



THE HEART OF FRESHNESS

# OPERATING INSTRUCTIONS

BITZER AUSTRALIA

BAO-106-2 AUS

## MAXI Rack Parallel Compressor Racks

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### 1. Important Recommendations

**i** This document is designed to outline the installation requirements, commissioning & operating instructions for the successful operation of the BITZER Maxi-Rack Parallel Compressor Rack employing 2 to 6 BITZER Compressors.

- BITZER Designed and Engineered
- Suitable for A1 HFC Refrigerants only
- DX [Direct Expansion Evaporator Systems.]
- Parallel Compressors available in 2, 3, 4, 5 and 6 Compressor configurations, employing the latest BITZER Varispeed and / or BITZER Ecoline compressors
- BITZER Rack available in Single Suction Group
- BITZER Rack available in Twin Suction Groups (Twin/Multiple Suction Group System) with “optional” suction bypass line/s each c/w Ball Valve/s.
- BITZER Rack available in Twin Suction Groups with satellite system (Twin Suction Groups) with one or more compressors at different suction pressures, eg: Low Temperature and Medium Temperature systems with common discharge
- BITZER Rack includes as standard Ø2-1/8” Suction Header Ball Valves. Ø2-1/8” Bare Stubs without Ball Valves Optional.
- BITZER Rack includes as standard Ø1-1/8” Liquid Header Ball Valves. Ø1-1/8” Bare Stubs without Ball Valves Optional.



- BIZER Rack available with “optional” Liquid Line Sub-Cooler BPHE (Braze Plate Heat Exchanger) fitted.
- BITZER Rack available with “optional” Heat Reclaim BPHE (Braze Plate Heat Exchanger) fitted.
- BITZER Rack available with vertical Liquid Receiver, Horizontal Liquid Receiver or Remote Liquid Receiver
- BITZER Racks are available (Optional.) c/w Electrical switchboard/s and Electronic Control System/s and fully wired

**NOTE: The safety switches, controls, system control valves are not factory set due to the flexible applications of BITZER Maxi-Racks.**

## 2. Design Features

This BITZER Maxi-Rack series offers flexibility and a large/extensive capacity range on a compact platform. The unit includes an Oil Separator c/w oil return/management system, Suction header/s, Suction filters, Liquid Header, Liquid Line Filter/s, Liquid Moisture Indicator Sight glass, Liquid Receiver, Relief Valve/s, Pressure Controls, Interconnecting pipework engineered to application, Ball valves for servicing the rack and or system, BITZER Unit Frame and Mounting feet. The product has an extensive range of accessories available to suit the demands of commercial refrigeration applications.

## 3. Compressor configuration

This BITZER Maxi-Rack employs BITZER Ecoline compressors and / or BITZER Varispeed compressors providing outstanding performance, reliability and efficiency. Refer to the extensive BITZER reciprocating compressor range using BITZER selection software to provide the correct selection for you specific application. Refer to KT102 Varispeed compressors; KT104 Ecoline compressors.

Configuration Options:

- Compressors all the same model/size for uniformity.  
Note: The 1st Compressor can be operated by a remote VSD drive system and the additional compressor/s each fitted CR11 capacity regulators. Providing a system that matches various loads/demands and also provides efficient, cost effective equipment.
- Compressors all the different models/sizes for wider capacity variance.  
Note: The 1st Compressor can be operated by a remote VSD drive system and the additional compressor/s each c/w CR11 capacity regulators. Providing a system that matches various loads/demands and also provides efficient, cost effective equipment.
- Compressors with the 1st Compressor a BITZER Varispeed and the additional Compressors Ecoline each c/w CR11 capacity regulators. Providing a system that matches various loads/demands and also provides efficient, cost effective equipment.
- Please consult your BITZER sales/engineering branch for assistance with system selection / design to further assist with the solution to best suit your application.

## 4. Compressor accessories

This BITZER Ecoline compressors include an extension range of accessories for best outcome of providing reliability, performance and efficient refrigeration.

Options:

- Capacity Control CR11 for Ecoline Compressors
- Head Cooling Fan
- OLCK-1 Oil Monitor for Dynamic disc Compressors / DP11 for Oil Pump Compressors
- CIC Module
- Unloaded Start By-Pass circuit
- Discharge Muffler (Inline)

## 5. Compressor branch pipework

BITZER designs the interconnecting branch pipework to each specific compressor. Each of the suction and discharge branch piping is CNC part-formed to precise specifications. This improves refrigerant flow while reducing pressure drop and leak potential resulting in high structural integrity and design. The branch piping is also compressor and application specific.

## 6. Rack discharge manifold main pipework

BITZER designs the interconnecting manifold main pipework to each specific system and application. Each of the Discharge manifold, Discharge pipework is either CNC formed to precise specifications, or hard drawn copper tube sections incorporating long radius elbows.

## 7. Rack Liquid Header and main Liquid line pipework

BITZER designs the interconnecting liquid line main pipework to each specific system and application. Each of the liquid header manifold and liquid line main pipework is either CNC formed & bent to precise specifications, or hard drawn copper tube sections incorporating long radius elbows. The Liquid header manifold includes individual liquid line outlet branches that are draw refrigerant from the base/bottom of the horizontal liquid header. The number of liquid line outlet branches is system specific.

- 1 x Liquid Line 3/8"MSAE Post Valve for system evacuation or Liquid Charging upstream of Drier Shell or alternatively 1 x Drier End plate c/w Rotolock charging valve fitted to drier shell
- Liquid Line including an Inline Drier Shell 1-4 Cores (Cores supplied Loose)
- Liquid Line dual sight glass moisture indicator downstream of Drier shell
- Liquid Horizontal Header to application
- Optional Liquid Line Ball valves to application

### 7.1 Rack Liquid Receiver

BITZER includes an extensive range of AS1210 Liquid Receiver (Pressure vessels.) to accommodate the various sized systems used in commercial refrigeration. The vessels are also available with inlet and outlet service valves to suit various line capacity requirements.

For BITZER Liquid Receiver (Vertical or Horizontal.) details refer brochure BA-603

- The Liquid Receiver Vessels (Invasive.) Low Level Probe (fitted as standard.) wire as per manufacturer's instructions
- The other optional alternative Liquid Receiver Low Level Alarm that can show refrigerant level as a percentage. Is to Install, on site a Hansen SVP Level Probe into the top central socket of the Liquid Receiver Vessel. And wire as per manufacturer's instructions Note; If a Dual Pressure Relief Manifold is also to be fitted on the adjacent socket on the Liquid Receiver, **install the Dual Pressure Relief Valve manifold assembly first, as it will impeded by the SVP Level Probe if that is fitted prior to the Dual PRV.**
- For Vertical Liquid Receivers RV162 to RV221 S56-162 SVP40 1016mm Low Level Alarm Probe
- For Vertical Liquid Receivers RV287 to RV491 S56-163 SVP54 1372mm Low Level Alarm Probe
- For Vertical Liquid Receivers RV598 S56-207 SVP69 1753mm Low Level Alarm Probe
- For other vessels contact BITZER Australia

**NOTE: The SVP Level Probes are calibrated for R134a/R407F as standard. Refer SVP operation manual for recalibration to other Refrigerants.**

## 8. Safety Instructions

All work on compressors and refrigeration systems shall be carried out only by qualified, accredited refrigeration personnel who have been trained and instructed in all work. The qualification and expert knowledge of the refrigeration personnel corresponds to respectively valid guidelines.

We suggest hanging a large sheet of paper or note pad on the rack (and labelling this sheet) indicating the systems condition during commissioning process. EG: System in pressure/leak test, System Under 1st Evacuation with all inline valves fully open, System under electrical controls circuits test...Etc.... This assists with completing the commissioning worksheet and informs site personal and site safety officer of the progress of the commissioning.

All plumbing work on the [Optional] Hot Water BPHE/s shall be carried out only by licensed accredited plumbing personnel who have been trained and instructed in all work. The qualification and expert knowledge of the plumbing personnel corresponds to respectively valid guidelines.

The BITZER Maxi-Rack is constructed according to the state of the art and valid regulations. Particular emphasis has been placed on the users' safety.

Retain these Operating Instructions during the entire lifetime of the BITZER Maxi-Rack.

### 8.1 Residual hazards

Certain residual hazards from the BITZER Maxi-Rack are unavoidable. All persons working on these units must therefore read these Operating Instructions carefully!

### 8.2 Safety References



#### ATTENTION!

Instructions on preventing possible damage to equipment.



#### CAUTION!

Instructions on preventing minor hazard to persons.



#### WARNING!

Instructions on preventing a possible severe hazard to persons.



#### DANGER!

Instructions on preventing an immediate risk of severe hazard to persons.

### 8.3 General safety references



#### Warning!

The BITZER Maxi-Rack is under pressure with a holding charge of nitrogen to a pressure of 1000 kPa above atmospheric pressure. Incorrect handling may cause injury to skin and eyes. Wear safety goggles while working on compressor. Do not open connections before pressure has been released.



#### Caution!

During operation surface temperatures exceed 100°C or fall below -30°C. Serious burns and frostbite are possible. Switch off and allow cooling down before working on the compressor and associated pipework.

## 8.4 Safety Instructions.

Caution!

Compressors contain oil & refrigerant under pressure. Release pressure from both high & low side of compressor before servicing.

Caution!

Tube brazing & compressor operation can produce hot surfaces. To avoid burns, allow surfaces to cool down before continuing installation or servicing.

Warning!

The BITZER Maxi-Rack is designed for indoor use within a dedicated plantroom. During commissioning and or maintenance it is necessary for hearing protection employed.

## 8.5 Safety Refrigerants.

Refer material data safety sheets (MSD.) for the selected refrigerant. (Available from your refrigerant Wholesaler/Provider.)

We recommend to store a copies of the MSD within plantroom, with the refrigerant cylinders as they maybe remote of the plantroom and to provide a copy to on site management.

## 9. Inspection and Designation.

On Receiving Your BITZER Maxi-Rack.

1. Before attempting to install rack, be sure to review this document in its entirety.
2. Immediately upon receiving the BITZER Maxi-Rack. Please inspect the crating, packaging and the BITZER Rack for possible damage during shipment. The crating and packaging has been designed to provide the safest possible protection for equipment transport. IMPORTANT Contact BITZER Australia immediately to notify of any damage reported.
3. Check the BITZER picking slip/list (bill of goods.) and product/s provided are correct to your purchase order. (Check unit/s nameplate/s and record serial number/s).
4. Accessories are packaged in separate carton/s. See Check list section.
5. Check compressor nameplate to ensure you have the correct model & voltage for the application. Also insure that the maximum pressure/temperature ratings listed on the nameplate are not exceeded during installation or operation.
6. Insure that all work carried out on the unit is done by qualified refrigeration personal, who are suitably trained & instructed. Applicable safety procedures & practices should be followed.
7. The unit is supplied under pressure approximately 1000kPa above atmospheric pressure. Failure to relieve the holding charge in the correct manner may result in injury.
8. Safety glasses, Safety footwear, Safety gloves and appropriate work wear must be worn when working on the unit. Contractors should complete their own risk assessment to determine any other site specific hazards that may be encountered during the installation of the BITZER rack.
9. When receiving multiple BITZER Maxi-Racks check and insure that the correct rack is located on the nominated system platform / designated area.
10. Install the supplied loose crankcase heaters to each of the compressors.
11. Do not apply any power supply to the compressor/s unless all suction & discharge shut off service valves are opened. [Fully back seated position.] And under positive pressure.
12. Do not operate compressor/s unless until system in-line valves, Pressure Relief Valves and Controls are set for operation.
13. Do not operate compressor/s unless the crankcase heater/s are installed.
14. Do not operate compressor/s unless compressors are correctly charged with correct BITZER oil.
15. Do not operate compressor/s unless the Oil Separator / Reservoir is correctly charged with correct BITZER oil.

16. Do not operate compressor/s unless system is pre-charged with the nominated Refrigerant.
17. Do not operate compressor/s unless the remote condenser is fully functional. For Air Cooled Condensers fans operating in correct direction and set to application, service valve fully open, Air Cooled Condenser coil/s not obstructed. For Water Cooled Condensers water circuit purged of air, pump/s operating to application, water regulator valve/s set to application water cooling source in correct operation, water inlet temperature to design specifications.
18. Do not operate or provide any electrical power to the compressor unless the terminal box cover is in place & secured. Measurement of amps & voltage during running conditions must be taken at other points in the power supply.
19. Do not remove terminal box cover until all electrical sources have been disconnected.
20. Follow recommended safety precautions listed on the terminal box cover label before attempting any service work on the compressor.
21. During operation surface temperatures can exceed +100°C. Severe burns are possible.
22. Discharge Lines from compressor/s service valves, inline components IE: Check Valves Discharge Mufflers, Ball Valves, Heat Reclaim Valves etc. main discharge Line/s, Oil Separators have excessive high temperatures during normal operation.

## 10. Product/Accessories/Check List.

### Component Check list for 2 Compressor Maxi-Rack.

- 1 x BITZER Maxi-rack Two Compressor Parallel Rack.
- 2 x BITZER Compressor instructions c/w spare service valve gaskets for compressors.
- 1 x wooden packing crate.
- 2 x Crankcase heaters [Supplied loose.]
- 3 x Two Litre cans of BSE32 BITZER Compressor Refrigeration Oil. [Item No. I06-019.]
- 4 x Embelton NR3 Equipment Mounting feet each 500kg Rated. [Item No.P37-053.]
- 2 x KRIWAN Int280 Oil level Controls or 2 x Traxon Oil level Controls electrical leads.
- 4 x Pleated Elements F48 for Suction header.
- 2 or 3 x Liquid line Drier Cores 48-DM. 100% Molecular sieve [Item No.S03-033.]
- 1 x Optical level Switch on Liquid Receiver Vessel (Low Level Alarm.) fitted.
- 1 x Single or Dual Pressure Relief Valve for the Liquid Receiver Vessel (Supplied Loose.)
- 1 x spare Temprite coalescent Oil Cartridge sized to application [when Temprite Oil Separator selected.]

### Component Check list for 3 Compressor Maxi-Rack.

- 1 x BITZER Maxi-Rack Three Compressor Parallel Rack.
- 3 x BITZER Compressor instructions c/w spare service valve gaskets for compressors.
- 1 x wooden packing crate.
- 3 x Crankcase heaters [Supplied loose.]
- 2 x Five Litre can of BSE32 BITZER Compressor Refrigeration Oil. [Item No. I06-022.] or 1 x Twenty Litre can of BSE32 BITZER Compressor Refrigeration Oil. [Item No. I06-012.]
- 6 x Embelton NR3 Equipment Mounting feet each 500kg Rated. [Item No.P37-053.]
- 3 x KRIWAN Int280 Oil level Controls or 3 x Traxon Oil level Controls electrical leads.
- 4 or 6 x Pleated Elements F48 for Suction header.
- 3 x Liquid line Drier Cores 48-DM. 100% Molecular sieve [Item No.S03-033.]
- 1 x Optical level Switch on Liquid Receiver Vessel (Low Level Alarm.) fitted.
- 1 x Single or Dual Pressure Relief Valve for the Liquid Receiver Vessel (Supplied Loose.)
- 1 x spare Temprite coalescent Oil Cartridge sized to application [when Temprite Oil Separator selected.]

### Component Check list for 4 Compressor Maxi-Rack.

- 1 x BITZER Maxi-Rack Four Compressor Parallel Rack.
- 4 x BITZER Compressor instructions c/w spare service valve gaskets for compressors.
- 1 x wooden packing crate.
- 4 x Crankcase heaters [Supplied loose.]
- 1 x Twenty Litre can of BSE32 BITZER Compressor Refrigeration Oil. [Item No. I06-012.]



- 8 x Embelton NR3 Equipment Mounting feet each 500kg Rated. [Item No.P37-053.]
- 4 x KRIWAN Int280 Oil level Controls or 4 x Traxon Oil level Controls electrical leads.
- 6 x Pleated Elements F48 for Suction Header.
- 3 x Liquid line Drier Cores 48-DM. 100% Molecular sieve [Item No.S03-033.]
- 1 x Optical level Switch on Liquid Receiver Vessel (Low Level Alarm.) fitted.
- 1 x Single or Dual Pressure Relief Valve for the Liquid Receiver Vessel (Supplied Loose.)
- 1 x spare Temprite coalescent Oil Cartridge sized to application [when Temprite Oil Separator selected.]

#### **Component Check list for 5 Compressor Maxi-Rack.**

- 1 x BITZER Maxi-Rack Five Compressor Parallel Rack.
- 5 x BITZER Compressor instructions c/w spare service valve gaskets for compressors.
- 1 x wooden packing crate.
- 5 x Crankcase heaters [Supplied loose.]
- 1 x Twenty Litre can of BSE32 BITZER Compressor Refrigeration Oil. [Item No. I06-012.]
- 8 x Embelton NR3 Equipment Mounting feet each 500kg Rated. [Item No.P37-053.]
- 5 x KRIWAN Int280 Oil level Controls or 5 x Traxon Oil level Controls electrical leads.
- 6 x Pleated Elements F48 for Suction Header.
- 3 or 4 x Liquid line Drier Cores 48-DM. 100% Molecular sieve [Item No.S03-033.]
- 1 x Optical level Switch on Liquid Receiver Vessel (Low Level Alarm.) fitted.
- 1 x Single or Dual Pressure Relief Valve for the Liquid Receiver Vessel (Supplied Loose.)
- 1 x spare Temprite coalescent Oil Cartridge sized to application [when Temprite Oil Separator selected.]

