MARSTAIR

REFRIGERATION AND SPECIALIST AIR CONDITIONING

R32 CXL / CKL TECHNICAL MANUAL





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1 – GENERAL INFORMATION

1A GENERAL INFORMATION

Installation must be carried out in accordance with the Marstair installation manual, EN 378 and national codes and guidance.

1. Installation work on this equipment to be completed by F Gas certified Technicians who are fully conversant with the appropriate Refrigeration and Electrical practices and have sound knowledge of current Industrial Safe Working practices. It is also advisable that technicians hold the ACRIB Understanding the properties of flammable refrigerants (A2L, A2 and A3) qualification.

   NOTE: it is the responsibility of the operator to ensure the technician is certified to the correct standard (EN13313 or equivalent).

2. These units are supplied with a holding charge of oxygen free nitrogen and polyolester oil. Do not mix oils or refrigerants.

3. These units when installed contain live electrical components, moving parts and refrigerant under pressure. Always site out of reach of children and protect from vandalism.

4. The data plate only gives information for the individual indoor or outdoor unit. For system details add input power and current of indoor and outdoor unit, including any heater load.

5. The refrigerant used should be identified by locating a refrigerant label on the unit case

6. A suitable risk assessment of the installation must be carried out. This ensures a safe working environment is maintained in accordance with The Dangerous Substances and Explosive Atmosphere Regulations and the Management of Health and Safety at Work Regulations. A step by step guidance template is provided within these instructions.

7. The condensing unit must be installed outside.

8. Systems uses R32 refrigerant which is classed as an A2L flammable gas



1B GENERAL INSTALLATION PROCEDURE

- Carry out “step by step” or full risk assessment
- Ensure that no sources of ignition are present during installation
- Only certified natural persons should be present during the installation
- Correct selection of tools and equipment compatible with A2L refrigerants. This should include the following:
    - Flammable gas leak detector placed at a low level next to the service valves of the condensing unit.
    - If adequate natural ventilation is not present throughout the installation process, then forced ventilation should be employed via an A2L compatible or ATEX rated fan and motor.
    - When pressure testing through a refrigerant manifold, ensure that it is suitable for the pressure (no sight glass fitted).
    - A2L compatible 2 stage vacuum pump, exhausted to a safe well ventilated area and away from any source of ignition (check exhaust fumes with flammable gas leak detector).
    - R454C bottle adaptor (left handed female and right handed male connections DIN477-1 21.8mm LH, External, 14 T.P.I).
    - All refrigerant hoses should be as short as possible and have self-closing or ball valve connections in accordance with BS EN 378.
    - If additional refrigerant is to be added, charge in liquid state and ensure a flammable gas leak detector is positioned at a low level near the connections. (If the flammable gas leak detector indicates the presence of a flammable atmosphere, do not energise or de-energise any electrical components until a safe environment has been ensured.)
- Leak checking the system in accordance with EN 1516/2017 directly after installation.
- If a leak is discovered, energise the flammable gas leak detector and place at a low level near connections to the recovery machine and cylinder. Connect an A2L compatible recovery machine and recover into a suitable recovery cylinder (red painted cylinder valve guard and shoulder) in accordance with BS EN 378.

2 - CKL CONDENSING UNITS

2A SYSTEM PERFORMANCE DATA

Total Duty

		27ºC					32ºC					37ºC				
Indoor CXL	Outdoor CKL	8ºC	10ºC	12ºC	14ºC	16ºC	8ºC	10ºC	12ºC	14ºC	16ºC	8ºC	10ºC	12ºC	14ºC	16ºC
40	40	2.7	3.0	3.2	3.5	3.7	2.5	2.8	3.0	3.2	3.4	2.3	2.5	2.8	3.0	3.2
60	60	3.6	4.0	4.3	4.6	4.9	3.4	3.7	4.0	4.3	4.6	3.1	3.4	3.7	3.9	4.2
80	80	5.0	5.5	5.9	6.3	6.8	4.6	5.1	5.5	5.9	6.3	4.2	4.7	5.1	5.4	5.8

