Installation & Operation Instruction

COMPAC

COMPAC Condensing Units
with Tecumseh Scroll Compressor

Issued –
June 2020

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This document should be kept with the installed unit.

1. SAFETY WARNINGS FOR END USERS, INSTALLATION AND MAINTENANCE PERSONNEL

DANGER - High Voltage

This condensing unit contains electrical parts. Always isolate the power supply before working on this unit. All field wiring must be carried out by a licensed electrical contractor and all wiring must be in accordance with the equipment specification, local and national codes.

DANGER - Moving Machinery

This condensing unit has moving parts which may start and stop without warning.

CAUTION - Auto Start

This unit and its moving parts can start automatically without warning.

CAUTION - High Pressure

This condensing unit contains high pressure refrigerant and oil.

CAUTION - High and Low Temperature Surfaces

During normal operation and during fault conditions some components will reach high and/or low temperatures.

CAUTION - Sharp Edges

This condensing unit contains parts with sharp edges. Appropriate personal safety equipment must be worn.

Only fully qualified licensed personnel should install, service or carry out maintenance to this condensing unit.

2. END USER INFORMATION

Design usage

This condensing unit is designed for commercial refrigeration duty within the limits of the published application data, ambient temperature range, refrigerant types and electrical specification. This unit is not intended for environments that are corrosive or flammable, including marine environments. If subjected to corrosive environments this unit should receive additional protection/s.

Maintenance intervals

It is good practice to have regular preventative maintenance performed to ensure this condensing unit continues to perform efficiently. Only fully qualified licensed personnel should carry out maintenance to this condensing unit.

3 to 6 monthly – dependent on location and duty

- Air cooled condenser check, clean as required
- Operational checks including but not limited to electrical connections, voltages, amperages, pressures, temperatures including compressor superheat, discharge temperature, unit sub-cooling, refrigerant leak check, moisture indicator check and compressor oil level.

Use of genuine spare parts from Actrol is recommended.

Decommissioning

This condensing unit contains refrigerant and oil that is harmful to the environment; these must be recovered and returned to an approved recycling or destruction facility. Only fully qualified and ARC licensed personnel should carry out decommissioning of this unit. It is illegal to vent some types of refrigerant to the atmosphere.

3. INSTALLATION INSTRUCTIONS

Safety first

- All refrigeration and electrical work must be carried out by fully qualified and licensed personnel.
- Personal safety protection equipment must be worn when working with this condensing unit.
- Refer to the safety warnings in "Section 1" of this instruction.

Initial inspection and damage notification

This unit must be inspected for damage 'before' installation and any damage found reported to Actrol so appropriate action can be taken.

Lifting and handling of unit

Ensure this condensing unit is balanced when lifting as the weight is not central.

Design conditions and refrigerant type

Confirm the application is to operate within the published design limits before installing this unit. Ensure the refrigerant type matches the published data, **'flammable refrigerants or ammonia refrigerant must not be used'.**

Oil Type

POE (Polyol-ester) oil is used to lubricate this compressor. Only use POE oil of the correct viscosity as listed in the compressor data when adding or replacing oil.

Positioning and Mounting of Unit

Clearance dimensions

- Avoid short cycling the condenser air by ensuring no obstruction of the discharged air.
- A minimum of half one fan diameter clearance must be allowed between the condenser coil and a wall on the inlet air side/s for correct air flow.
- Safe access for service and maintenance must be provided including clear access to all serviceable components within the unit
- A minimum of 800mm clearance should be provided to all serviceable components within this unit.

Noise considerations

- Consideration should be given to ensure noise from this unit will not be of concern to surrounding sound sensitive environments. Information on noise control is available from Actrol.

Mounting and fixing

- This condensing unit must be installed level on the horizontal plane.
- The unit is to be fixed to a solid base using anti vibration mounts or rubber pads.

System pipe sizing and design

Pipe Sizing

Every installation is different so the field pipe sizes may differ from the unit connection sizes. Please select appropriate pipe sizes using published pipe sizing information or contact Actrol for advice.