#### **Component Check list for 6 Compressor Maxi-Rack.**

- 1 x BITZER Maxi-Rack Six Compressor Parallel Rack.
- 6 x BITZER Compressor instructions c/w spare service valve gaskets for compressors.
- 1 x wooden packing crate.
- 6 x Crankcase heaters [Supplied loose.]
- 1 x Twenty Litre can of BSE32 BITZER Compressor Refrigeration Oil. [Item No. I06-012.]
- 8 x Embelton NR3 Equipment Mounting feet each 500kg Rated. [Item No.P37-053.]
- 6 x KRIWAN Int280 Oil level Controls or 6 x Traxon Oil level Controls electrical leads.
- 6 x Pleated Elements F48 for Suction Header.
- 3 or 4 x Liquid line Drier Cores 48-DM. 100% Molecular sieve [Item No.S03-033.]
- 1 x Optical level Switch on Liquid Receiver Vessel (Low Level Alarm.) fitted.
- 1 x Single or Dual Pressure Relief Valve for the Liquid Receiver Vessel (Supplied Loose.)
- 1 x spare Temprite coalescent Oil Cartridge sized to application [when Temprite Oil Separator selected.]

### **11. BITZER reciprocating Compressors Documentation**

The BITZER reciprocating compressor range employed for BITZER Maxi-Racks is extensive. The reason for this is to provide the best result/outcome within the product at hand. And provide a best solution for the given application.

Provide energy efficient refrigeration equipment.

Provide a product that addresses the various system / load needs effectively.

Provide a long life product of value.

BITZER reciprocating compressors documentation listing: (Refer WEBSITE.)

- CP-100 BITZER Vari-Pack Compressors.
- KB-104 Semi-Hermetic ECOLINE Compressors.
- KT-100 BITZER Document Capacity Control for Reciprocating compressors.
- KT-101 BITZER CRII Capacity Control.
- KT-110 Start Unloading for BITZER Reciprocating Compressors
- KT-122 Protection device SE-B
- KT-130 CIC System. (Single Stage Compressors.)
- KT-140 Additional Cooling Compressors.

- KT-150 Crankcase Heating.
- KT510 BITZER Polyolester Oils BSE32 & BSE55

## 12. Installation

BITZER Maxi-Racks are designed exclusively for indoor use, preferably within a designated plant equipment room. We also recommend that the product be stored indoors prior to site installation within the dedicated plant/equipment room.

Refer enclosed safety data, especially 3.1 and Risk assessment documentation prior to any equipment unloading from transport, Lifting, and installation.

**WARNING:** Careful considerations to lifting should be applied, prior to removal from transporter.

Instructions:

- The BITZER Maxi-Rack should only be lifted from the base.
  - Employing fork tine extensions for even support to both front and rear of the base frame. (Insure that the Forklifts lifting capacity is correct for the application.)
  - **Note** For crane lifts attach lifting straps to the four corners of the frame base and evenly distribute to ensure a perpendicular lift. [Or install a set of BITZER Lifting Eye Nut kit. (Purchased separately.) And have accredited lifting operator attach the lifting chains/straps to each lifting Eye Nut.]
  - The BITZER Maxi-Rack should remain within its wooden crate until, located on designated area within plant room.
  - The BITZER Maxi-Rack must remain perpendicular [upright.] and level at all times.
  - A single BITZER Maxi-Rack unit will have a Net Weight between 800kg up to +4000kg depending on Number of Compressors, Compressors models, Vessels, BPHE's and other options applied.
  - The BITZER Maxi-Rack must be set on a flat level foundation.
  - The designated plant room floor area, must allow for the rack weight and size, Including the Refrigerant weight, Electrical wiring / Equipment, and conform to current building codes.
  - **Clearances:** A safe working space surrounding 360° to be provided, including free access to above and must conform to current building codes. A safe working distance must also apply to any integral or adjacent switchboards or mains boards to AS3000.
  - Free working space is required for service of the BITZER Maxi-Rack.
  - When the BITZER Maxi-Rack is located in its designated location. Unpack the wooden crate/ Plastic wrapping; Install the Embelton mounting feet to both the floor and the unit frame. Adjust mounting feet until the rack is level.
  - It is imperative that the rack be mounted level and secure. (Free from any twists or uneven distortions.) As this may cause undue stress on rack piping or be a source of vibration.
  - It is important that all Embelton mounting feet are installed and the locking nuts are tight.
- Embelton NR3 adjustable mounting foot. Capacity 500Kg each. [Item No.P37-053]



Figure

- The Embelton mounting feet slightly raise the BITZER Maxi-Rack off the floor allowing free space for a metal condensate / oil tray to be inserted at floor level. [Recommended.] (Oil Tray/s by others.)



### 13. Installation Interconnecting Field Pipework to Maxi-Rack.

- Insure that fully operational [tested/certified.] Refrigerant detection / Oxygen deprivation detectors: Are installed and fully functional prior to receiving any refrigerant to site.
- The equipment plant room should be free of dust before the BITZER Maxi-Rack is connected to any field piping to insure internal cleanliness.
- Insure that the system nitrogen holding charge is expelled from the BITZER Maxi-Rack, prior to any attempts at connecting field piping.
- Insure that the BITZER Maxi-Rack and all refrigeration field piping are not exposed to atmosphere for any long periods.
- The System (field) piping must be to AS1677 / AS5149. An inert gas [Dry Nitrogen.] must be charged through field refrigeration pipe work during the brazing process. It is recommended that the inert gas [Dry Nitrogen.] be delivered into the pipework in a manner, so that air is not also introduced.
- Install compressor sump heaters and connect to electrical as per BITZER operational instructions.
- The interconnecting Suction Lines must be engineered to the application and insure positive oil return at both full load and minimum load conditions.
- The suction Line velocity must insure oil return in both riser/s and horizontal pipework.
- The suction pipe engineering must consider the super heat conditions of a DX (Direct Expansion) evaporator system.
- In some applications a double riser (for vertical suction lines.) is necessary, due to varying upper and lower load conditions and to ensure a minimum EG: 7.6m/Sec R134a refrigerant velocity required to return oil.
- For horizontal suction lines an approximate minimum velocity of EG: 5.0m/Sec R134a is required.
- The Liquid line must also be engineered to the application to insure the correct supply of liquid refrigerant to the expansion valves (metering devices.) without excessive pressure drop or flash gas occurring.
- The interconnecting field pipe size is not necessarily the same size as the stub on the rack.
- Warning: The refrigeration field piping employs refrigeration grade copper tube and fittings. Some refrigerated, foods produce ammonia as a by-product in the ripening process. In this instance the refrigeration copper tube and fittings must be externally coated/treated to ensure the integrity of the pipe in the NH<sub>3</sub> environment.

#### 13.1 Installation Interconnecting Field Pipework to Maxi-Rack.

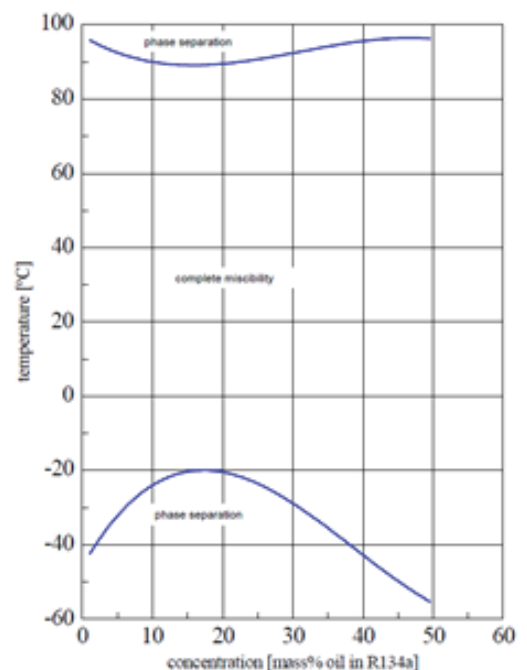
##### Refrigeration piping goals and objectives.

1. The interconnecting field assembled refrigeration piping connecting the system components and equipment primary goals are to maximize system reliability and efficiency with cost effective outcome. To accomplish these goals Suction Lines must be engineered to the application and insure positive oil return.

##### Mixture of BSE32 Oil and R134a Refrigerant Chart.

Figure 1

As detailed within the above chart. BSE32 Oil and R134a refrigerant are in a condition of complete miscibility at the operational range of saturated suction temperatures. Refer Miscibility limits within KT510 BITZER document.



#### 14. Ancillaries/BITZER Temprite Coalescent Oil Separation System

The BITZER Maxi-Racks can offer an option to fit a high efficient Temprite Coalescent Oil Separator / Reservoir.

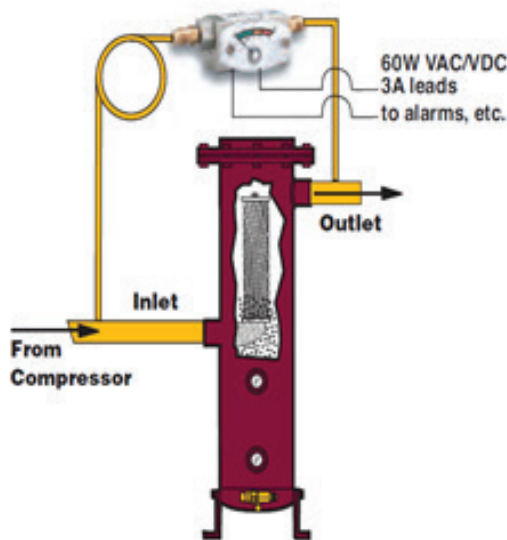
- The Temprite Coalescent Oil Separators have an internal filter, installed. Temprite™ Coalescent Oil Filters will remove dirt and effluent to 3.0 microns. [Typical Filter driers only catch 50 microns or larger.] Replace the coalescent filter if dirt loading is above 0.896 Bar / 89.63kPa./ 13.0 PSI differential across the separator [Refer the Temprite Differential Indicator.] See below.
- The Temprite Coalescent Oil Separators are also excellent at maintaining oil cleanliness. [This has a direct positive effect in reducing operational costs.]
- The Temprite Coalescent Oil separator / Reservoirs are not affected by velocity and are 98.5% efficient down to 20% of total rated load.

Temprite Coalescent OIL Separator / Reservoir.

Temprite Coalescent Oil separator / Reservoir.

Temprite Oil Separator with Pressure differential Indicator. PDI installed

Figure 2



##### 14.1 Ancillaries/BITZER Temprite Coalescent Oil Separation System

Temprite Pressure differential Indicator. PDI BITZER Item No. B36-088



This PDI indicator B36-088 includes electrical leads that can be wired to your Micro-processor refrigeration control system to indicate when the differential across the oil separator is too high [requiring a filter change.] The Alarm differential pressure is 0.83 Bar. The Yellow /Green transition is 0.69 Bar. The Yellow /Red transition is 0.89 Bar.

The B36-088 PDI Pressure Differential Indicator Electrical data 60W VAC /VDC. 3.0 Amp leads to your Alarm.

#### NOTES:

1. Ensure that the PDI Pressure Differential Indicator Ø1/4"MSAE Inlet, is connected via GOMAX flexible hose to the main discharge pipe before the oil separator/reservoir. (Inlet is marked on the back of the PDI.)
2. Ensure that the PDI Pressure Differential Indicator Ø1/4"MSAE Outlet, is connected via GOMAX flexible hose to the main discharge pipe after the oil separator/reservoir. (Outlet is marked on the back of the PDI.)

## 14.2 Ancillaries/BITZER Temprite Coalescent Oil Separation System



### ATTENTION!

**The internal coalescent Filter must be changed after the first 100 hours of system operation.**

### Ancillaries/BITZER Temprite Coalescent Oil Separation System

Temprite Filter Change Instructions:

1. Isolate Oil separator from System.
2. Recover or recycle any remaining refrigerant from the oil separator.
3. Be sure that the Oil Separator is de-pressurized.
4. Carefully unbolt the flange bolts and nuts. [Put aside with washers to be reused.]
5. Carefully remove the top plate.
6. Remove the filter retaining nut and sealing washer.
7. Remove the old filter and "O" ring from the bottom of the filter.
8. Make sure that the filter sealing surface inside the separator is smooth and clean of dirt.
9. Wipe clean oil separator internals so that it is free from any dirt, scale or contaminates.
10. Dispose old oil properly.
11. Install a new Temprite™ replacement filter cartridge.
  - a.) Apply a thin film of clean refrigeration oil to the "O" ring of the new filter and insert the new filter into the separator so that it is centred and that the "O" ring seats flush on the sealing surface.
  - b.) Re-attach the new sealing washer and filter nut.
  - c.) Tighten the filter nut until it will not turn.
  - d.) Tighten the filter nut an additional 1/2 to 3/4 turn.
12. Thoroughly remove the old gasket or "O" ring from the groove. [Careful not to scratch the steel surface.]
13. Select the correct "O" ring and fit in the groove, discard extra "O" ring.
14. Replace the flange "O" ring or gasket in the groove dry, and then apply oil with 360° coverage of the "O-ring.
15. Pre charge the Oil separator with BSE60K oil. [see nameplate for quantity]
16. Re attach the top cover plate to flange by first finger tightening nuts on bolts with lock washers, in between nut and flange face. Start with any given bolt and gradually tighten crisscross pattern firmly up to
17. 27 to 29.8 N-m of torque for 922R - 9227R.
18. 67.7 to 74.5 N-m of torque for 928R.
19. 94.9 to 101.6 N-m of torque for 930R.]
20. Tighten mounting bolts in an opposing pattern to insure even pulling down of the top cover assembly.
21. Leaks test/check the oil separator flange junction.
22. Evacuate the oil separator and interconnecting lines.
23. Return the oil separator to operation, slowly open the isolating valves.
24. Monitor the oil levels and pressure drop frequently.
25. Continue to replace filters until you maintain a pressure drop staying below 0.896 Bar / 89.63kPa./ 13.0PSI differential across the separator. The separator is clean.

### NOTES:

- The clean-up Oil Filters are for clean-up purposes only. They remove dirt down to 3.0 microns.
- The standard coalescent oil filters remove dirt down to 0.3 microns and you will have 98.5% oil separation for normal operation.
- **Oil Separator is not Pre-charged with Oil.** Please insure that the oil separator is charged with a correct quantity of the nominated oil prior to evacuation.



### 14.3 Ancillaries/BITZER Temprite Coalescent Oil Separation System

Ancillaries/BITZER Temprite Coalescent Oil Separation System

Temprite AS2971 Coalescent Oil Separator/Reservoirs models and Accessories:

BITZER Item No.	Description
B36-070	922R OIL SEPARATOR/RESERVOIR COALESCENT c/w Filter kit
B36-071	923R OIL SEPARATOR/RESERVOIR COALESCENT c/w Filter kit
B36-072	924R OIL SEPARATOR/RESERVOIR COALESCENT c/w Filter kit
B36-073	925R OIL SEPARATOR/RESERVOIR COALESCENT c/w Filter kit
B36-074	926R OIL SEPARATOR/RESERVOIR COALESCENT c/w Filter kit
B36-075	927R OIL SEPARATOR/RESERVOIR COALESCENT c/w Filter kit
B36-076	928R OIL SEPARATOR/RESERVOIR COALESCENT c/w Filter kit
B36-077	930R OIL SEPARATOR/RESERVOIR COALESCENT c/w Filter kit
B36-078	OIL FILTER KIT STD. 922R/923R
B36-079	OIL FILTER KIT CLEAN-UP. 922R/923R
B36-080	OIL FILTER KIT STD. 924R/925R
B36-081	OIL FILTER KIT CLEAN-UP. 924R/925R
B36-082	OIL FILTER KIT STD. 926R/927R
B36-083	OIL FILTER KIT CLEAN-UP. 926R/927R
B36-084	OIL FILTER KIT STD. 928R
B36-085	OIL FILTER KIT CLEAN-UP 928R
B36-086	OIL FILTER KIT STD. 930R
B36-087	OIL FILTER KIT CLEAN-UP 930R
B36-088	PRESSURE DIFFERENTIAL INDICATOR 224#

Temprite Oil Separator/Reservoirs are manufactured to AS2971 with a Design Pressure 45 bar.

Temprite Oil Separator/Reservoirs recommended BSE32 vessel oil charge.

BITZER Item No.	Description	Oil Charge Litres
B36-070	922R OIL SEPARATOR/RESERVOIR COALESCENT	2.27
B36-071	923R OIL SEPARATOR/RESERVOIR COALESCENT	2.27
B36-072	924R OIL SEPARATOR/RESERVOIR COALESCENT	3.22
B36-073	925R OIL SEPARATOR/RESERVOIR COALESCENT	3.22
B36-074	926R OIL SEPARATOR/RESERVOIR COALESCENT	6.7
B36-075	927R OIL SEPARATOR/RESERVOIR COALESCENT	6.7
B36-076	928R OIL SEPARATOR/RESERVOIR COALESCENT	7.55
B36-077	930R OIL SEPARATOR/RESERVOIR COALESCENT	21.25

NOTE: BITZER COS and Temprite Coalescent Oil Separator / Reservoirs complete with accessories are available from BITZER Price Book.