Sensible Duty

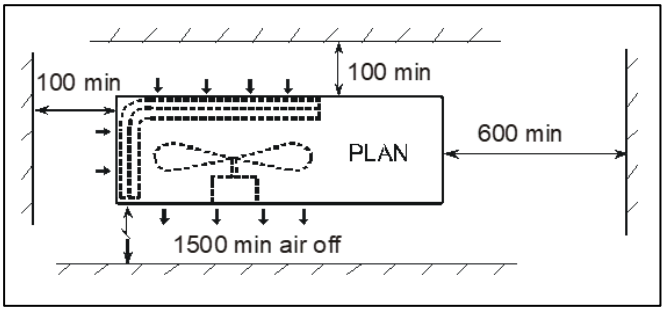
		27ºC					32ºC					37ºC				
Indoor CXL	Outdoor CKL	8ºC	10ºC	12ºC	14ºC	16ºC	8ºC	10ºC	12ºC	14ºC	16ºC	8ºC	10ºC	12ºC	14ºC	16ºC
40	40	1.9	2.1	2.3	2.4	2.6	1.8	1.9	2.1	2.2	2.4	1.6	1.8	1.9	2.1	2.2
60	60	2.5	2.8	3.0	3.2	3.4	2.3	2.6	2.8	3.0	3.2	2.2	2.4	2.6	2.8	2.9
80	80	3.5	3.8	4.1	4.4	4.7	3.2	3.5	3.9	4.1	4.4	3.0	3.3	3.6	3.8	4.1

System	Duty		m^3 Above		m^3 Below	
	8ºC	12.7º	8ºC	12.7º	8ºC	12.7º
CXL40 CKL40	2.7	3.2	26	38	44	63
CXL60 CKL60	3.6	4.3	39	55	64	91
CXL80 CKL80	5.0	5.9	59	84	94	134

2B CKL INSTALLATION.

These units are designed to stand on a flat surface.

Whether floor or wall mounted, it is essential that the mounting surface is capable of supporting the unit weight. Leave space around the unit for air circulation and access for installation and maintenance.



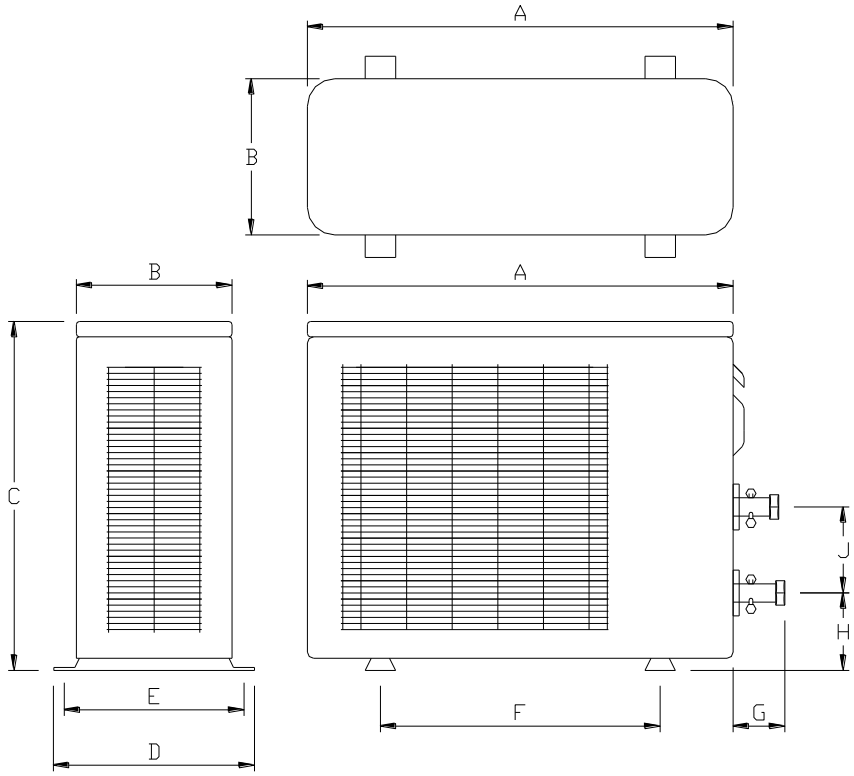
Dimensions in mm.

Condensing unit to be installed outside and not in an enclosed area.

Smoking and naked flames should be prohibited around the area around the condensing unit.

2C CKL DIMENSIONS & WEIGHTS.

CKL	40	60	80
A	760	760	860
B	256	256	307
C	552	552	660
D	330	330	370
E	290	290	340
F	510	510	630
G	50	50	50
H	85	85	85
J	70	70	70
Weight	35kg	42kg	56kg
Valve size Liquid (Upper)	1/4"	1/4"	3/8"
Valve size Suction (Lower)	1/2"	1/2"	5/8"



2D CKL PIPEWORK.

NOTE: Please check this before installation.