Holding pressure

This unit has a holding charge of nitrogen which must be released in a safe manner.

Maximum design and test pressure

This condensing unit is designed for a maximum design pressure (PS) of 31bar. Test pressure of the suction side must not exceed 20bar as indicated on the compressor name plate.

A pressure relief device is provided, if a PRV is field fitted it should be selected at 31bar (1 x PS) in accordance with AS/NZS-5149.2.

Oil return

Pipe design must allow for adequate oil return to this condensing unit, the use of "P" traps and double risers may be required; all horizontal sections of the suction line must fall towards the condensing unit.

Soldering

Nitrogen must be used when soldering the field pipe work to stop the formation of copper oxides.

If MaxiPro press fittings are used no nitrogen purging is required.

Pressure testing

The entire system must be pressure tested and any leaks repaired prior to charging with refrigerant.

Pipe insulation

The suction line must be adequately insulated to minimize heat absorption into the return vapour.

3. INSTALLATION INSTRUCTIONS (CONT)

Electrical connection

- A licensed electrical contractor must carry out all electrical work.
- All electrical work must meet local and national requirements.
- Care must be taken to ensure no damage is done to internal unit components when mounting the electrical isolator.
- An electrical diagram is attached to the inside of the service panel.
- The control safety circuit must not be bypassed.

Commissioning and start-up

Visual pre-start check

A visual check must be carried out to ensure the unit has been installed with the correct companion equipment and in the correct location. All pipe work and electrical work must be complete and safe. All electrical connections must be checked for tightness as connections can loosen during transport.

Crank case heater

The crankcase heater must have power applied for a minimum of 12 hours prior to starting the compressor.

Evacuation

A vacuum of less than 500 microns must be achieved and held before breaking the vacuum with liquid refrigerant into the liquid line.

Safety pressure switch settings

Use a temperature pressure chart to determine the pressures to set the high and low safety pressure switches on this condensing unit. The pressures must be set within the limits shown in the compressor application envelope.

The HP safety switch must be set no greater than 0.9 x PS (0.9 x 31 bar = 27.9 bar).

The compressor must never operate in a vacuum as internal parts will overheat and arcing between the electrical terminals will occur within the compressor. Operating the compressor in a vacuum will cause fatal damage to the compressor.

Fan cycle switch setting and operation

This condensing unit is fitted with HP fan cycle switches so the condensing pressure can be maintained within desired limits.

If an EEV (electronic expansion valve) is used on the evaporator, energy savings can be made by reducing the fan cycle switch pressure so the condensing pressure can float down as the ambient temperature falls.

The compressor must operate within the published operating envelope.

System charging

The vacuum must be broken by charging liquid refrigerant into the liquid line to ensure the compressor does not operate in a vacuum and the compressor dos not overheat when the system is first started.

Fine tuning the refrigerant charge can be achieved by adding small quantities of liquid into the suction service valve port while the compressor is running.

Under no circumstances should excessive liquid refrigerant enter the compressor.

Unit Operational checks

Operation checks include but are not limited to the following:

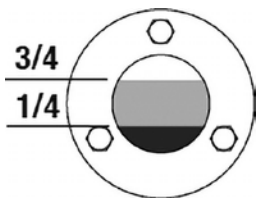
- Voltages of all phases
- Amperages of compressor and fans
- Suction and discharge pressures
- Compressor suction superheat *
- Evaporator suction superheat *
- Liquid sub-cooling
- Liquid line moisture indicator colour and sight glass clearness
- Compressor discharge temperature
- Compressor oil sight glass level
- Confirm oil is returning to compressor
- Refrigerant charge
- Vibration and noise
- Observe on/off cycle after reaching design temperature and ensure;
- No liquid slugging at compressor start-up
- Cycle times (no more than 8 compressor starts per hour)
- Pump down pressure must be within published operating envelope (if pump down is used)

*When refrigerated space or product is at or near design temperature

Handover to end user

When the commissioning is complete the contractor should provide a full explanation of system usage to the end user.