## 15. Refrigeration Oil



ATTENTION!

### Only use BITZER BSE32 POE Oil

1. BITZER Australia Item No. I06-018 Oil BSE32 1 litre container.
2. BITZER Australia Item No. I06-019 Oil BSE32 2 Litre container.
3. BITZER Australia Item No. I06-015 Oil BSE32 5 Litre container.
4. BITZER Australia Item No. I06-012 Oil BSE32 20 Litre container.

Refer BITZER Documentation for Oil Applications.

## 16. Oil Level Regulator

### 16.1 KRIWAN Oil Level Control

#### Ancillaries/ Kriwan Int.280 Compressor Oil Level Control

The KRIWAN Int.280 Oil level control, monitors and controls the oil level within the refrigeration compressor. The oil level regulator keeps the crankcase oil level at half the height of the sight glass. A KRIWAN Int.280 is fitted to each compressor replacing the compressor sight glass.



#### Functional Description

After the KRIWAN Int.280 is switched on, the alarm relay picks up after 3 seconds, if no malfunction is present (closed circuit principle.). Regardless of the oil level, a 20 second pause is activated, to allow oil to settle. If, thereafter, to low oil level is detected, the solenoid valve switches to oil injection, in a specified cycle.

1st cycle: Fill 5 seconds / wait 5 seconds.

2nd cycle: Fill 10 seconds / wait 10 seconds.

3rd cycle: Fill 20 seconds / wait 20 seconds.

If after the 135 seconds, an adequate oil level has not be reached, the alarm relay drops out. The last filling cycle that has been reached (Fill approx. 30 seconds / wait approx. 30 seconds.) stay active. If an adequate oil level has been reached, the alarm relay picks up again after a waiting time, the filling cycle is reset. If there is a device malfunction (e.g. Low Line (Supply.) Voltage.) The alarm relay drops out and is locked, regardless of the oil level, after approx. 5 seconds No filling procedure is preformed the lock can be released by interrupting the voltage supply for at least 5 seconds. An LED positioned next to the sight glass visually signals the respective operating status.

#### LED Status

Level OK.	Green continuously lit.
Filling.	Green Flashes.
Oil level Low.	Red continuously lit.
Internal error.	Red flashes.

## Installation Instructions

Prior to installation of the KRIWAN Int.280, ensure that the “O” ring at the connecting flange is seated properly.

There must be no foreign objects in the oil feed area of the KRIWAN Int.280.

The device has to be mounted to the compressor horizontally. It can be rotated 180°.

Use matching washers for the flange fastening screws. Tighten the screws alternating with a torque of (M6, steel 8.8 dry.) 9 Nm.

### 16.1 KRIWAN Oil Level Control Technical Specifications

- Supply voltage AC 230Volt 50/60Hz  $\pm 10\%$  15VA
- Ambient Temperature -30°C to +60°C
- Relative Humidity 10% to 95%RH. Without condensation.
- Operating Pressure -1 to 60Bar.
- Test Pressure 75Bar
- Differential Pressure 1 to 25Bar (across valve.)
- Output relay AC240V 2.5A.
- Connecting cable 6 x AWG (0.75mm<sup>2</sup>) Length 1 metre. Numbered 1 to 5 GNYE
- Ingress protection IP65

### 16.2 TRAXON Oil Level Control

#### Ancillaries/ TRAX Oil. Compressor Oil Level Control

The OW3 Traxon Oil level control uses a Hall-Sensor to measure oil level. A magnetic float changes its position according to the oil level. The Hall-Sensor converts these magnetic field changes into an equivalent signal, which is used by the electronic controller to show with LED's the actual oil level. If the oil level drops into the red zone the OW3 generates an alarm signal and the alarm contact (SPDT) changes into the alarm state. The later can be used to shut down the compressor. If the oil level comes back to normal the alarm will reset.



The level control is divided into 3 zones. The green LED indicates that the oil level is within the normal limit green zone (50-70% sight glass height) and only the green LED is on. On reaching the yellow zone the OW3 is switching on the yellow LED after a 10 second delay. The time delay of 10sec is necessary to avoid flickering of the LED's during compressor start up as the oil level can vary greatly and thereby switching the LED on/off frequently. When in the yellow zone only the yellow LED is on (50-30% sight glass height). The yellow zone can be interpreted as a warning zone and indicate that the oil separator is not operating correctly or that the compressor is throwing out excessive oil into the system.

Should the oil level reach the red zone (30% sight glass height) the OW3 will generate a critical alarm after a delay of 20sec. The alarm relay will switch to “ALARM” and the red LED will illuminate.

#### ATTENTION!

The external compressor control circuit wiring should automatically shut down. The compressor/s failure to do so may result in compressor damage and void warranty.

24 Volt power supply to Traxon. External Transformer must be employed.



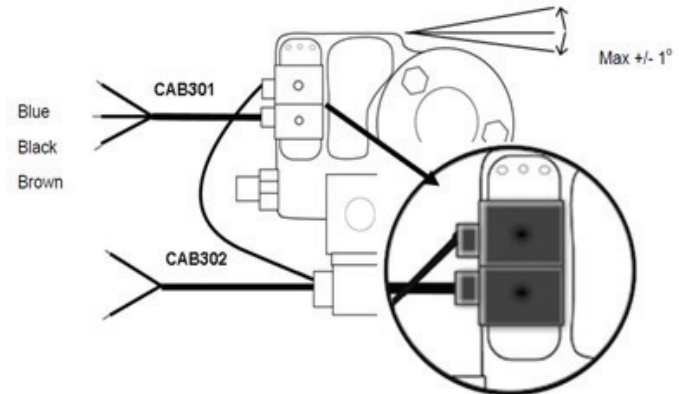
### 16.3 TRAXON Oil Level Control

#### OW3 Electrical Wiring

Figure 4

Connect CAB301 cable to relay connection, maximum 3A/240V according to drawing above.

- Blue (open in Alarm)
- Black (Common)
- Brown (closed in Alarm)



**Do not switch compressor directly, use the compressor power relay instead**

Connect CAB302 cable to 24VAC 50/60Hz 0.7A (see Figure 7). Ensure the cables are parallel to each other and they protrude out the side of the and not over the LED's

#### **WARNING!**

**All electrical wiring should be carried out by qualified persons and in accordance with AS3000 or equivalent standard in the country of installation.**



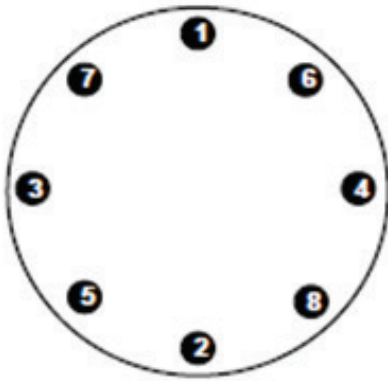
### 17. Replaceable Core Liquid Line Drier Shells Operating Instructions

The BITZER Maxi-Racks include a Liquid Line Drier Shell in various configurations of connection size and with various number of drier cores from 1-4. (Sized to application.)

Instructions for Liquid Line Drier Core replacement: (Refer safety data handling refrigerants.)

- 1.) Completely pump down the section of liquid line and isolate the Liquid Line Drier Shell.
- 2.) Remove any remaining refrigerant within the drier shell via the Ø3/8"MSAE Post valve upstream of the Drier Shell or via the Drier Shell End Plate c/w Rotalock Service valve Ø3/8"MSAE attached to the drier shell. The remaining refrigerant within the Drier Shell can be reclaimed or diverted to another part of the system.
- 3.) Once this refrigerant is removed, re-check that the drier is fully isolated and check internal pressure of drier shell.
- 4.) With the drier shell fully isolated, carefully loosen the end cover plate bolts-but do not fully remove them.
- 5.) Before completely removing the end plate bolts, break the "O" Ring seal to release any residual pressure within the shell.
- 6.) Once Drier shell is at atmospheric pressure within, carefully remove the end plate bolts, washers & spring washers. Placing them where you will not lose or damage any of the components.
- 7.) Check the "O"-Ring seal for damage and wear. Replace the seal with a new seal.
- 8.) Fully remove the retaining spring and the core assembly by pulling on the wing nut.
- 9.) Once fully removed disassemble the core assembly by removing the wing nut, the inlet cover plate and the contaminated drier core/s or filter gaskets for multiple core shells, remove the separator plates and gasket between each core.
- 10.) Inspect and thoroughly clean all internal components including the end cover plate.
- 11.) Before opening new cores from their sealed containers, organize the internal assembly components to aid in reassembling the drier core structure minimizing the time that the new core/s are exposed to atmosphere.
- 12.) Install the new cores and gaskets in the outlet screen base plate, adding any additional cores, gaskets and separator plates as needed. NOTE: The tapered ID of each of the cores should be facing the outer plate.
- 13.) Re-install the inlet plate and tighten the core assembly using the wing nut.
- 14.) Install a bolt and lock washer into the shell flange.
- 15.) Lightly coat the "O"-Ring seal with refrigeration oil.

- 16.) Re-install the retaining spring, preventing interference with the wing nut.
- 17.) Engage the slotted hole on the end cover plate with the bolt already installed in the flange shell. Ensure that the lock washer is on top of the end cover plate. This will allow easier installation of the remaining bolts/washers.
- 18.) Compress the retaining spring using the end cover plate and install the remaining bolts and washers tensioning to hand tight.
- 19.) For steel end cover plates using the torque pattern shown below evenly tension all of the bolts in sequence to a maximum of 34 Nm.
- 20.) Properly evacuate the portion of system just serviced. Test shell for leakage under vacuum.
- 21.) Return drier shell to system pressure and test shell for external leakage. Caution failure to do so may result in refrigerant leakage.
- 22.) Return system to normal operation.



Torque sequence cross tensioning evenly to ensure correct installation.

NOTE:

- Use only 48-D Drier cores 100% molecular sieve for BSE32 oil systems.
- This above instructions also apply to BITZER Suction Header core replacement.

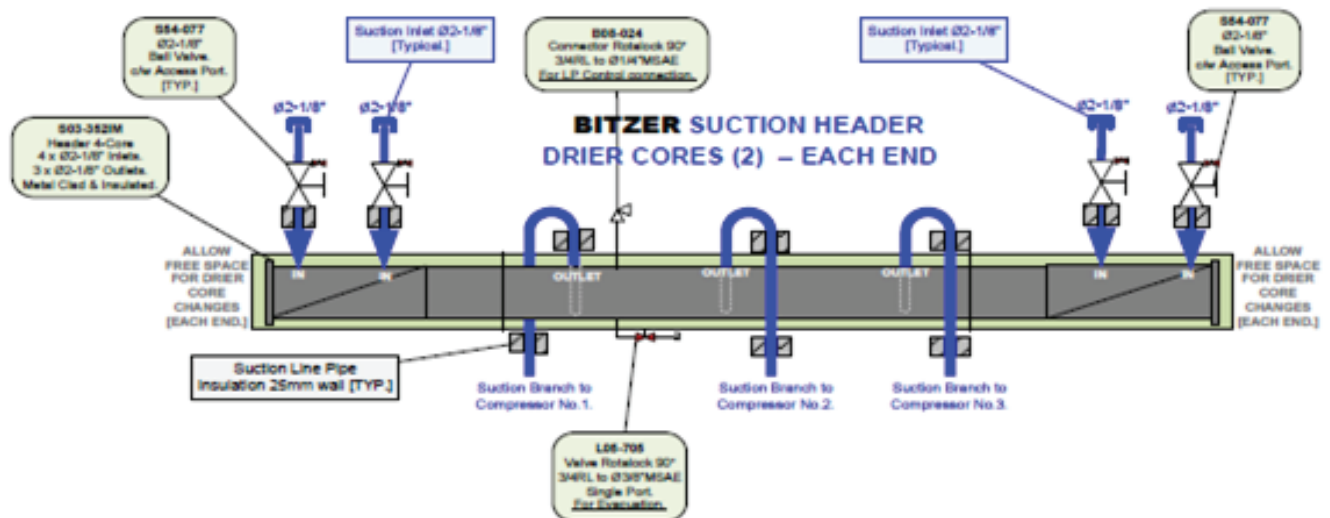
## 18. Suction Header/s

**BITZER Maxi-Racks are available with BITZER Designed Suction Headers c/w integral Suction Filters.**

The suction headers are steel pressure vessels, powder coated finish then Metal clad with polyurethane insulation available in several models:

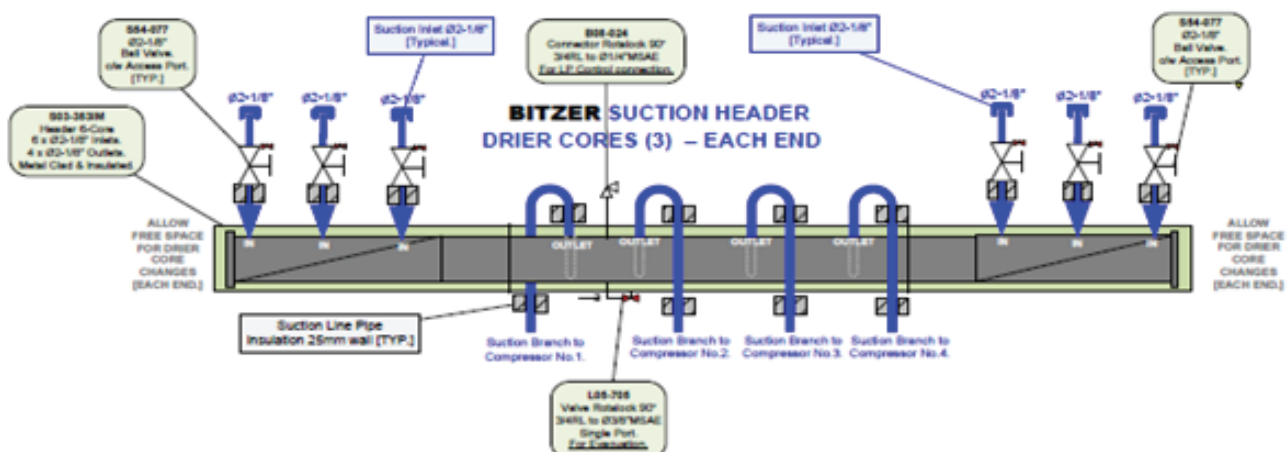
### 1.) S03-352IM Suction Header 2-3 Compressors.

- 4 x Suction Inlets (two at each end.)
- 3 x Compressor outlet Pickup tubes centrally located.
- 4 x Drier Cores (two at each end.) Pleated Filter Cores provided as separate items.
- 2 x Drier Shell End Cover Plates (one at each end.)
- 2 x Insulated covers one at each end.



### 2.) S03-353IM Suction Header 2-4 Compressors.

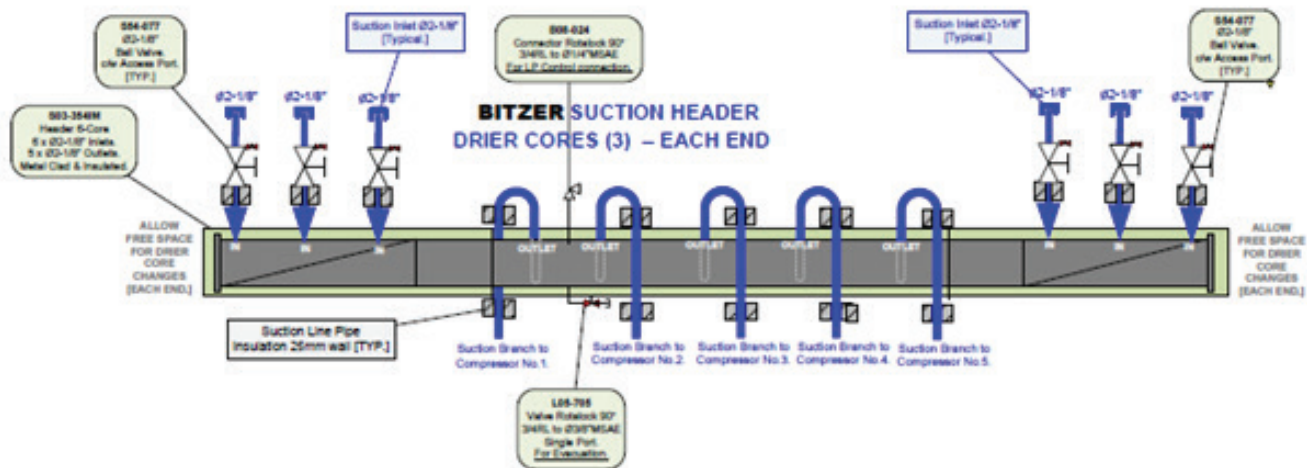
- 6 x Suction Inlets (three at each end.)
- 4 x Compressor outlet Pickup tubes centrally located.
- 6 x Drier Cores (three at each end.) Pleated Filter Cores provided as separate items.
- 2 x Drier Shell End Cover Plates (one at each end.)
- 2 x Insulated covers one at each end.



