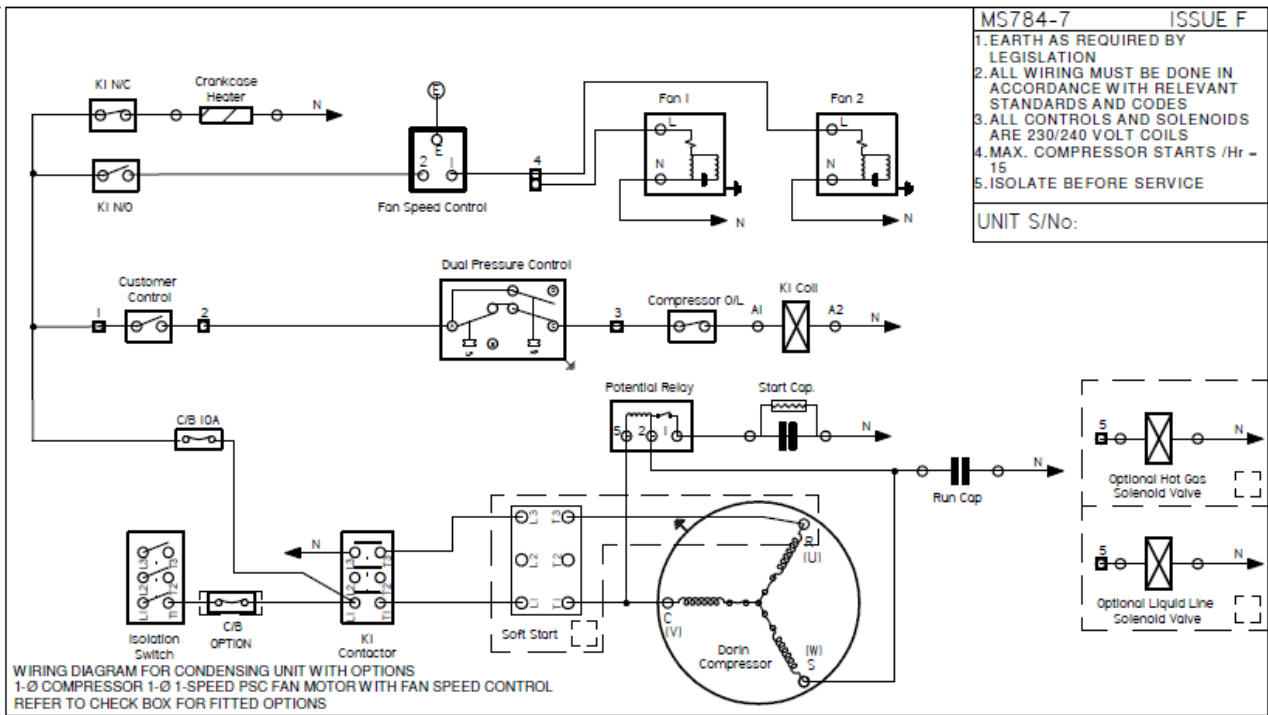
MS784-5 POLAR PACK 1 PH COMPRESSOR AND 1 PH PSC FAN MOTOR WITH FSC AND OPTIONS



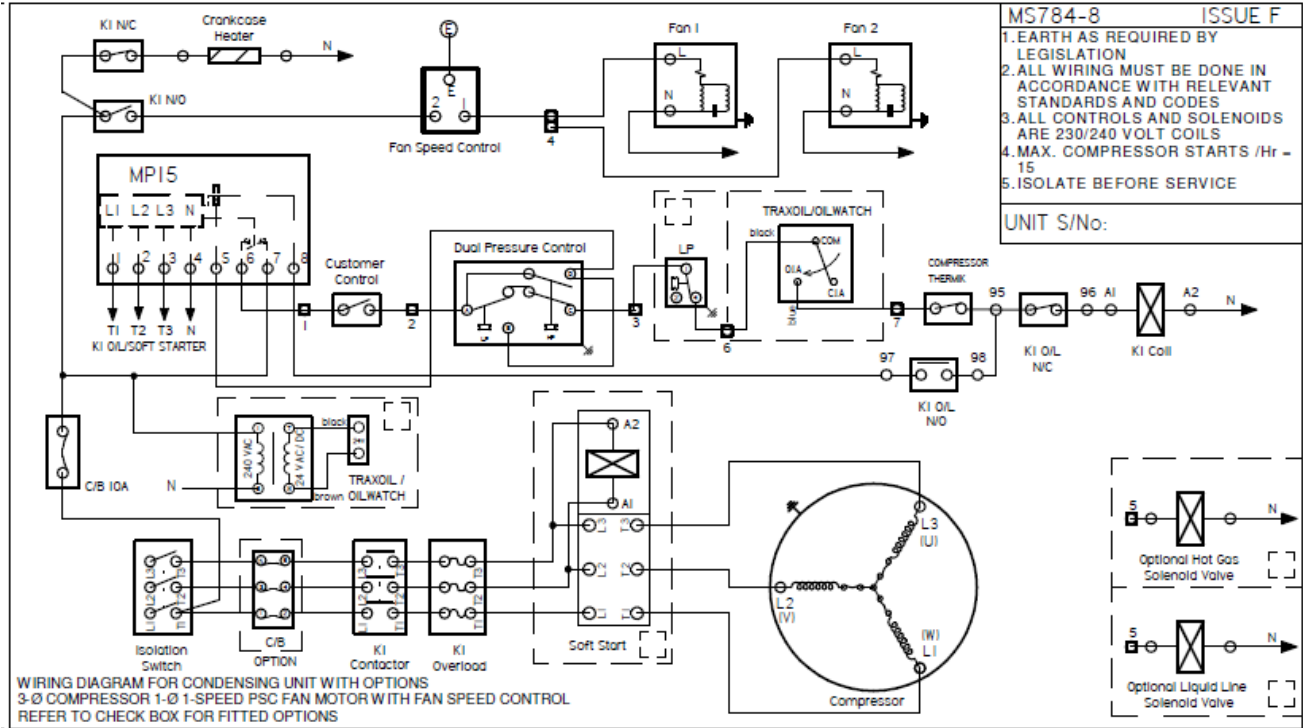
MS784-6 POLAR PACK 3 PHASE COMPRSR AND 1 PH PSC FAN MOTOR WITH FSC AND OPTIONS



MS784-7 POLAR PACK 1 PH DORIN COMPRSR AND 1 PH PSC FAN MOTOR WITH FSC AND OPTIONS



MS784-8 POLAR PACK 3 PH DORIN CMPRSR AND 1 PH PSC FAN MOTOR WITH FSC AND OPTIONS



COMMISSIONING NOTES

UNIT SERIAL NUMBER

UNIT INSTALLATION/COMMISSIONING DATES



HEATCRAFT AUSTRALIA PTY LTD

286 HORSLEY ROAD MILPERRA NSW 2214
LOCKED BAG 6501 REGENTS PARK NSW 2143
A.B.N. 67 000 056 717