Section 6 of this instruction should be completed, and this instruction left with the end user to keep so the unit base data is known.



Correct compressor oil level

4. MAINTENANCE AND DECOMMISSIONING GUIDELINES

Maintenance guidelines

It is good practice to have regular preventative maintenance performed to ensure this condensing unit continues to perform efficiently.

- **3 to 6 monthly**
  Air cooled condenser check, clean as required
- **3 to 6 monthly**
  Operational check including but not limited to electrical connections, voltages,amperages, pressures, temperatures including compressor superheat, unit sub-cooling and discharge temperature, refrigerant leak check, moisture indicator check and correct compressor oil level.

Use of genuine spare parts from Actrol is recommended.

De-commissioning guidelines

- This condensing unit contains refrigerant and oil that is harmful to the environment; these must be recovered and returned to an approved recycling or destruction facility.
- Only fully qualified ARC licensed personnel should carry out decommissioning of this unit.
- It is illegal to vent some types of refrigerant to the atmosphere.
- Disconnection of electricity supply wiring must be carried out by fully qualified and licensed personnel.
- This unit should be disposed of in a responsible manner.

CAUTION - This unit contains high pressure refrigerant and oil.

Glossary of terms

Condensing unit

Unit comprising compressor, condenser with associated components to recirculate refrigerant via external components and back through the condensing unit.

HFC refrigerant

Hydro-fluoro-carbon fluid circulated around a refrigeration system used to transfer heat energy by changing phase from vapour to liquid and back to vapour.

Ambient temperature

The air temperature surrounding the equipment.

Ongoing product improvement

Due to ongoing product improvement Actrol reserves the right to change equipment specification without notice.

Electronic overload fault indication

Condition			Red O.L. LED		Green Fault LED		Note
Operation	Normal		OFF		OFF		
	Over Current		ON & OFF		OFF		0.4 second interval
	Over Current		ON		OFF		
Trip	Phase failure (3CT)	R	ON		ON & OFF		1 times for 3 seconds
		S	ON		ON & OFF		2 times for 3 seconds
		T	ON		ON & OFF		3 times for 3 seconds
	Phase failure (2CT)		ON & OFF		Protect 2 phases of 3 phases, trips within 3 sec.		
	Reverse failure (3CT)		ON & OFF		ON & OFF		One after the other

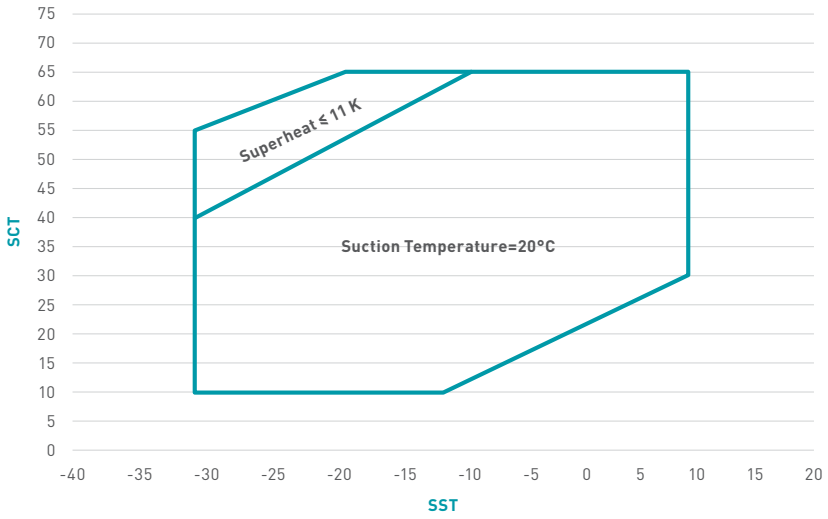
!

If unit will not start check the phase rotation indication. If indicating phase rotation rotate any two phases of the power supply.