## 18.1 Suction Header/s

### 3.) S03-354IM Suction Header 5 Compressors.

- 6 x Suction Inlets (three at each end.)
- 5 x Compressor outlet Pickup tubes centrally located.
- 6 x Drier Cores (three at each end.) Pleated Filter Cores provided as separate items.
- 2 x Drier Shell End Cover Plates (one at each end.)
- 2 x Insulated covers one at each end.



Note: For other Suction header configurations please contact BITZER Australia.

For installation or replacement of Suction Filter pleated elements or 48D Drier core installation / replacement for de-hydration or system clean-up. Refer drier core installation replacement data contained in the manual.

**WARNING: Do not use Suction Header Pleated Elements in Liquid Line Drier Shells**

## 19. Ball valves

BITZER Maxi Racks can be fitted with Ball Valves for service on Suction Headers / Liquid Headers / Liquid Lines / Discharge Lines.

- The Design pressure for all Ball Valves is 48Bar.
- The Operational temperature range is -40°C to +149°C
- The Ball Valves are full port construction to match line size ID.
- The Ball Valves operate from fully open to fully closed, with

a quarter stem turn (90°) See arrow stamped on top of stem for flow

orientation. Care should be taken when opening or closing the valves not to damage the stem stops.



### 19.1 Brazing Ball Valves

- Before brazing check to make sure that the ball valve is in fully opened position.
- Remove the seal cap and ring/gasket.
- Use Dry Nitrogen to purge the ball valve and maintain a flow of nitrogen to stop carbon formation occurring internally.
- Remove Schrader valve from 1/4"MSAE access port/s (if included.) and replace a 1/4"FSAE cap over the access port.
- Wrap the Ball Valve in wet rags, ensuring that no moisture enters pipe joints.
- When soldering ensure that the flame is directed away from the valve body at all times.
- When soldering focus the flame at the expanded copper end and bring join area to soldering temperature quickly so that the ball valve doesn't over heat.
- Use approved silver solder for brazing.
- After brazing quench the newly created solder joint with wetted rags to reduce joint temperature. Then replace wetted rag wrapped around the valve body with another wetted rag to reduce valve temperature.
- Coat the Schrader valve with refrigeration oil prior to reinserting the Schrader valve on the 1/4"MSAE access port/s and replace Flare Nut/s complete with copper bonnets to all Schrader access ports. (if included.)



#### Caution!

Tube brazing & compressor operation can produce hot surfaces. To avoid burns, allow surfaces to cool down before continuing installation or servicing.

#### Caution!

Number/Title the designated Suction Circuits.

Number/Title the designated the Liquid Circuits.

Number/Title the designated the Discharge Circuit.

Number/Title the designated the Liquid Drain (Return.) Circuit.

## 20. Ancillaries Brazed Plate Heat Exchanger (BPHE)

BITZER Maxi Racks can be fitted with BPHE Brazed Plate Heat Exchangers for various uses. For example.

- As a Liquid Line Sub Cooler BPHE. Where a small portion of a higher stage (Higher Suction System.) is cooling a lower suction systems Liquid Line for increased performance of the lower suction system by taking advantage of the higher suction systems COP.
- As a Heat Reclaim BPHE to reclaim a portion of the discharge sensible heat to heat water to provide lower cost, consistent hot water or to assist the HC&V (air-conditioning) system/s.
- As a Cascade Condenser BPHE to increase the efficiency of a Lower stage (Lower Suction System.) and to reduce that systems refrigerant charge.

The liquid refrigerant (typically R134a) from the high stage of the cascade system to the R134a or R404A Liquid Separation Vessel located above the Dual R134a outlet BPHE. The CO<sub>2</sub> condenses through the BPHE condenser. The direction of flow of the R134a is always in counter flow to the CO<sub>2</sub>, see

A Brazed Plate Heat Exchanger (BPHE.) excluding the polyurethane insulation and metal clad enclosure



Figure 5



Figure 6

Notes:

The BPHE when used as a Liquid Line Sub cooler the flow of each circuit is counter flow. See Figure 6.

S1. Cooling Side (Evaporator Outlet) Higher Stage System.

S2. Cooling Side (Evaporator Inlet.) Higher Stage System.

S3. Hot Side (Evaporator Inlet) Lower stage system.

S4. Hot Side (Evaporator Outlet.) Lower stage system.

The Sub-Cooled Liquid Line is insulated from the BPHE to the liquid Outlets on the Rack. The on-site (field Piping.) must also be insulated to the Tx Valve/s to ensure no flash gas occurs. This is due to the Liquid Line now being at a lower temperature than the surrounding Ambient. The liquid refrigerant within the Liquid Line with this additional sub-cooling has also increased in density.

The insulated line should be engineered/sized to its sub-cooled condition.



## 20.1 Ancillaries/Electronic Expansion Valve (EEV) for BPHE

This process is regulated typically by an AKV or EEV: The AKV or EEV is optional and sized to application..



### ATTENTION!

Care should be taken when selecting, installing and commissioning of the AKV or EEV

- Refer manufactures data sheet for operational requirements of the AKV or EEV

## 21. Risk Assessment Documentation

<b>Work Activity:</b>  Transport , lifting		
<b>Site/Location:</b>  Onsite Location		
Those at Risk	Y/ N	Comments - enter names or general groups
Contactors:  Other workers:  General Public:	Y  Y  N	Installation, personal and Assistants.   
Comments: The package is supplied shrink wrapped on a export treated wooden skid, & requires installing in its final position. No one under the age of 18 will undertake lifting or slinging operations unless directly & closely supervised by a competent person.		
<b>Hazards</b>		
<ol style="list-style-type: none"> <li>Collision of moving crane, host, forklift truck or lifting other device with people or plant.</li> <li>Collision of crane boom, hook, block or other moving part with people or plant.</li> <li>Collision of suspended load with people or plant.</li> <li>Working in windy or rainy weather or when sunshine makes observation difficult.</li> <li>Working at night when there is insufficient lighting to observe the full travel of the load.</li> <li>Dropping of load due to mechanical failure of load bearing component (crane, sling or shackle)</li> <li>Dropping of load due to incorrect slinging method or use of equipment or overload of crane or sling.</li> <li>Trapped fingers or toes.</li> <li>Cuts &amp; abrasions whilst handling chains or slings.</li> </ol>		

### Control Measures (existing or planned)

Control	Details
PPE:	<ol style="list-style-type: none"> <li>1. Steel toecap boots.</li> <li>2. Overalls/protective clothing.</li> <li>3. Safety helmet</li> <li>4. Leather gloves for handling chains or slings.</li> <li>5. Safety harness (if appropriate)</li> </ol>
Equipment:	<ol style="list-style-type: none"> <li>1. Forklift</li> <li>2. Slings, hooks (fitted with safety catches), plate clamps, eyebolts &amp; shackles.</li> <li>3. Crane or hoist (mobile cranes must be fitted with overload warning devices)</li> </ol>
Information, Instruction, and Training	<ol style="list-style-type: none"> <li>1. Observe local standards &amp; guidelines relating to Lifting operations &amp; lifting equipment &amp; safe use of cranes.</li> <li>2. Insure that all lifting equipment including forklifts are properly maintained.</li> <li>3. Only qualified personal should lift or install package</li> <li>4. No one under the age of 18 will undertake lifting or slinging operations unless directly &amp; closely supervised by a component person.</li> <li>5. Any good Boson or rigger's manual with a section on rigging practices.</li> <li>6. Maintenance checklist of slings &amp; lifting equipment.</li> <li>7. Weights of items slung &amp; lifted should be known before lift is undertaken.</li> <li>8. Only those trained in slinging will carry out these operations.</li> <li>9. Damaged slings or lifting equipment must be discarded immediately &amp; cut or otherwise rendered unusable.</li> <li>10. For large &amp; unusually shaped loads or loads with no fixed lifting points are provided, a professional rigger should be sub-contracted in addition to the crane &amp; operator.</li> <li>11. The safe working load must be clearly marked on all lifting equipment &amp; tackle. Check before use.</li> <li>12. A competent person must plan non-routine lifts.</li> <li>13. Ropes, chains or slings should be shortened in a safe manner.</li> <li>14. Lifting tackle will be returned to appropriate storage after use.</li> <li>15. Extreme care should be taken not to trap fingers when loads are being positioned.</li> </ol>
Control	Details
Supervision:	<p>An experienced person who has been trained in slinging will attach the slings or direct the rigger to the appropriate lifting points. No fixed lifting points are provided, so a competent rigging sub-contractor should employed. The crane driver will not lead the lift.</p> <p>Forklift drivers should poses relevant licences</p>
Environment;	<p>Lifting &amp; slinging takes place under all conditions &amp; weathers – Important considerations are that the load is balanced &amp; that tag lines are used to steady &amp; guide the load. Very windy conditions may prohibit the lift.</p>
Procedures, documents etc	<ol style="list-style-type: none"> <li>1. The load should be slung from correctly attached shackles – the most common failure is that of an eyebolt pulled at an incorrect angle.</li> <li>2. The load should be lifted a few inches &amp; checked that it is stable before the full lift is attempted.</li> <li>3. When lifting operations are sub-contracted to specialist, the contractor should ensure that the crane was thoroughly examined within the last 12 months, that the accessories were thoroughly examined within the last 6 months &amp; that both the crane driver &amp; banks man are certified competent.</li> <li>4. Observe the safety standards &amp; other national safety regulations</li> <li>5. Refer to relevant BITZER documentation</li> </ol>

Communications:	1. Lift should be supervised by suitably trained or qualified persons, radios or other suitable communication devices should be used
Emergency action/procedures	1 Observe the safety standards & other national safety regulations 2 Persons trained in the use of first aid should be present 3 Call emergency services.
Access:	1. Access should be restricted to the area where lift is taking place, sue appropriate signage 2. Access to the area beneath the crane radius over which a load will pass should be prohibited to prevent a load striking a person. Access around the crane will be controlled to prevent the crane trapping persons.

## 1.2 Risk Assessment Documentation.

### Risk Evaluation of Identified Hazards

Probability of Occurrence	Remote = 1	Possible = 2			Frequent = 3			
Hazard Severity	Minor = 1	Serious (Hospital) = 2			Major (3 days or more) = 3			
Probability of Occurrence x Hazard Severity = Risk Rating (RR)		Probability			Severity			RR
Identified Hazards (base scores on existing or planned control measures)		1	2	3	1	2	3	
<div>1. Collision with Moving plant.</div> <div>2. Collision with moving Machine parts.</div> <div>3. Collision with moving Materials.</div> <div>4. Weather conditions.</div> <div>5. Insufficient Lighting.</div> <div>6. Dropping loads due to mechanical failure.</div> <div>7. Dropping load due to misapplication of lifting equipment.</div> <div>8. Trapped fingers or toes.</div> <div>9. Cuts &amp; abrasions</div>		1				2		2
		1				2		2
		1				2		2
		1			1			1
			2		1			2
		1				3		3
			2			2		4
			2	3	1			2
					1			3

Note: Moderate scores; Thought should be given to reducing risk, but the cost and time

(1 to 5) Requirements of prevention should be carefully considered and limited.

Substantial Work should not be started until the risk has been reduced, for work (6 to 7) in Progress, urgent action is required. Considerable resources may have to be allocated.

Intolerable: If unlimited resources cannot reduce risk, work will be prohibited.(8 to 9)



Is risk adequately controlled using the above control measures Y/N	Y	If "NO" State further action required
State further action required:		

**Note:** This risk assessment is only valid when all control measures are in place before the work or activity commences. If the nature of the work changes or there is a dangerous occurrence.

#### 18 Risk Assessment Documentation.

<b>Work Activity:</b>  Pressure Testing & Evacuating	
<b>Site/Location:</b>  Onsite Location	

Those at Risk	Y/ N	Comments - enter names or general groups
Contractors:	Y	Installation, personal and Assistants.
Other workers:	Y	
General Public:	N	
Comments: The package is delivered with a holding charge of dry nitrogen, which requires releasing before additional field pipework is connected.  Care should be taken during pressure testing the entire system & during the commissioning of the package.		
<b>Hazards</b>		
The following hazards have been identified.  <ol style="list-style-type: none"> <li>1. Risk of explosion</li> <li>2. Risk of over pressure</li> <li>3. Environmental pollution</li> </ol>		

#### Control Measures (existing or planned)

Control	Details
PPE:	<ol style="list-style-type: none"> <li>1. Gloves</li> <li>2. Safety goggles</li> <li>3. Steel toe cap boots</li> </ol>
Equipment:	<ol style="list-style-type: none"> <li>1. General tools</li> <li>2. Calibrated gauges &amp; test equipment</li> </ol>

Information, Instruction, and Training	<ol style="list-style-type: none"> <li>1. Only use dry nitrogen for pressure testing, never use Oxygen or other industrial gases as this lead an explosion</li> <li>2. Never add refrigerant to the test gas, environmental pollution possible</li> <li>3. Refer to relevant BITZER documentation</li> <li>4. Only use calibrated gauges &amp; equipment, use serviced regulators to control the flow of nitrogen</li> <li>5. Continuously observe the flow &amp; pressure of nitrogen</li> <li>6. Only qualified personal should install &amp; commission the package</li> </ol>
Control	Details
Supervision:	<ol style="list-style-type: none"> <li>1. Work should only be carried out by qualified persons</li> <li>2. Observe national safety regulations</li> </ol>
Environment;	<ol style="list-style-type: none"> <li>1. Ensure adequate levels of ventilation.</li> <li>2. Check emergency exits.</li> </ol>
Procedures, documents etc.	<ol style="list-style-type: none"> <li>1. Observe the safety standards &amp; other national safety regulations</li> <li>2. Refer to relevant BITZER documentation</li> <li>3. AS1667 AS NZS 5149</li> </ol>
Communications:	<ol style="list-style-type: none"> <li>1. Comply with site rules permits may be required.</li> <li>2. Familiarise yourself with ant site emergency plan</li> </ol>
Emergency action/procedures	<p><b>In Case of leak</b></p> <ol style="list-style-type: none"> <li>1. Isolate leak (if possible)</li> <li>2. If isolation is not possible, evacuate area &amp; follow the site emergency plan.</li> <li>3. Treatment to injuries should be in accordance with the product data sheet.</li> </ol>
Access:	<ol style="list-style-type: none"> <li>1. Access should be restricted to the area where work is taking place</li> </ol>



## 21.4 Risk Assessment Documentation.

### Risk Evaluation of Identified Hazards

Probability of Occurrence	Remote = 1	Possible = 2			Frequent = 3			
Hazard Severity	Minor = 1	Serious (Hospital) = 2			Major (3 days or more) = 3			
Probability of Occurrence x Hazard Severity = Risk Rating (RR)		Probability			Severity			RR
Identified Hazards (base scores on existing or planned control measures)		1	2	3	1	2	3	
1. Risk of explosion								
2. Risk of over pressure		1					3	3
3. Environmental pollution		2					2	4
		1					1	2

Note: Moderate scores; Thought should be given to reducing risk, but the cost and time

(1 to 5) Requirements of prevention should be carefully considered and limited.

Substantial: Work should not be started until the risk has been reduced, for work (6 to 7) required. Considerable resources may

in Progress, urgent action is

have to be allocated.

Intolerable: If unlimited resources cannot reduce risk, work will be prohibited.

(8 to 9)



## 21.5 Risk Assessment Documentation.

Is risk adequately controlled using the above control measures Y/N	<b>Y</b>	If "NO" State further action required
State further action required:		

**Note:** This risk assessment is only valid when all control measures are in place before the work or activity commences. If the nature of the work changes or there is a dangerous occurrence.