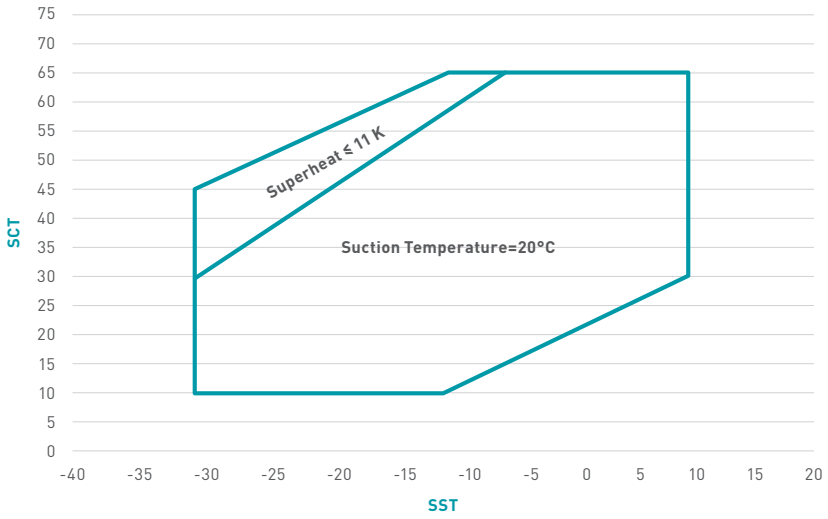
This unit is tested during production which sets the overload phase rotation protection.

5. COMPRESSOR OPERATING ENVELOPES

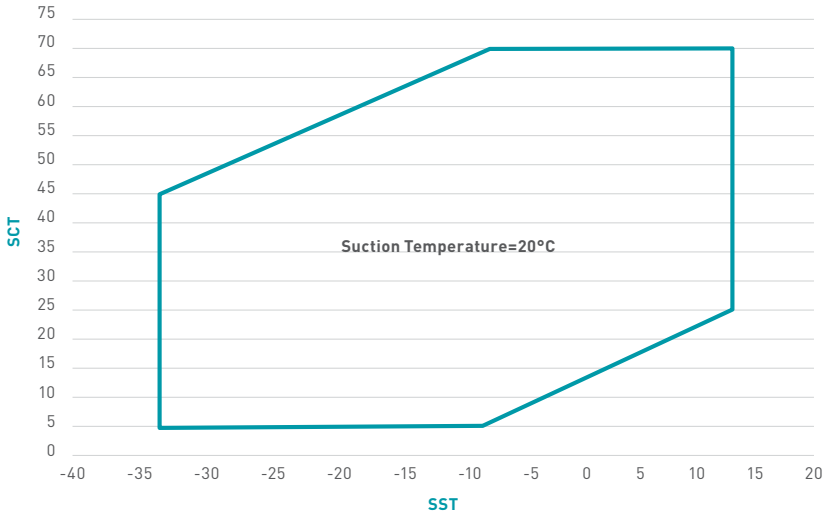
VSE Scroll Compressor R404A and R452A Operating Envelope