Work Activity:		
Charging/Decanting Refrigerant		
Site/Location:		
On site Location		
Those at Risk	Y/N	Comments - enter names or general groups
Contractors:	Y	Installation, personal and Assistants.
Other workers:	Y	Sub-contractors, site Maintenance personal.
General Public:	N	
Comments:		
<p>When charging a system, when decanting a system, it is also very easy to overfill a recovery cylinder. An <b>overfilled</b> refrigerant recovery cylinder represents a serious explosion hazard. It is essential that proper charging &amp; recovery procedures be observed to prevent serious incidents involving injury or accidental emission of refrigerant.</p>		

### Hazards

1. Explosion
2. Asphyxiation
3. Refrigerant liquid burns
4. Manual handling injury when moving cylinders or plant

### Control Measures (existing or planned)

Control	Details
PPE:	<ol style="list-style-type: none"> <li>1. Safety boots with a heel, good grip &amp; steel toe cap</li> <li>2. Overalls/protective clothing</li> <li>3. Safety goggles</li> <li>4. Neoprene impervious gloves</li> <li>5. Hard hat</li> </ol>
Equipment:	<ol style="list-style-type: none"> <li>1. Refrigerant recovery pump.</li> <li>2. Scales (for recovery).</li> <li>3. Suitable charging/transfer lines.</li> <li>4. Properly identified refrigerant recovery cylinders.</li> <li>5. Log book for recording amount charged, decanted or transferred.</li> </ol>
Information, Instruction, and Training	<ol style="list-style-type: none"> <li>1. Wear impervious gloves to prevent refrigerant contacting the hands</li> <li>2. Eye protection must be worn when opening any refrigeration system. As a minimum goggles are required.</li> <li>3. Only persons experienced in handling refrigerants &amp; with relevant licences will charge, decant refrigerant. They may have an apprentice or assistant helping them or observing the operation.</li> <li>4. Continuously &amp; accurately weigh recovery cylinders during decanting.</li> <li>5. Continuously supervise charging, decanting or transferring operations.</li> <li>6. Secure cylinders from falling over.</li> <li>7. Do not trap liquid refrigerant between valves.</li> <li>8. Use mechanical handling equipment, or follow good manual handling techniques</li> <li>9. Warning signs to be erected, warning of hazards.</li> <li>10. Transfer lines to be made safe by marking with bunting to stop accidental collision.</li> </ol>
Control	Details
Supervision:	<ol style="list-style-type: none"> <li>1. Contractors should ensure that all persons are properly trained in handling refrigerants &amp; have in date handling licence</li> </ol>
Environment;	<ol style="list-style-type: none"> <li>1. Ensure adequate levels of ventilation.</li> <li>2. Check emergency exits.</li> </ol>
Procedures, documents etc.	<ol style="list-style-type: none"> <li>1. When charging liquid refrigerant, disconnect the hoses slowly in case liquid remains in the hose (frost on hose may indicate that liquid is still present).</li> <li>2. Keep an accurate record of the amount of refrigerant added, decanted or transferred</li> </ol>

Communications:	<ol style="list-style-type: none"> <li>1. Comply with site rules permits may be required.</li> <li>2. Familiarise yourself with the site emergency plan</li> </ol>
Emergency action/procedures	<b>In Case of leak</b> <ol style="list-style-type: none"> <li>1. Isolate leak (if possible)</li> <li>2. If isolation is not possible, evacuate area &amp; follow the site emergency plan.</li> <li>3. Treatment to injuries should be in accordance with the product data sheet.</li> </ol>
Access:	<ol style="list-style-type: none"> <li>1. Access should be restricted to the area where work is taking place</li> </ol>
Environmental	<ol style="list-style-type: none"> <li>1. Disposal of waste refrigerants covered by various Environmental Protection Acts, refer to local, observe the safety standards &amp; other national safety regulations</li> </ol>

#### Risk Evaluation of Identified Hazards

Probability of Occurrence	Remote = 1	Possible = 2			Frequent = 3			
Hazard Severity	Minor = 1	Serious (Hospital) = 2			Major (3 days or more) = 3			
Probability of Occurrence x Hazard Severity = Risk Rating (RR)		Probability			Severity			RR
Identified Hazards (base scores on existing or planned control measures)		1	2	3	1	2	3	
Hazards								
1. Explosion		1					3	4
2. Asphyxiation		1					3	4
3. Refrigerant liquid burns								
4. Manual handling injury when moving cylinders or plant								



## 21.7 Risk Assessment Documentation.

Note: Moderate scores; Thought should be given to reducing risk, but the cost and time

(1 to 5) Requirements of prevention should be carefully considered and limited.

Substantial: Work should not be started until the risk has been reduced, for work (6 to 7) in Progress, urgent action is required.  
Considerable resources may have to be allocated.

Intolerable: If unlimited resources cannot reduce risk, work will be prohibited.

(8 to 9)

Is risk adequately controlled using the above control measures Y/N	Y	If "NO" State further action required
State further action required:		

**Note:** This risk assessment is only valid when all control measures are in place before the work or activity commences. If the nature of the work changes or there is a dangerous occurrence.

<b>Work Activity:</b>  Electrical Connections		
<b>Site/Location:</b>  Onsite Location		
Those at Risk	Y/ N	Comments - enter names or general groups
End user Employees:	Y	Installation, Service and Maintenance personal and Assistants.
Other workers:	N	
General Public:	N	
Comments: The package is supplied with no wiring, contractors need to wire mains power for compressor & relevant control circuits, work should only be carried out by qualified persons		
<b>Hazards</b>		
<p>The following hazards have been identified.</p> <ul style="list-style-type: none"><li>4. Electric shock incorrect wiring</li><li>5. Electric shock from earth leakage</li></ul>		

## 21.8 Risk Assessment Documentation.

### Control Measures (existing or planned)

Control	Details
PPE:	1. N/A
Equipment:	<ol style="list-style-type: none"> <li>General hand tools (insulated)</li> <li>Electrical test equipment e.g. Clamp amp meter, multi-meter, test lamp etc. Insulated fused &amp; with calibration.</li> <li>Warning notices.</li> </ol>
Information, Instruction, and Training	<ol style="list-style-type: none"> <li>Electrical installation should be carried out in accordance with wiring diagram in the compressor terminal box,</li> <li>Observe the safety standards &amp; other national safety regulations</li> <li>Compressor housing must be grounded or connected to an equipotential bond</li> <li>Refer to relevant BITZER documentation</li> </ol>
Control	Details
Supervision:	<ol style="list-style-type: none"> <li>Work should only be carried out by qualified persons</li> <li>Observe national safety regulations</li> </ol>
Environment;	<ol style="list-style-type: none"> <li>Observe national safety regulations &amp; guidelines in case of emergency.</li> </ol>
Procedures, documents etc.	<ol style="list-style-type: none"> <li>Observe the safety standards &amp; other national safety regulations</li> <li>Refer to relevant BITZER documentation</li> </ol>
Communication	<ol style="list-style-type: none"> <li>If in doubt consult your local BITZER office</li> </ol>
Emergency action/procedures	<ol style="list-style-type: none"> <li>Switch off &amp; isolate supply</li> <li>Remove injured person(s) from danger area (if without risk).</li> <li>Call emergency services.</li> </ol>
Access:	<ol style="list-style-type: none"> <li>The normal site rules restrict access to the panel room to authorised maintenance personal that are all familiar with electrical safety.</li> </ol>



## 21.9 Risk Assessment Documentation.

### Risk Evaluation of Identified Hazards

Probability of Occurrence	Remote = 1		Possible = 2			Frequent = 3				
Hazard Severity	Minor = 1		Serious (Hospital) = 2			Major (3 days or more) = 3				
Probability of Occurrence x Hazard Severity = Risk Rating (RR)				Probability			Severity			RR
Identified Hazards (base scores on existing or planned control measures)				1	2	3	1	2	3	
1. Electric shock incorrect wiring				1					3	4
2. Electric shock from earth leakage				1					3	4

Note: Moderate scores; Thought should be given to reducing risk, but the cost and time

(1 to 5) Requirements of prevention should be carefully considered and limited.

Substantial: Work should not be started until the risk has been reduced, for work (6 to 7) in Progress, urgent action is required. Considerable resources may have to be allocated.

Intolerable: If unlimited resources cannot reduce risk, work will be prohibited.

(8 to 9)

## 21.10 Risk Assessment Documentation.

Is risk adequately controlled using the above control measures Y/N	Y	If "NO" State further action required
State further action required:		

**Note:** This risk assessment is only valid when all control measures are in place before the work or activity commences and will be if the nature of the work changes or there is a dangerous occurrence.

Work Activity:	
Electrical fault finding/testing within the packaged unit	
During commissioning, service & maintenance	



<b>Site/Location:</b>	
<b>On site Location</b>	

Those at Risk	Y/N	Comments - enter names or general groups
Contractors:	Y	Service and Maintenance Contractors and Assistants.
Other workers:	Y	Onsite maintenance personal.
General Public:	N	
Comments: All circuits to be worked on will be treated as live until verified dead. There are no exceptions to this requirement; experience of employees is irrelevant.		
<b>Hazards</b>		
<p>Because of the complexity of the refrigeration package control circuits, it will occasionally be necessary to carry out "live" testing/fault finding. This assessment addresses the hazards associated with such work. "Live" testing/fault finding is to be carried out by a trained, competent, authorised person.</p> <p>In general each plant contains control circuitry at 240 volts and power circuits at 415 volts 3 phase.</p> <p><b>The following hazards have been identified.</b></p> <ol style="list-style-type: none"> <li>1. Electric shock from power circuitry</li> <li>2. Electric shock from 240 volt control circuitry</li> <li>3. Eye injury (from an electric arc)</li> <li>4. Burn Injury</li> <li>5. Injury to third party (Maintenance personal)</li> </ol>		

## 21.11 Risk Assessment Documentation.

### Control Measures (existing or planned)

Control	Details
PPE:	<p><b>For Live Testing:</b></p> <ol style="list-style-type: none"> <li>1. Rubber soled shoes or boots</li> <li>2. Rubber mats</li> <li>3. Safety glasses</li> <li>4. Suitable work wear overalls</li> </ol> <p><b>For work on dead Systems:</b></p> <ol style="list-style-type: none"> <li>1. Padlock (for lock-off isolator)</li> </ol>
Equipment:	<ol style="list-style-type: none"> <li>1. General hand tools (insulated)</li> <li>2. Electrical test equipment e.g. Clamp amp meter, multi-meter, test lamp etc. Insulated fused &amp; with calibration.</li> <li>3. Warning notices.</li> <li>4. Suitable means of cordoning-off the work area e.g. red &amp; white bunting.</li> </ol>

Information, Instruction, and Training	<ol style="list-style-type: none"> <li>1. Isolate (by removing fuses) power circuits within a panel before fault finding.</li> <li>2. Prove your test instrument prior to and immediately after testing for "dead"</li> <li>3. Test for "dead" power circuits with exposed conductors.</li> <li>4. Fault find power circuits in the "dead" condition.</li> <li>5. The 240 volt control circuit may be kept live for fault finding purposes providing that there is no reasonable way of doing the work "dead" &amp; that all control measures are followed</li> <li>6. When live testing ensure that a current wiring diagram is available &amp; Followed</li> <li>7. Be familiar with all safety &amp; operating controls such as pressure switches oil differential switches, motor starters etc.</li> <li>8. Isolate or discharge power factor correction capacitors before primary circuit work (if installed).</li> </ol>
Control	Details
Supervision:	<ol style="list-style-type: none"> <li>1. Accompaniment is required when, during live testing the person carrying out the work, cannot without assistance, keep other persons from the work area.</li> </ol>
Environment;	<ol style="list-style-type: none"> <li>1. Maintain a 1m clear space around the work area.</li> <li>2. Rubber mats should be placed around package, ensure that these do not pose a trip hazard.</li> </ol>
Procedures, documents etc.	<ol style="list-style-type: none"> <li>1. Follow site safety rules.</li> <li>2. Lock individual panel doors.</li> </ol>
Communications:	<ol style="list-style-type: none"> <li>1. Inform the site manager when isolating panels as this may this may mean safety circuits are being isolated Inform second person (if applicable) of emergency actions.</li> </ol>
Emergency action/procedures	<ol style="list-style-type: none"> <li>1. Switch off &amp; isolate supply</li> <li>2. Remove injured person(s) from danger area (if without risk).</li> <li>3. Call emergency services.</li> </ol>
Access:	<ol style="list-style-type: none"> <li>1. The normal site rules restrict access to the panel room to authorised maintenance personal that are all familiar with electrical safety.</li> </ol>

## 21.12 Risk Assessment Documentation.

### Risk Evaluation of Identified Hazards

Probability of Occurrence	Remote = 1	Possible = 2	Frequent = 3
Hazard Severity	Minor = 1	Serious (Hospital) = 2	Major (3 days or more) = 3
Probability of Occurrence x Hazard Severity = Risk Rating (RR)		Probability	Severity

Identified Hazards (base scores on existing or planned control measures)	1	2	3	1	2	3	RR
1. Electric shock from power circuitry.		2				3	5
2. Electric shock from 110-volt control circuit.		2			2		4
3. Eye injury (from electric arc)					2		3
4. Burn injury	1				2		3
5. Injury to third party (Iceland Maintenance personal	1				2		3
	1				2		3

### 21.13 Risk Assessment Documentation.

Note: Moderate scores; Thought should be given to reducing risk, but the cost and time

(1 to 5) Requirements of prevention should be carefully considered and limited.

Substantial: Work should not be started until the risk has been reduced, for work (6 to 7) in Progress, urgent action is required. Considerable resources may have to be allocated.

Intolerable: If unlimited resources cannot reduce risk, work will be prohibited.

(8 to 9)

Is risk adequately controlled using the above control measures Y/N	Y	If "NO" State further action required
State further action required:		

**Note:** This risk assessment is only valid when all control measures are in place before the work or activity commences. If the nature of the work changes or there is a dangerous occurrence.

## 22. Important Recommendations

- BITZER Refrigeration Equipment are intended for installation only by Qualified, Accredited Refrigeration Personnel and are to be installed in accordance with the guidelines mentioned in this manual.
- All electrical work is to be carried out by qualified Electrical Personnel and to be in accordance with local electrical regulations.

### Safety Recommendations

- Refrigeration Plant Equipment are supplied with a Nitrogen Holding Charge. (Release fully before removing seals).
- Electrical power to be isolated prior to the commencement of any electrical work.
- During normal operation Pressurised Refrigerant is contained within the evaporator. Extreme care should be taken to avoid leakage, as personal injury may occur.
- **(Avoid the use of sharp objects in close proximity to refrigeration piping).**
- Extensive gas loss in enclosed area may result in asphyxiation.
- Contact with refrigerant may cause personal injury. (Freeze Burns).

### Application Ranges

BITZER Maxi-Racks are intended for use in commercial applications.  
For Example.

- Medium Temperature Systems, High Temperature Systems and Low Temperature Systems.
- Recommended refrigerants: HFCs, HCFCs. (Also suitable for CFCs) This series is not suitable for use with NH<sub>3</sub>. (Ammonia), R744

## 23. Commissioning Instructions

The Start-up procedure consists of seven important processes.

- 23.1.) Leak Testing of entire system. (Pressure testing.)
- 23.2.) Oil Charging Compressors / Oil Separator / Oil reservoir.
- 23.3.) Evacuation procedure.
- 23.4.) Refrigerant Charging.
- 23.5) Commissioning Pre-Checks.
- 23.5.) Electrical testing.
- 23.6.) Control system programming and Pressure Control setting.
- 23.7.) Expansion Valve (Tx Valve or EEV Electronic Expansion Valve.) superheat calibration.

All commissioning should be carried out in accordance with the current "Refrigeration Code of Good Practice"\*.

### 23.1 Leak testing procedure.

The success of all the subsequent commissioning depends on a leak free system, free of contaminants, free of oxides, free of non-condensables, that has been evacuated to a low vacuum and charged with the prescribed refrigerant.

At the completion of equipment installation (Rack, Condenser/s, Evaporators.) and all field pipework.

- Ensure that compressors are switched off. (Circuit Breakers removed.)
- Ensure that all N.C solenoid valves are energised and open.
- Ensure that all inline system service valves are open.
- We suggest to install rubber balloons on the various pressure relief valve outlets. The balloons can be attached with elastic bands. When the system is under pressure, If a balloon expands and explodes

that relief valve is likely to be faulty and leaking.

- The leak testing procedure commences with system pressure testing with a combination of Trace-A-Gas The pressure testing is to two separate values 1.) The test pressure to the Low side Design Pressure and 2.) The test pressure to the High Side Design Pressure. Initially add the recommend quantity of Trace-A-Gas for the application Refer Trace-A-Gas manuals for correct product usage.
- Ensure that the test pressure do not exceed the system design pressures.
- Do not expose system pressure transducers to test pressures above their design pressure. This can damage the pressure transducer/s.
- Do not expose system pressure controls HP/LP, LP or HP to test pressures above their design pressure. This can damage the pressure controls.
- **The system should be labelled that it is in a Pressure Testing condition.**
- Using an approved, calibrated Electronic Trace-A-Gas Leak Detector. Leak test the entire system paying particular attention to all joints. Periodically check functionality of the electronic leak detector during this process.
- To further check system integrity spray a soapy water solution over joints then visually inspect for bubbles.
- Leave the system under pressure for a designated period. (24 Hours.) Check and record the ambient temperatures and the system pressure with calibrated approved instruments. This process is to be carried out every 8-12 hours during the pressure testing process. If the test pressures cannot be maintained repeat the leak testing process employing the isolation of sections of the system to determine the source of leak/s. repair the leak and repeat the leak testing process until system can be signed off as leak free and approval by authorised personal. Record findings and confirm pressure testing process completion.
- Following leak testing, the system should be purged of the pressure testing gases. This is best achieved with Dry Nitrogen (Medical grade N.) this also helps expel some of the moisture inside the system.
- When purging the system of Trace-A-Gas insure that no air (non-condensable's) are permitted to enter the system.
- Then return the entire system to 15Kpa above atmospheric pressure. When ready to charge the system with the designated refrigeration oil bring the system back to atmospheric pressure just before oil charging.
- At this stage the system should be charged/primed with oil within the compressors, Oil Separator/ Reservoir to manufactures specifications.

## 23.2 Oil charging procedure

### **WARNING!**

Risk of damage to the motor and compressor! Do not start the compressor while it's being charged with oil.

Do not apply any voltage, not even for testing.

Check the oil level within each compressor viewing the oil level controls oil sight glass.

Pump additional oil into each compressor to a maximum ½ sight glass level.

Pump additional oil into the Oil Separator/Reservoir to top of lower sight glass level.

Check settings and functions of safety and protection devices.

Check Oil Level Control systems for functionality.

Check Oil Filters on Oil Level Controls

Check Oil return needle valves are fully open and clean of contaminants.

Dirty or discoloured oil indicates one of the following:

Contaminants within the oil such as acids, sludge, air or moisture.

Test oil with approved acid test kit.

Replace Temprite coalescent Oil Filter with a Temprite Oil clean-up filter and replace this filter until oil within system is clean.

### 23.3 Evacuation procedure

The system must now be prepared for evacuation using accepted refrigeration practices. The Liquid Line Drier cores can now be installed into the liquid Line drier shell prior to evacuation. The Drier shell can be isolated from the rest of the system, pressurized to Design pressure with Dry Nitrogen (Medical grade N.)  $\leq 40\text{ppm}$  moisture content. Then leak tested, once the leak testing is proved successful the Drier shell can be re-opened to the system and the evacuation process begin.



#### **WARNING!**

Risk of damage to the motor and compressor! Do not start the compressor while it's in vacuum.

Do not apply any voltage, not even for testing.

- The vacuum pump/s should be connected to both the high and low pressure sides of the system with all inline system shut-off valves and solenoid valves fully open.
- If the system includes heat recovery circuit ensure that this is fully connected and open to system prior to evacuation.
- **The system should be labelled that it is in an Evacuation condition.**
- Use only approved dual stage vacuum pump/s sized to application. Prior to operation change all vacuum pump/s oil with an approved vacuum pump oil.
- Attach the vacuum pump/s to the system to be evacuated.
- During the evacuation process insure that the vacuum testing gauges are never exposed to high pressures as this is likely to damage the gauge/s.
- BITZER Maxi-Racks provide servicing ports on the suction header, the liquid line drier shell end plate or upstream of liquid line. There are also several service ports on the rack ball valves and the compressor service valves. All are recommended for connecting vacuum pumps to. Insure that evacuation lines are large diameter and short in length (as practical) to simplify evacuation.
- Use an approved, calibrated Electronic Vacuum gauge/s to monitor the evacuation process and indicate that level of vacuum achieved. Record vacuum in microns and register findings with time taken. Record ultimate vacuum.
- The initial operation of the dual stage vacuum pump/s should be with the ballast valve fully open to exhaust any non-condensable's extracted from the system. (Non-condensable's can become water inside the oil sump of the vacuum pump/s. This can damage the pump/s and reduce the pump/s ability to achieve best vacuum. After a period of time the sound of the vacuum pump will likely change. This often indicates that it is approaching a lower vacuum, there should also be no visible fog leaving the ballast exhaust chimney on the vac-pump.
- To assist the evacuation process we recommend that all compressor sump heaters be turned on. This will further improve moisture removal. At this stage, test electrical function of the sump heaters and record their individual Amperages. NOTE: Label Compressors stating-warning that the Sump Heaters are turned on.
- During the evacuation process the systems fan motors can be tested for operation, direction, noise and vibration the air movement over the evaporator and condenser coils may further assist evacuation.
- During the evacuation process isolate the vacuum pump/s from the system as test for inward leaks while system is under vacuum. It is imperative that the system maintain a low vacuum. Repeat this testing process several times during evacuation and record times, ambient temperatures and vacuum results with calibrated approved instruments. This process is to be carried out every 4-12 hours during the evacuation process. Continue the evacuation process as another required ingredient is time. The required ultimate vacuum is  $\leq 500$  microns. (500 microns is the recognised, standard representing the absence of moisture within the system.)
- A preferred method in achieving the ultimate vacuum is to employ the Triple Evacuation process. This consists of evacuating the entire system three complete times, after each of the first two evacuations the system is brought back to atmospheric pressure with Dry Nitrogen (Medical grade N.)  $\leq 40\text{ppm}$  moisture content. After the final evacuation the system is ready for refrigerant charging. The reasoning behind this is that each evacuation removes more than the previous, equating to a lower vacuum than can be achieved with one evacuation.
- Record final vacuum result.
- Isolate the vacuum pump/s from the system and leave standing for a determined period of time. To check if the vacuum is maintained.

### 23.3 Evacuation procedure continued

1. Table of water boiling points at various vacuum levels.

BOILING POINT OF WATER AT VARIOUS VACUUM LEVELS			
Temperature °C	Pressure in Microns	Inches of HG Vacuum	Pressure in kPa <i>abs</i>
100	759,968	0	101.32
96.11	535,000	4.92	71.33
90	525,526	9.23	70.06
80	355,092	15.94	47.34
70	233,680	20.72	31.15
60	149,352	24.04	19.19
50	92,456	26.28	12.33
40	55,118	27.75	7.35
30	31,750	28.67	4.23
26.67	25,400	28.92	3.39
24.44	22,860	29.02	3.05
22.22	20,320	29.12	2.71
20.56	17,780	29.22	2.37
17.78	15,240	29.32	2.03
15	12,700	29.42	1.69
11.67	10,160	29.52	1.35
7.22	7,620	29.62	1.02
0	4,572	29.74	0.61
-6.11	2,540	29.82	0.34
-14.44	1,270	29.87	0.17
-17.22	1,000	29.88	0.13
-20.83	750	29.89	0.099
-24.44	500	29.90	0.066
-31.11	254	29.91	0.03
-33.33	200	29.91	0.026
-37.22	127	29.9150	0.02
-51.11	25.4	29.9190	0.00339
-56.67	12.7	29.9195	0.00169
-67.78	2.54	29.9199	0.00034

#### NOTES:

- The recommend evacuation range is 500 microns or less for commercial refrigeration.
- Moisture and Air (Non-Condensable's.) must be removed in order to avoid compressor burnout/s, expansion valve blockages/failures and or other system failures. The correct evacuation process insures moisture and air (non-condensable's being reduced to safe operational levels.

## 23.4 Refrigerant Charging procedure.

Refrigerant charging should be carried out by authorised accredited personal.  
The system should be charged in liquid form, directly into the liquid line down stream of liquid receiver prior to the Line Drier.



### WARNING!

Risk of damage to the motor and compressor! Do not start the compressor while it's in vacuum.  
Do not apply any voltage, not even for testing.

- Notify authorised personal that the evacuation is successful / approved and that the refrigeration system is ready for refrigerant charging.
- **NOTE: Label system stating-warning refrigerant charging in process.**
- Insure that the refrigeration plantrooms ventilation system is fully functional and operating prior to refrigerants being delivered to site.
- At this stage all refrigerant electronic detectors should be tested for function and confirmed as fully operational.
- Extreme care should be taken to avoid direct contact with liquid refrigerant. (Freeze - Burns)
- Remember to wear safety goggles and appropriate gloves and clothing when transferring / charging refrigerants.
- Once the designated refrigerant has been received. Fit a pressure gauge to the refrigerant bottles record the temperature and the pressure. Check with an approved refrigerant pressure temperature chart to determine that the refrigerant is as intended.
- To assist the refrigerant charging process we recommend that all compressor sump heaters be turned on. This will reduce the risk of liquid refrigerant migration to the compressor sump/s during the charging process. **NOTE: Label Compressors stating-warning that the Sump Heaters are turned on.**
- To insure the dryness and cleanliness of the refrigerant we recommend that the refrigerant charging line incorporate an inline 3-4 core drier shell with brand new 100% molecular sieve drier cores fitted. Or alternatively two Drier Shells 3-4 core each piped in parallel. We recommend that these charging line drier cores be replaced for each use.
- The refrigerant charging line must be pressure tested and evacuated prior to receiving any refrigerant.
- The Suction Filters (Pleated Elements.) should be installed within the Suction Header/s prior to system charging. The suction header can be isolated from the rest of the system, pressurized to atmospheric pressure with Dry Nitrogen (Medical grade N.)  $\leq 40\text{ppm}$  moisture content. The filters can then be installed. Then raise the suction header pressure to design test pressure for leak testing. Once the leak testing is proved successful the header can be evacuated and re-opened to the system.
- Refrigerant Blends must be taken out of refrigerant cylinders as a solid liquid.
- Never permit liquid refrigerant to reach the compressors. **Liquid refrigerant is not compressible and will damage the compressors voiding any warranty.**
- Log the amount of refrigerant added to the system and record findings.
- After commissioning, it may be necessary to add refrigerant. While the compressor/s are running, charge with liquid refrigerant on the suction side preferably at the Evaporator inlet.

## 23.5 Commissioning Pre Checks

### Cycling rate: [Compressors.]

- The compressor/s should not start more than eight times per hour. Be sure to adhere to the minimum running time.

MOTOR POWER.	Minimum Running Time:
< 5.5kW	2.0 minutes.
5.5kW to 15.0kW	3.0 minutes.
> 15.0kW	5.0 minutes.



**Checking the operational data:** (repeat this checking procedure, numerous times during commissioning.)

- Record external ambient temperature/s during commissioning.
- Record internal ambient temperature/s during commissioning. (Confirm with HVAC contractor.)
- The Evaporator/s temperature.
- The Evaporator/s suction superheat.
- Suction gas temperature at rack suction header/s. (return vapour temperature.)
- Condensing temperature.
- Discharge gas temperature.
- Oil Temperature.
- Cycling Rate.
- Current.
- Voltage.
- Prepare data protocol.

**Pre-Start-up.**

- Once the system is pre-charged with as much refrigerant as practical.
- Check all entire system fans for operation (Direction & function.)
- Check all temperature probes at fixtures and confirm that they assigned to the correct input on the rack control.
- Check all temperature probes attached to pipes and confirm that they are assigned to the correct input on the rack control.
- Check all temperature sensors (ambient.) sensors and confirm that they are assigned to the correct input on the rack control.
- Check and verify that all system liquid line solenoid valves at fixtures are connected to the correct rack outputs
- Check / verify that all breakers and switches are in the off position.
- Check / verify that all refrigeration loads are in refrigeration mode.
- Turn on the condenser power switch and breakers.
- Pre-set Compressor pressure controls

**Fixtures: Coolroom's / Freezer Rooms.**

- Check Coolroom/freezer room labelling that it is correct as per technical schedule.
- Review room construction for conformity to building specifications.
- Check all Coolroom / freezer room evaporators.
- Check Air Flow and Air Throw.
- Check TX-Valves including bulb location, bulbs positive contact with the suction line and that the bulb is properly insulated.
- Check that the condensate drain tube/s are free of any obstruction and terminated at the appropriate tundish.
- Check Coolroom/freezer room door anti-sweat heaters for function and current draw. (Ensure that anti-sweat heaters are regulated so that over-heating cannot occur.)
- Check Coolroom/freezer room under floor slab anti-sweat heaters for function and current draw. (Ensure that anti-sweat heaters are regulated so that over-heating cannot occur.)
- Check condensate drains / condensate drain "P" traps / drain heaters and floor tundish for correct condensate removal.
- Check Coolroom/freezer room lighting. Including door opening warning lights where applicable.
- Check Coolroom/freezer room refrigerant leak alarm/s.
- Check Coolroom/freezer room personal-trapped alarm/s.

### 23.5 Commissioning Pre Checks continued.

#### **Fixtures: Refrigerated Merchandising Display Cases / Coolroom's / Freezer Rooms. (Contractor responsibility.)**

- Check Display case/s labelling that it is correct as per technical schedule.
- Review location, construction for conformity to building specifications.
- Check all Display case/s evaporators.
- Check all evaporator fans for direction/operation/current draw & noise.
- Check electric defrost heaters, Pan Headers for operation/current draw/ defrost setting drain times and frequency.
- Check for condensate water and confirm its draining from the cabinet/s.
- Check all TX-Valves including bulb location, bulbs positive contact with the suction line and that the bulb is properly insulated.
- Check all internal pipe circuiting for installation and support.
- Check that the condensate drain tube/s are free of any obstruction and terminated at the appropriate tundish.
- Check all anti-sweat heaters for function and current draw. (Ensure that anti-sweat heaters are regulated so that over-heating cannot occur.)
- Check lighting. Including door opening warning lights if applicable.
- Check Display case door seals.
- Check Display case refrigerant alarm/s.
- Check Display cabinet for rattles, vibrations.
- Check Display case for ice build-up.

#### **Initial Start-up.**

- Ensure that electrical wiring is in accordance with previously mentioned drawings / documentation and that all fan motor/s direction is correct.
- Pre-program rack control system and check that control is set up/programmed to the application.
- Delegate 25% of the system for initial commissioning operation preferably Coolroom's (fixture/s with consistent heat load once their floor area is down to temperature.) This will provide adequate load without excessive demands on the suction superheat. Monitor Suction and discharge pressures and temperatures during the commissioning process.

#### **System Balancing:**

- It's imperative that the system be balanced during the commissioning process.
- Insure that as systems/fixtures come on line. (Become operational.) That the rack is maintained within its operational envelope. This can be achieved by slowly adding the additional compressors as the load increases. Careful monitoring is required at this period of initial operation.
- Ensure that all Evaporators are delivering correct superheat and that no flooding back occurs.
- Since there are many possible control programming sequences. It is not possible to provide a written generic test for all sequences. Its best to record set up and describe commissioning tests and the final conclusions, verifying the results.

## 24. Important Instructions.

- BITZER Refrigeration Equipment are intended for installation only by Qualified, Accredited Refrigeration Personnel and are to be installed in accordance with the guidelines mentioned in this manual.
- All electrical work is to be carried out by qualified Electrical Personnel and to be in accordance with local electrical regulations.

### Safety Recommendations

- Refrigeration Plant Equipment are supplied with a Nitrogen Holding Charge. (Release fully before removing seals).
- Electrical power to be isolated prior to the commencement of any electrical work.
- During normal operation Pressurised Refrigerant is contained within the evaporator. Extreme care should be taken to avoid leakage, as personal injury may occur.
- (Avoid the use of sharp objects in close proximity to refrigeration piping).
- Extensive gas loss in enclosed area may result in asphyxiation.
- Contact with refrigerant may cause personal injury. (Freeze Burns).

### Application Ranges

BITZER Maxi-Racks are intended for use in commercial applications.

For Example: Medium Temperature Systems, High Temperature Systems and Low Temperature Systems.

- Recommended refrigerants: HFCs, HCFCs. (Also suitable for CFCs) This series is not suitable for use with NH<sub>3</sub>. (Ammonia), R744

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CAUTION: Care should be taken to ensure that wiring cannot come into contact with elements during operation.

### DE-COMMISSIONING INSTRUCTIONS

- Pump down refrigeration system into the receiver or suitable container. (As per "Refrigeration Code of Good Practice" \*)
- Isolate power and remove electrical wiring (remove earth wire last) and associated components where necessary.
- Disconnect drain pipe.
- Disconnect refrigeration piping and seal both the system and evaporator connections. (Ensure that positive/negative pressure does not exist in evaporator prior to disconnection)
- Evaporator can now be removed from ceiling. (The use of lifting devices during removal is recommended where applicable)

\* "Code of Good Practice" produced in conjunction with AFCAM.

- Our products are manufactured in compliance with applicable international standards and regulations. If you have any questions about how to use our products or if you are planning special applications, please contact: BITZER Australia.



DATE / /

**BITZER COMMISSIONING DATA SHEET MAXI-RACK.**

DESCRIPTION	VALUE	COMPRESSOR No.1	COMPRESSOR No.2	COMPRESSOR No.3	COMPRESSOR No.4	COMPRESSOR No.5	COMPRESSOR No.6
<b>SYSTEM TITLE :</b>							
<b>SYSTEM TYPE :</b>		<b>SINGLE (MONO.) SUCTION HEADER</b>			<b>DUAL SUCTION HEADER</b>		
<b>CLIENT &amp; LOCATION DETAIL :</b>							
<b>BITZER RACK SERIAL No. &amp; DATE OF MANUFACTURE</b>							/ /
<b>HOLDING PRESSURE ON RECEIPT OF RACK. (Mandatory.)</b>	Kpa						
BITZER COMPRESSOR MODEL No.							
BITZER COMPRESSOR SERIAL No.							
COMPRESSOR PRESSURE RELIEF VALVE (FITTED)	√ or X						
COMPRESSOR SUMP HEATER (FITTED & CHECKED)	√ or X						
COMPRESSOR RUN AMPS L1. / L2. / L3.	Amp.	/ /	/ /	/ /	/ /	/ /	/ /
COMPRESSOR OVERLOAD SETTINGS	Amp.						
COMPRESSOR START DELAY SETTING	M/S	/	/	/	/	/	/
CHECK TENSION OF ALL BOLTS, FLARE NUTS & PLUG FITTINGS	√ or X						
<b>FINAL LEAK TEST ACHIEVED</b>	√ or X						
<b>FINAL EVACUATION ACHIEVED</b>	Microns						
<b>REFRIGERANT</b>	TYPE					kg Added.	
<b>REFRIGERATION OIL</b>	TYPE					Litres Added.	
SUCTION PRESSURE	Kpa						
SUCTION TEMP. RVT. @ COMPRESSOR.	°C						
SUCTION TEMP. RVT. @ SUCTION HEADER No1.	°C						
SUCTION TEMP. RVT. @ SUCTION HEADER No2.	°C						
DISCHARGE PRESSURE	Kpa						
DISCHARGE TEMP. Compressors	°C						
Discharge TEMP. Main Discharge Manifold	°C						
Capacity Control C/R.II 100% TO 10%	√ or X						
Capacity Control C/R.II 100% OR 66% OR 33% 100% OR 50%	√ or X						
Capacity Control C/R.II Pressure Settings 100% OR 66% OR 33%	Kpa	/ /	/ /	/ /	/ /	/ /	/ /
Capacity Control C/R.II Pressure Settings 100% OR 50%	Kpa	/	/	/	/	/	/
Capacity Control C/R.II Control Logic.							
Additional Head Cooling fan. 1Ø..... or 3Ø.....	√ or X						
Oil Pressure Monitoring. (Check √ )	√ or X						
Discharge Sensor. (Fitted to Cylinder Head.)	√ or X						
<b>AIR COOLED CONDENSER/S. MAKE / MODEL / SERIAL No. &amp; DATE MANUFACTURED</b>							/ /
Discharge TEMP. Entering Air Cooled Condenser	°C						
Liquid Drain Line TEMP. Exiting Air Cooled Condenser	°C						
Air Inlet Temperature.	°C						
Air Outlet Temperature.	°C						
Chill-Boost (System.)	√ or X						
<b>WATER COOLED CONDENSER/S. MAKE / MODEL / SERIAL No. &amp; DATE MANUFACTURED</b>							/ /
Discharge TEMP. Entering Water Cooled Condenser	°C						
Liquid Drain Line TEMP. Exiting Water Cooled Condenser	°C						
Water Inlet Temperature.	°C						
Water Outlet Temperature.	°C						
Water Regulating Valve Setting.	Kpa						

[illegible]



## BITZER MAXI-RACK System Diagnostic Worksheet

Recommendation: On arrival to plantroom, Read / Review the Service History Log. This may bring to light current or previous system issues.