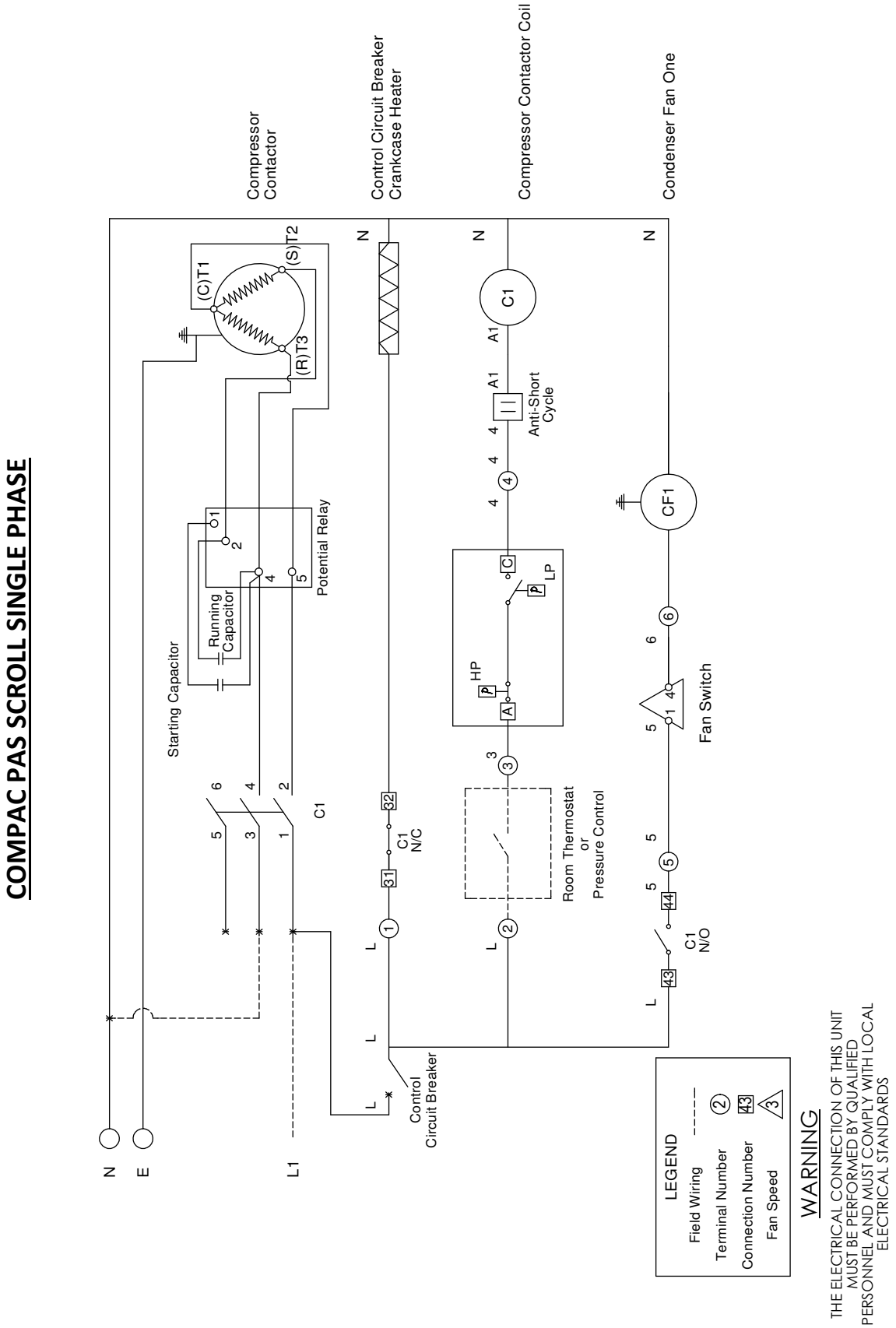
VSE Scroll Compressor R448A and R449A Operating Envelope