Suggestion.		The actual cause is sometimes, something else entirely. Always keep an open mind to problem solving.
Symptoms	Probable cause/s	Possible Solutions.
1.) <b>Compressor will not run.</b>  Does not attempt to start.  <u>No Compressor Hum.</u>  <u>Suction Service valve not cold.</u>  <u>Discharge Service valve not hot.</u>	a.) No power to compressor  b.) Incorrectly wired. c.) Loose Terminal connection d.) Main Switch Open. e.) Power circuit is open due to...1.) Tripped Circuit Breaker, 2.) Blown Fuse, 3.) Open or disconnected switch. f.) Control circuit open, Phase protection control issue.  g.) Control circuit open, Thermostat or pressure control issue.  h.) Electronic Controller programming issue  i.) Verify that controller relay boards are online and operating as intended  j.) Motor protection device open circuited. k.) Internal mechanical damage to compressor. <u>Check motor for Locked Rotor rated conditions.</u>  l.) Compressor motor burn out. (burn out motor windings.) - Shorted /Grounded motor windings - open circuited. m.) Loss of Refrigerant        n.) Compressor failed o.) System shut down by safety device	1.) Check circuit breaker / Check control circuit, Check Rack Control system. Check compressor motor electrical characteristic's 2.) Have wiring checked and corrected. 3.) Have wiring checked and corrected. 4.) Close switch. 5.) Check Compressor, Check Compressor motor current, Check circuit breaker/fuse sizing. 6.) Check Phase protection device, Check wiring. If controls faulty Replace.  7.) Check control functions/settings. Check if control/s are isolated from system, Check refrigerant Charge. Recalibrate control/s, If controls faulty replace. 8.) Check electronic controller, Check controller functions/setup, Check that relay boards are online and functional, Check Transducer & Thermocouples. 9.) Check electronic controller, Check controller functions/setup, Check controller wiring. 10.) Check functions/settings. If faulty replace. 11.) Check Valve Plates/Check volumetric efficiency if possible. Replace Compressor c/w associated contactors and circuit breakers  12.) Determine failure cause, Replace Compressor, Commence system burnout-cleanup procedure. 13.) <u>Check entire system for Leaks, determine leak source, Repair Leak, re-check entire system for leaks, Change drier cores, Pending on leakage severity top up system or Replace entire refrigerant charge.</u>  <u>If refrigerant charge is to be replaced. Reclaim remaining refrigerant, Pressure test entire system, Replace drier cores, Check all strainers, Evacuate system, Check all Refrigerant Sensors, Prior to Re-Charging System.</u>  <u>If compressor has failed determine reason for failure.</u> 14.) <u>If compressor has failed determine reason for failure.</u> 15.) Check Motor Protection Device, Check Oil Protection Device, Check Oil level Control, Check Pressure Controls, Check Rack Control System.
2.) <b>Compressor will not run.</b> Compressor Hums but will not start.	a.) Incorrectly wired b.) Low line Voltage.  c.) Compressor bearings tight  d.) High discharge pressure.  e.) Refrigerant shortage  f.) Burned motor windings - open circuit.	1.) Have wiring checked and corrected. 2.) Have wiring checked and corrected. Determine reason for low line voltage. 3.) Check Oil level, Check oil colour, Check compressor mechanical function,  4.) Check system operation, AC Condenser fans or WC Condenser Pumps function, Check for Non-condensibles in system 5.) Determine source of refrigerant loss, repair-pressure test-evacuate system. Prior to recharging system. 6.) <u>If compressor has failed determine reason for failure.</u>
3.) <b>Compressor Starts runs briefly then stops.</b> Compressor trips on Overload protection..	a.) Incorrectly wired b.) Low line Voltage. Trips on Overload  c.) Excessive suction or discharge Pressure.  d.) Tight bearing or internal mechanical damage to compressor e.) Defective compressor overload protection device f.) Shorted or Grounded motor winding.	1.) Have wiring checked and corrected. 2.) Have wiring checked and corrected. Determine reason for low line voltage. 3.) Determine cause of excessive (High-) pressures. Check system functions/settings. 4.) Check Valve Plates/Check volumetric efficiency if possible. 5.) Check functions/settings. If faulty replace. 6.) Check motor characteristic's <u>If compressor has failed determine reason for failure.</u>
4.) <b>Compressor Shortcycles.</b>  Compressor runs for a short period then stops.	a.) Controls incorrectly set, Differential setting to small.  b.) Shortage of refrigerant  c.) Discharge valve/s (reed/s) leaking.  d.) Discharge pressure to high.  e.) Dirty Condenser causing High Discharge Pressure Cut-Out.  f.) Defective overload protector g.) Cycling on HP Control  h.) Electronic Controller programming issue  i.) Compressor Motor  j.) Cylinder Head C/R Capacity Regulator (Solenoid operated.) Leaking.  K.) Liquid Line Solenoid Leaking during Off Cycle.  l.) Low refrigerant flow, High superheat.  m.) Low refrigerant charge.  n.) Leaking compressor valve plate/s	1.) Check control functions/settings. Check if control/s are isolated from system, Check refrigerant Charge. Recalibrate control/s, If controls faulty replace. 2.) Determine source of refrigerant loss, repair-pressure test-evacuate system. Prior to recharging system. 3.) Determine cause of valve plate failure, Repair/Replace Valve Plate/s  4.) Check system operation, Air Cooled Condenser fans or WC Condenser Pumps function, Check for Non-condensibles in system.  5.) Check and Clean Condenser, Check Fans on Air Cooled Condensers or Check Flow Controls & Pumps on Water Cooled Condensers.  6.) Check functions/settings. If faulty replace. 7.) Determine cause of excessive (High-) pressures. Check system functions/settings. Check HP control settings, Check for non-condensibles. 8.) Check electronic controller, Check controller functions/setup, Check Transducer & Thermocouples. 9.) Check for high head pressure, Check for tight bearings, seized pistons, clogged air cooled condenser 10.) Check for high side / low side leak due to Capacity Regulator.  11.) Repair/Replace Solenoid Valve, Replace Liquid Line Drier Cores, Check system for contaminants. 12.) Expansion Valve check function, check superheat setting. Check refrigerant charge. 13.) Determine cause of low refrigerant charge. Repair leak/s, Replace drier cores, Top Up system, OR Reclaim refrigerant, Re-Evacuate entire system & Replace refrigerant 14.) Check compressor/s valve plate/s replace if necessary.  <u>If compressor has failed determine reason for failure.</u>
5.) <b>Compressor Draws Low Current (Amps.).</b>  Compressor draws low current.	a.) Low current draw at design conditions (pressures.) Mechanical fault with compressor	1.) Check compressor/s performance low current draw may indicate compressor mechanical fault. 2.) Check Compressor Valve Plate/s 3.) Check line voltage.

<p>6.) <b>Compressor Draws High Current (Amps).</b></p> <p>Compressor draws excessive current.</p>	<p>a.) Excessive suction pressure beyond compressor design envelope.</p> <p>b.) Excessive refrigeration load on system.</p> <p>c.) Improperly wired</p> <p>d.) High or Low voltage.</p> <p>e.) Excessive discharge pressure.</p> <p>f.) Incorrect refrigerant</p> <p>g.) Tight bearings or mechanical damage within compressor.</p> <p>h.) Burnt contacts.</p> <p>i.) Supply wires under sized for application.</p> <p>j.) Voltage out of balance on 3-Phase motors</p>	<p>1.) Check compressor/s performance data/application charts,for the maximum suction pressure. The use of crankcase pressure regulator (CPR Valve/s.) or MOP Tx valves may be required.</p> <p>2.) Determine cause/s of excessive system loading, Check Compressor rack, Condenser and Evaporator loads (System design capabilities.)</p> <p>3.) Have wiring checked and corrected.</p> <p>4.) Have electrical supply and wiring checked and corrected.</p> <p>5.) <b>See section (14)</b></p> <p>6.) Check / determine the system Refrigerant. Review the refrigerant to the system / application.</p> <p>7.) Check to determine cause of compressor mechanical failure, repair Compressor or replace compressor and associated electrical; switch gear.</p> <p>8.) Have wiring checked and corrected.</p> <p>9.) Have wiring checked and corrected.</p> <p>10.) Check to determine cause of compressor motor failure, repair Compressor or replace compressor and associated ectrical; switch gear.</p> <p>11.) <b>If compressor has failed determine reason for failure.</b></p>
<p>7.) <b>Low Oil Pressure ( Compressor/s.)</b></p>	<p>a.) Compressor Oil Pump/s Faulty</p> <p>b.) Compressor Oil Pressure safety switch faulty</p> <p>c.) Excessive Liquid refrigerant within Compressor sump/s.</p> <p>d.) Oil trapping within system</p> <p>e.) insufficient oil within system</p> <p>f.) Restriction/Blockage within oil filter RE: (Systems with BITZER COS Oil Separator /Reservoir fitted)</p> <p>g.) Restriction/Blockage within oil separator coalescent filter RE: (Systems with Temprite Oil Coalescent Separator /Reservoir fitted)</p> <p>h.) Faulty Oil level Control Kriwan/Traxon</p> <p>i.) Restriction with Oil Inlet screen within Kriwan/Traxon Oil level Controls</p> <p>h.) Blocked Oil Filter (COS Oil Separator/Reservoir systems only.)</p> <p>i.) Blocked Coalescent Oil Filter (Temprite Coalescent, Oil Separator/Reservoir systems only.)</p> <p>j.) Oil Inlet Service Valve/s to Kriwan/Traxons shut (fully front seated.)</p> <p>k.) Loose fitting on Oil lines (Oil Circuit.)</p> <p>l.) Faulty [Compressor.] Oil pump or the oil pump inlet screen is restricted.</p>	<p>1.) Check pump operation, Check Pump operation with compressor rotation direction changed, Replace Faulty Pump and Oil safety Switth.</p> <p>2.) Replace oil safety switch.</p> <p>3.) Check Crankcase Heater/s, Check Tx Valve/s superheat, Check Oil Separator.</p> <p>4.) Check Ssuperheat, Tx Valve/s Liquid Line Solenoid valve/s.</p> <p>5.) Check pipe layout for possible oil trapping, Check Compressor oil levels, Check oil separator oil level, if Temprite Check / Replace Coalescent Filter cartridge. Correct improper piping.</p> <p>6.) Check records of oil charging, Check Compressor oil levels, Check oil separator oil level, if Temprite Check / Replace Coalescent Filter cartridge.</p> <p>7.) Check oil colour, Check oil for contaminants, Replace oil filter, check oil level oil inlet screens, Check oil levels, Replace Drier cores and check/clean mesh strainer in drier shell.</p> <p>8.) Check operation of Level Control. Check/clean oil level control inlet screen/s, replace Oil Level control if deemed as faulty.</p> <p>9.) Check operation of Level Control. Check/clean oil level control inlet screen/s, replace Oil return line Strainer or Coalescent filter..</p> <p>10.) Check operation of Level Control. Check/clean oil level control inlet screen/s, replace Oil strainer within Oil Return manifold or Temprite Coalescent filter cartridge.</p> <p>11.) Replace oil filter/strainer, Check oil level Control inlet screens, Purge oil return manifold of contaminants</p> <p>12.) Open valves, monitor oil levels</p> <p>13.) Leak test oil system, makes repairs where necessary, check oil filters /strainers, monitor oil levels.</p> <p>14.) Check oil pump fuction, check oil inlet screen, check oil protection control function, replace if necessary, Change drier cores.</p>
<p>8.) <b>Low Oil Levels in Compressor/s</b></p>	<p>a.) Leak in system.</p> <p>b.) Excessive Liquid refrigerant within compressor sump.</p> <p>c.) System Flooding back (Liquid refrigerant.)</p> <p>d.) Oil trapping within system</p> <p>e.) Insufficient oil within system</p> <p>f.) Restriction/Blockage within oil filter RE: (Systems with BITZER COS Oil Separator /Reservoir fitted)</p> <p>g.) Restriction/Blockage within oil separator coalescent filter RE: (Systems with Temprite Oil Coalescent Separator /Reservoir fitted)</p> <p>h.) Faulty Oil level Control Kriwan/Traxon</p> <p>i.) Restriction with Oil Inlet screen within Kriwan/Traxon Oil level Controls</p> <p>h.) Blocked Oil Filter (COS Oil Separator/Reservoir systems only.)</p> <p>i.) Blocked Coalescent Oil Filter (Temprite Coalescent, Oil Separator/Reservoir systems only.)</p> <p>j.) Oil Inlet Service Valve/s to Kriwan/Traxons shut (fully front seated.)</p> <p>k.) Loose fitting on Oil lines (Oil Circuit.)</p> <p>l.) Faulty [Compressor.] Oil pump or the oil pump inlet screen is restricted.</p>	<p>1.) <a href="#">Check entire system for Leaks, determine leak source, Repair Leak, re-check entire system for leaks, Change drier cores, Pending on leakage severity top up system or Replace entire refrigerant charge.</a></p> <p><a href="#">If refrigerant charge is to be replaced. Reclaim remaining refrigerant, Pressure test entire system, Replace drier cores, Check all strainers, Evacuate system, Check all Refrigerant Sensors, Prior to Re-Charging System.</a></p> <p>2.) Check Crankcase Heater/s, Check Tx Valve/s superheat, Check Oil Separator.</p> <p>3.) Check Ssuperheat, Tx Valve/s Liquid Line Solenoid valve/s.</p> <p>4.) Check pipe layout for possible oil trapping, Check Compressor oil levels, Check oil separator oil level, if Temprite Check / Replace Coalescent Filter cartridge. Correct improper piping.</p> <p>5.) Check records of oil charging, Check Compressor oil levels, Check oil separator oil level, if Temprite Check / Replace Coalescent Filter cartridge.</p> <p>6.) Check oil colour, Check oil for contaminants, Replace oil filter, check oil level oil inlet screens, Check oil levels, Replace Drier cores and check/clean mesh strainer in drier shell.</p> <p>7.) Check function of oil level control, Replace if faulty.</p> <p>8.) Check operation of Level Control. Check/clean oil level control inlet screen/s, replace Oil Level control if deemed as faulty.</p> <p>9.) Check operation of Level Control. Check/clean oil level control inlet screen/s, replace Oil strainer within Oil Return manifold or Temprite Coalescent filter cartridge.</p> <p>10.) Replace oil filter/strainer, Check oil level Control inlet screens, Purge oil return manifold of contaminants</p> <p>11.) Replace coalescent oil filter/strainer, Check oil level Control inlet screens, Purge oil return manifold of contaminants</p> <p>12.) Open Oil return Isolation Valves, Check Valves for blockage/s replace if necessary.</p> <p>13.) Repair loose fittings and Leak test.</p> <p>14.) Clean or replace Oil inlet screen.</p>