VSE Scroll Compressor R134a Operating Envelope

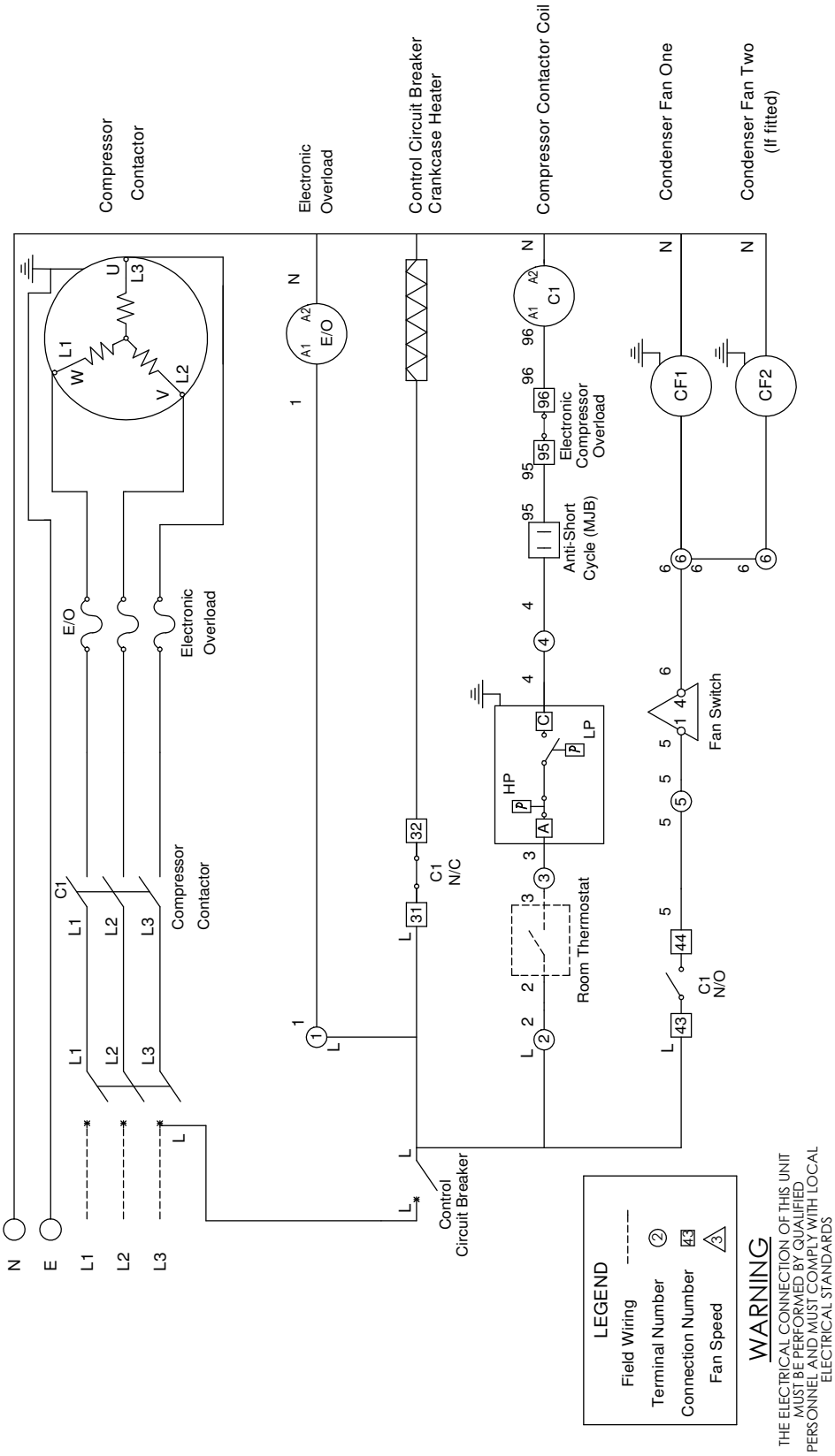


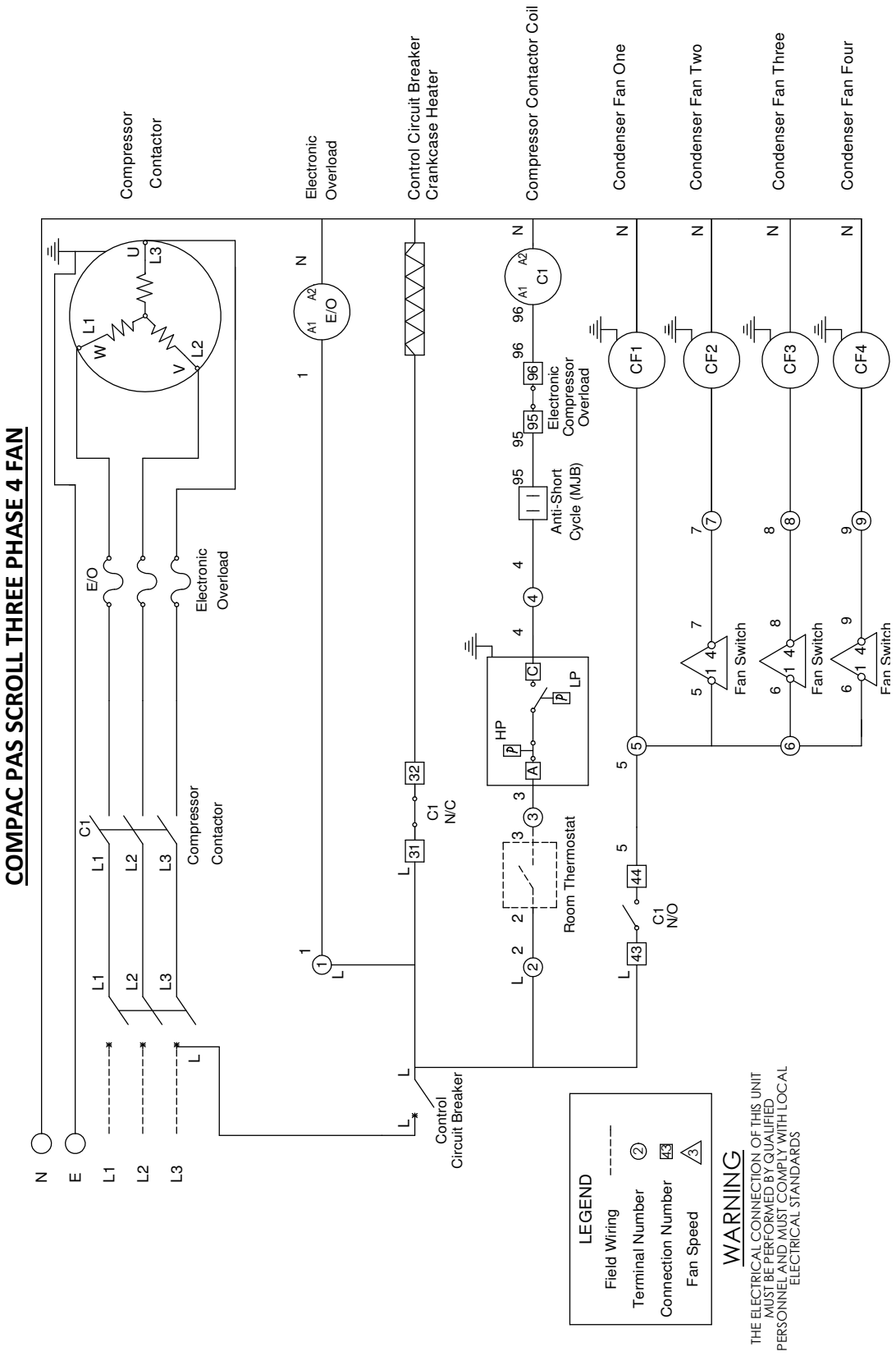
6. ELECTRICAL WIRING DIAGRAMS



6. ELECTRICAL WIRING DIAGRAMS (CONT)

COMPAC PAS SCROLL THREE PHASE




COMPAC PAS SCROLL THREE PHASE 4 FAN
Compressor Contactor
Electronic Overload
Control Circuit Breaker Crankcase Heater
Compressor Contactor Coil
Condenser Fan One
Condenser Fan Two
Condenser Fan Three
Condenser Fan Four
N
E
L1
L2
L3
L
C1
E/O
Electronic Overload
Compressor Contactor
Control Circuit Breaker
C1 N/C
C1 N/O
Room Thermostat
HP
LP
Anti-Short Cycle (MJB)
Electronic Compressor Overload
CF1
CF2
CF3
CF4
Fan Switch
LEGEND
Field Wiring
Terminal Number
Connection Number
Fan Speed
WARNING
THE ELECTRICAL CONNECTION OF THIS UNIT MUST BE PERFORMED BY QUALIFIED PERSONNEL AND MUST COMPLY WITH LOCAL ELECTRICAL STANDARDS