<p>9.) Oil is Discoloured/Dirty</p>	<table> <tr> <td>a.) Oil has been contaminated due to. Leak/s and or Moisture within system</td><td>1.) Replace Oil in Compressor sumps and Oil Separator, Replace Oil Strainer COS Oil Separators, Replace Temprite coalescent Filter with the Temprite clean-up Filter, Replace Liquid Line Driers, Clean all mesh screens on oil level controls and TX valves.</td></tr> <tr> <td>b.) Oil has been contaminated due to. High Discharge temperatures.</td><td>2.) Fixture High discharge problem/s. Replace Oil in Compressor sumps and Oil Separator, Replace Oil Strainer COS Oil Separators, Replace Temprite coalescent Filter with the Temprite clean-up Filter, Replace Liquid Line Driers, Clean all mesh screens on oil level controls and TX valves.</td></tr> <tr> <td>c.) Oil has been contaminated due to. Non Condensibles within system</td><td>3.) Remove Non-condensibles. Replace Oil in Compressor sumps and Oil Separator, Replace Oil Strainer COS Oil Separators, Replace Temprite coalescent Filter with the Temprite clean-up Filter, Replace Liquid Line Driers, Clean all mesh screens on oil level controls and TX valves.</td></tr> <tr> <td>d.) Oil has been contaminated due to. Compressor motor burn out.</td><td>4.) Replace Compressor, Replace Liquid Line &amp; Suction Line Drier Cores with Clean-Up Filters suitable for BITZER Oil. Acid Test System. (Repeat Drier replacement until all acid is removed from system.)</td></tr> <tr> <td>e.) The 100% Molecular sieve Drier Cores are spent.</td><td>5.) Replace drier cores, check all strainers in system, determine cause.</td></tr> <tr> <td>f.) The Oil Filter is spent. RE: (Systems with BITZER COS Oil Separator /Reservoir fitted)</td><td>6.) Replace Oil Filter with approved 3.0 micron Oil Stariner.</td></tr> <tr> <td>g.) The oil separator coalescent filter is spent. RE: (Systems with Temprite Oil Coalescent Separator /Reservoir fitted.)</td><td>7.) Replace Temprite coalescent Filter with the Temprite <u>Clean-up Filter</u> cartridges until system is clean, Then Replace Temprite Coalescent oil Filter.</td></tr> <tr> <td>h.) Excessive acid within system</td><td>8.) Replace Liquid Line Drier Cores with High Acid cleanup type, Install Burnout Drier cores in Suction drier shells/ Suction Header, Install high capacity acid cleanup filter in oil return circuit..</td></tr> <tr> <td>i.)</td><td>- Replace oil filter, Clean Kriwan/Traxon</td></tr> </table>	a.) Oil has been contaminated due to. Leak/s and or Moisture within system	1.) Replace Oil in Compressor sumps and Oil Separator, Replace Oil Strainer COS Oil Separators, Replace Temprite coalescent Filter with the Temprite clean-up Filter, Replace Liquid Line Driers, Clean all mesh screens on oil level controls and TX valves.	b.) Oil has been contaminated due to. High Discharge temperatures.	2.) Fixture High discharge problem/s. Replace Oil in Compressor sumps and Oil Separator, Replace Oil Strainer COS Oil Separators, Replace Temprite coalescent Filter with the Temprite clean-up Filter, Replace Liquid Line Driers, Clean all mesh screens on oil level controls and TX valves.	c.) Oil has been contaminated due to. Non Condensibles within system	3.) Remove Non-condensibles. Replace Oil in Compressor sumps and Oil Separator, Replace Oil Strainer COS Oil Separators, Replace Temprite coalescent Filter with the Temprite clean-up Filter, Replace Liquid Line Driers, Clean all mesh screens on oil level controls and TX valves.	d.) Oil has been contaminated due to. Compressor motor burn out.	4.) Replace Compressor, Replace Liquid Line & Suction Line Drier Cores with Clean-Up Filters suitable for BITZER Oil. Acid Test System. (Repeat Drier replacement until all acid is removed from system.)	e.) The 100% Molecular sieve Drier Cores are spent.	5.) Replace drier cores, check all strainers in system, determine cause.	f.) The Oil Filter is spent. RE: (Systems with BITZER COS Oil Separator /Reservoir fitted)	6.) Replace Oil Filter with approved 3.0 micron Oil Stariner.	g.) The oil separator coalescent filter is spent. RE: (Systems with Temprite Oil Coalescent Separator /Reservoir fitted.)	7.) Replace Temprite coalescent Filter with the Temprite <u>Clean-up Filter</u> cartridges until system is clean, Then Replace Temprite Coalescent oil Filter.	h.) Excessive acid within system	8.) Replace Liquid Line Drier Cores with High Acid cleanup type, Install Burnout Drier cores in Suction drier shells/ Suction Header, Install high capacity acid cleanup filter in oil return circuit..	i.)	- Replace oil filter, Clean Kriwan/Traxon		
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13.) <b>High Suction Superheat</b>	a.) Flash gas within Liquid line. b.) Insufficient refrigerant charge within system          c.) Excessive pressure drop within liquid line, Improper liquid line piping sizing - design d.) Under sized expansion valve (TX Valve/Orifice under sized for application. e.) Internally Equalized expansion valve used (Incorrectly.) on a system with Distributor. f.) Internally Equalized expansion valve used (Incorrectly.) on a system with high pressure drop. g.) Expansion valve TX valve /s power element has failed or lost charge. h.) Starving Evapoartor/s i.) Undersized expansion valve.	1.) Insufficient refrigerant charge. 2.) <a href="#">Check entire system for Leaks, determine leak source, Repair Leak, re-check entire system for leaks, Change drier cores, Pending on leakage severity top up system or Replace entire refrigerant charge.</a>  If refrigerant charge is to be replaced. Reclaim remaining refrigerant, Pressure test entire system, Replace drier cores, Check all strainers, Evacuate system, Check all Refrigerant Sensors, Prior to Re-Charging System. 3.) Check liquid line sizing, Check liquid line for excessive vertical lift, check for liquid line restrictions 4.) Check Expansion valve and orifice capacity compared to evaporator and fixture load. Replace Tx valve and Orifice if incorrectly sized for application. 5.) Replace existing Tx Valve with correctly sized Externally Equalized TX Valve and orifice. 6.) Replace existing Tx Valve with correctly sized Externally Equalized TX Valve and orifice. 7.) Replace the Power element or replace the entire TX valve. 8.) Check Tx valves, Recalibrate or replace with new sized to application/s. 9.) Replace Tx valve/s with new sized to application.
14.) <b>Discharge Pressure to High</b>	a.) Refrigerant contaminated with non-condensibles          b.) Malfuction of AC Condenser restricted Air flow, Dirty Coil Blocked or Coil Block Obstructed, Check Chill Booster System. c.) Malfuction of WC Condenser restricted tubes, Obstruction/s in water circuit, faulty water pump/s d.) Faulty Thermal Expansion Valve/s (TX Valve/s) on High Side System e.) Incorrectly sized Thermal Expansion Valve/s (TX Valve/s) on High Side system. f.) Restriction within Discharge line. g.) Refrigerant over charge.	1.) Check Discharge Pressure & Temperature. To determine non-condensibles presence. Purge high parts of system and replace drier cores. OR Replace drier cores, Evacuate entire system, and recharge with new refrigerant. 2.) Clean Condenser coil, remove obstructions, check fans operation. 3.) Clean Condenser water circuit (tubes.), remove obstructions, Check Pump/s operation, Check water regulating valve/s. 4.) Check function of Tx Valve/s. Check Tx Valve selection, Check Orifice Selection. Replace Tx Valve/s with New sized to application. 5.) Check function of Tx Valve/s. Check Tx Valve selection, Check Orifice Selection. Replace Tx Valve/s with New sized to application. 6.) Check Discharge Line size to application, Replace restricted section of Discharge Line. 7.) Reclaim refrigerant, reducing charge to meet application.
15.) <b>Discharge Pressure to Low</b>	a.) Insufficient refrigerant charge within system.          b.) Faulty condenser pressure regulation c.) Faulty condenser temperature regulation d.) Compressor/s valve plates faulty leaking. e.) Low Suction Pressure f.) Head Pressure control/s incorrectly set. g.) Condenser oversized.	1.) <a href="#">Check entire system for Leaks, determine leak source, Repair Leak, re-check entire system for leaks, Change drier cores, Pending on leakage severity top up system or Replace entire refrigerant charge.</a>  If refrigerant charge is to be replaced. Reclaim remaining refrigerant, Pressure test entire system, Replace drier cores, Check all strainers, Evacuate system, Check all Refrigerant Sensors, Prior to Re-Charging System. 2.) Clean AC Condenser/s coil/s, remove obstructions, check fans operation, Check WC Condenser/s, Check water pump/s 3.) Check High Pressure transducer, Check Thermocouples associated with system HP side. Check System controller functions / settings. Check water regulating valve/s 4.) Check compressors for volumetric efficiency 5.) <b>See section (14.)</b> 6.) Re-program Rack Control to application, Reprogram EC Fan/s. 7.) Change fan/s speeds. Re-program Rack Control, Reprogram EC Fan/s. 8.) Ambient Air to low.
16.) <b>System is noisy / vibrating</b>	a.) Check Compressor/s Valve Plate/s for Valve Noise. b.) Check Compressor/s Valve Plate/s for Bearing Noise. c.) Pipe Vibrations - Support Piping as required d.) Check VSD to Lead Compressor. e.) Check compressor mounting/fixing       f.) Check Coalescent Oil Filter pressure drop. (Temprite Coalescent, Oil Separator/Reservoir systems only.) g.) Check for System flood-back of liquid refrigerant.	1.) Determine source of compressor noise/vibration, 2.) Determine source of compressor noise/vibration, 3.) Secure refrigeration pipe work. Check Pipe sizing to application, replace to correct pipe size if necessary. 4.) Check function of VSD. Check Control programming. 5.) Check Compressor mounting bolts and Mounting Blocks, Check main rack mounting feet, Re-adjust main mounting feet to make rack correctly supported and level. 6.) Check Coalescent Filter and Oil Ring. 7.) Check superheat, Check sound of compressors, Check compressor oil sight glasses.
17.) <b>Compressor Thermal Protection Switch open circuited.</b>	a.) Compressor operating beyond its design envelope (operating limits) b.) Compressor valve plate gasket blown / fractured. c.) Discharge service valve partially shut d.) Discharge pressure to high. e.) Defective motor protection device f.) Oil Pump housing gasket leaking g.) Oil Pump faulty / worn h.) Low oil level.	1.) Check operation conditions and compare to compressor operation data. 2.) Check compressor volumetric efficiency, and valve plate/s function. 3.) Check compressor service valve, set service valve to back-seated position. 4.) <b>See section (14.)</b> 5.) Check motor protection module. Check wiring, Replace if faulty. 6.) Replace gasket, leak test system, change drier cores. 7.) Check Oil pump function. Replace if necessary. 8.) Determine cause of low oil. IE: Insufficient originally supplied, Suction Riser/s issues, Oil Logging in Evapoartor/s.

<p>18.) <b>System Fixture/s (Evaporator/s) Temperatures to High</b></p>	<p>a.) Excessive system load.</p> <p>b.) Refrigerant shortage (Insufficient Refrigerant Charge within system.)</p> <p>c.) Clogged Liquid Line Drier.</p> <p>d.) Clogged Suction Line Drier/s.</p> <p>e.) Faulty Thermal Expansion Valve/s (TX Valve/s)</p> <p>f.) Incorrectly sized Thermal Expansion Valve/s (TX Valve/s)</p> <p>g.) Incorrect TX Valve power element.</p> <p>h.) Faulty system solenoid valve/s</p> <p>i.) Evaporator/s Iced, Dirty, Coil blocked.</p> <p>j.) Controls settings to high</p> <p>k.) Controls wiring loose</p> <p>l.) Oil logged within system.</p> <p>m.) Evaporator/s Fan/s fault.</p> <p>n.) Incorrectly sized plant for system.</p> <p>o.) Electronic Controller programming issue</p> <p>p.) Compressor/s pumping issue/s</p> <p>q.) Compressor/s operating issue/s</p> <p>r.) Compressor/s operating issue/s</p> <p>s.) Coolroom room door/s remain open, Medium Temperature Cabinet door/s remains open</p>	<p>1.) Check to determine cause of excessive refrigeration load. Check Coolroom / Freezer Room doors <u>if they are open</u>. Bring system fixtures back to design loading.</p> <p>2.) <a href="#">Check entire system for Leaks, determine leak source, Repair Leak, re-check entire system for leaks, Change drier cores, Pending on leakage severity top up system or Replace entire refrigerant charge.</a></p> <p><a href="#">If refrigerant charge is to be replaced. Reclaim remaining refrigerant, Pressure test entire system, Replace drier cores, Check all strainers, Evacuate system, Check all Refrigerant Sensors, Prior to Re-Charging System.</a></p> <p>3.) Replace drier cores and clean the drier shell internal filter strainer. Check TX Valve Strainers for blockages, clean where necessary</p> <p>4.) Replace drier cores and clean the drier shell internal filter strainer. Check Compressor Oil color / condition.</p> <p>5.) Replace Tx Valve and orifice with correctly sized to application.</p> <p>6.) Check TX Valve setting/s, Clean TX Valve Strainer/s Check Orifice size to application.</p> <p>7.) Replace with correctly sized to application.</p> <p>8.) Replace with correctly sized to application.</p> <p>9.) Check defrost settings and recalibrate if/where necessary. Clean Coils &amp; Condensate pans and Condensate Drains, Check Tungdishes.</p> <p>10.) Re-program controls / control system.</p> <p>11.) Tension all wiring to appropriate torque. Replace Terminal/s if necessary.</p> <p>12.) Check solenoid valve/s for function and internal cleanliness.</p> <p>13.) Check control system settings / programing, Check wiring, Check Evaporator Fan motor/s. Check Evaporator/s Air Flow</p> <p>14.) Review system capacity to system load. Quote to increase system capacity or shed system load to other system/s. Check if there has been a recent addition to the design load.</p> <p>15.) Check the Electronic control system programming and function. Check Thermocouples, Check Transducers.</p> <p>16.) Review compressor function. Mechanically and Electrically.</p> <p>18.) Review compressor function. Mechanically and Electrically.</p> <p>19.) Check control settings.</p> <p>20.) Check Doors for operation, Check Door Gaskets, Check / Adjust Door hinge systems.</p>
<p>19.) <b>Low refrigerant alarm fault.</b></p>	<p>a.) Refrigerant shortage (Insufficient Refrigerant Charge within system.)</p> <p>b.) Faulty refrigerant level probe.</p> <p>c.) Refrigerant backing up with Condenser.</p> <p>d.) Refrigerant backing up within Heat reclaim system.</p>	<p>1.) <a href="#">Check entire system for Leaks, determine leak source, Repair Leak, re-check entire system for leaks, Change drier cores, Pending on leakage severity top up system or Replace entire refrigerant charge.</a></p> <p><a href="#">If refrigerant charge is to be replaced. Reclaim remaining refrigerant, Pressure test entire system, Replace drier cores, Check all strainers, Evacuate system, Check all Refrigerant Sensors, Prior to Re-Charging System.</a></p> <p>2.) Check function of level probe, check wiring, check alarm input terminals of rack controller.</p> <p>3.) Check refrigerant charge. Change/correct the refrigerant charge to application.</p> <p>4.) Check system pipe work, Check control function,</p> <p>5.) Check plantroom located (remote.) refrigerant detectors and other (remote.) refrigerant detectors on site.</p>
<p>20.) <b>Liquid Flashing in Sight Glass</b></p>	<p>a.) Refrigerant shortage (Insufficient Refrigerant Charge within system.)</p> <p>b.) Restricted Drier</p> <p>c.) Refrigerant backing up with Condenser.</p> <p>d.) Refrigerant backing up within Heat reclaim system.</p> <p>e.) Condensing Pressure to low</p> <p>f.) Refrigerant leak not detected. Faulty refrigerant detection system / sensors.</p> <p>g.) Lack of positive head pressure control.</p> <p>h.) Loss of sub-cooling due to liquid line/s running through a hot area.</p> <p>i.) Excessive pressure drop within liquid line due to undersized liquid line or excessive vertical lift.</p> <p>j.) Often corresponds with high suction super heat at evaporator outlet/s</p>	<p>1.) <a href="#">Check entire system for Leaks, determine leak source, Repair Leak, re-check entire system for leaks, Change drier cores, Pending on leakage severity top up system or Replace entire refrigerant charge.</a></p> <p><a href="#">If refrigerant charge is to be replaced. Reclaim remaining refrigerant, Pressure test entire system, Replace drier cores, Check all strainers, Evacuate system, Check all Refrigerant Sensors, Prior to Re-Charging System.</a></p> <p>2.) Change Drier Cores.</p> <p>3.) Check refrigerant charge. Change/correct the refrigerant charge to application.</p> <p>4.) Check system pipe work, Check control function,</p> <p>5.) Increase Condensing Pressure</p> <p>6.) Check plantroom located refrigerant detectors control system and all other (remote.) refrigerant detectors/sensors on site.</p> <p>7.) Check Control system for function and calibration. Readjust control to application.</p> <p>8.) Relocate liquid line to cooler location, Insulate the liquid line.</p> <p>9.) Replace liquid line/s with new (correctly sized to application.) Reconfigure liquid line/s to minimize vertical lift or relocate plant equipment.</p> <p>10.) Check Tx valve superheat setting, replace valve/orifice if necessary.</p>



**BITZER Australia Pty Limited**

134 Dunheved Circuit,  
St Marys, NSW 2760  
Australia  
tel +61 (2) 8801 9300  
fax +61 (2) 9673 4698  
info@bitzer.com.au

**Victoria**

tel +61 (3) 8326 8200  
fax +61 (3) 9310 2520

**Queensland**

tel +61 (7) 3725 1360  
fax +61 (7) 3274 3621

**South Australia**

tel +61 (8) 8345 6110  
fax +61 (8) 8268 4555

**Western Australia**

tel +61 (8) 6350 6297  
fax +61 (8) 9359 2077

**BITZER New Zealand**

**BITZER Australia Pty Ltd**

9a Douglas Alexander Parade  
Rosedale 0632  
Auckland  
New Zealand  
tel +64 9 415 2030

[www.bitzer.com.au](http://www.bitzer.com.au)



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