7. COMMISSIONING AND OPERATION DETAILS

Commissioning and Operation Details

CUSTOMER/SITE: **DATE:**

SERVICE TECHNICIAN: **JOB#**

Application Unit ID Code

(Coolroom, Freezer Room, Air Conditioning, Chiller, Process Cooling, Etc) (i.e. Coolroom # 2.1)

Ambient Temperature (°C) Application Temperature (°C)

Equipment Details

Compressor / Unit Model # Refrigerant

Evaporator (Make & Model)

Condenser / Condensing Unit (Make & Model)

Pipe Run & Sizes (Equivalent Length)

(Add Approx 1m to Length per Elbow)

SYSTEM OPERATIONAL OBSERVATIONS

Refrigerant Type Charge Quantity

Charge Condition

(Liquid Level, Sight Glass –Full Head of Liquid, Some Flash Gas, etc)

Suction Pressure (Gauge)

(Measured at Evap) (At Stabilised Conditions)

Suction Vapour Temperature (°C) (B)

(Measured at Evap Before Liquid/Suction Heat Compressor)

Suction Pressure (Gauge)

(Measured at Compressor)

Suction Vapour Temperature (°C) (E)

(Measured at Compressor Button Line 150mm from Compressor)

Discharge Pressure (Gauge)

(Measured at Compressor) (At Stabilised Conditions)

Discharge Line Temperature (°C) (F)

(Measured 50mm from Compressor) (At Stabilised Conditions)

Liquid Pressure (Gauge)

(Measured 50mm from Compressor) (At Stabilised Conditions)

Liquid Line Temperature (°C) (J)

(Measured 100mm from Receiver Outlet)

Measured Suction Pressure After Defrost

(Applicable to Freezers Only – CPR or MOP TX Valve Fitted)

Compressor Oil Level

Equivalent Saturated Suction Temp. (°C) (A)

(Use a Pressure Temperature Chart)

Calculated Evaporator Superheat (K) (B-A)

(Measured Suction Line Temp (B) – Saturated Refrigerant Temp (A))

Equivalent Saturated Suction Temp. (°C) (D)

(Use a Pressure Temperature Chart)

Calculated Superheat at Compressor (K) (E-D)

(Measured Suction Line Temp (E) – Saturated Refrigerant Temp (D))

Equivalent Saturated Suction Temp. (°C) (G)

(Use a Pressure Temperature Chart)

Calculated Discharge Superheat (K) (F-G)

(Measured Suction Line Temp (F) – Saturated Refrigerant Temp (G))

Equivalent Saturated Liquid Temp. (°C) (H)

(Use a Pressure Temperature Chart)

Calculated Liquid Subcooling (K) (J-H)

(Measured Suction Line Temp (J) – Saturated Refrigerant Temp (H))

Oil Condition

(Clean, Clear, Honey, Brown, Black, Carried Out Acid Test)

Sump Heater Current Draw During Off Cycle (& Operational During Compressor off Cycle) (Measured Current Draw)

CONDENSER

AIR ON TO COIL (TEMP °C)

AIR OFF TO COIL (TEMP °C)

EVAPORATOR

AIR ON TO COIL (TEMP °C)

AIR OFF TO COIL (TEMP °C)

CONTROLS – Pressure Controls

L.P. Cut In L.P. Cut Out

H.P. Cut In H.P. Cut Out

Temperature Control – Make & Model

Set Point

Differential

# of Defrosts/24hrs Defrost Period

Termination Temp.

ELECTRICAL

Supply Requirement	Volts	Hz	Phase
Measured Volts	L1	L2	L3
Measured Current	L1	L2	L3

(Maximum 2% Imbalance)

(Maximum 10% Imbalance)

(Maximum 8 Starts per Hour)

Anti-Cycle Timer Fitted Duration

(Maximum 8 Starts per Hour)

Full Name

Signature

Other Observations (Make further notes on back)

NOTES

NOTES

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