MAXIMUM EQUIVALENT PIPE LENGTHS 25m

1. Performance is based on 15m pipe runs. Allow a 3.5% reduction in capacity for pipe runs above 15m.

2. In calculating equivalent lengths of pipe runs, the effect of bends and fittings must be taken into account. The table below covers the fittings most likely to be encountered in this installation.

The equivalent lengths of all the fittings in a pipe run should be added together and the total added to the actual pipe length in order to calculate the total equivalent length.

3. Use the shortest possible route, avoiding sharp bends.

4. Completely insulate the suction line, fully over the indoor unit drain tray.

FITTING LOSSES, in equivalent straight lengths of pipe (m).

FITTING	Pipe Size OD		
	3/8"	1/2"	5/8"
45° Bend	0.12	0.15	0.18
90° Bend R/d = 1	0.37	0.43	0.49
90° Bend R/d = 1.5	0.24	0.27	0.30
180° Bend R/d = 1.5	0.73	0.91	1.10
180° Bend C/d = 2.5	0.46	0.55	0.64
90° Elbow	0.67	0.85	1.04

To calculate the total equivalent length, the equivalent lengths of all fittings in a pipe run must be added to the actual length of pipe in the run: these are the fittings most likely to be used.

R = Radius of bend
d = Diameter of tube
C = Centres of bend

A. SUCTION AND LIQUID/EXPANSION LINES:

The expansion capillary is located in the outdoor unit and the equivalent pipe run is 25m maximum, including a maximum lift of 7.5m. Fully insulate the suction and liquid/expansion line. Ensure the suction pipe is insulated well over the drain tray at the indoor unit. Liquid lines should be routed to avoid hot areas. This prevents flash gas forming, which may result in erratic control of liquid refrigerant to the evaporator.

System	Maximum equivalent length of suction line pipe		Maximum equivalent length of Liquid/Expansion		Total Charge (kgs) for 3.0m piperun
	1/2"	5/8"	1/4"	3/8"	-
CXL/CKL 40	25		25		0.46
CXL/CKL 60	25		25		0.81
CXL/CKL 80		25		25	1.65

For systems with interconnecting pipework in excess of 3.0 metre add 20gms per metre on CKL 40 & CKL 60, add 30gms per metre on CKL 80. No additional oil is required.

PIPE CONNECTIONS
Units are supplied with the following male flare connections (sizes in inches):

INTERCONNECTING PIPEWORK (Max 25m)						
System	Liquid / Expansion	Suction	Torque (Nm)		Nut A/F (mm)	
			Liquid Line	Suction Line	Liquid Line	Suction Line
CXL/CKL 40	1/4"	1/2"	17	54	17	24
CXL/CKL 60	1/4"	1/2"	17	54	17	24
CXL/CKL 80	3/8"	5/8"	34	73	22	27

INTERCONNECTING PIPEWORK

1. The Indoor unit has a low pressure charge of N_2, which may be safely released into the atmosphere before connection. The service valves on the outdoor unit should remain closed (IN, fully clockwise) until pipework has been fitted, and system evacuated.

2. Connecting the pipework
- **a.** Remove the flare nuts from the suction and liquid service valves.
- **b.** Ensure that the suction line is fully insulated: if an expansion line is used this should also be fully insulated.
- **c.** Place the flare nuts over the incoming pipework and flare the pipe ends. The use of a little refrigeration oil on the flaring tool will help.
- **d.** Connect the pipework between the units. Do not leave pipe ends, valves etc. open to the atmosphere.

  R410A is very hygroscopic, and will absorb damaging levels of moisture if left open.

  Always use two spanners when tightening the flare nuts to avoid twisting the pipes. Use a small amount of refrigerant oil on the mating surfaces.
- **e.** Sight glasses and filter driers are not necessary, but if required should be fitted between the outdoor unit liquid shut off valve and the expansion device.

2E PRESSURE TESTING

The pressure testing section of the risk assessment template or equivalent should be carried out before commencing pressure testing.

Pressure and leak testing of the system should be completed in accordance with EN 378.

Note: The interconnecting pipework and evaporator are all on the low-pressure side of the system. The only high-pressure side of the system is within the condensing unit. Therefore, the pressure and leak testing of the pipework can be treated as such within EN 378.

The matched CXL evaporators all have a maximum allowable pressure of 29Barg

The CKL condensing unit is fitted with a 42Barg high-pressure limiting device

2F EVACUATING & REFRIGERANT

The Evacuation section of the risk assessment template or equivalent should be carried out before commencing Evacuation.

EVACUATING (CKL CONDENSING UNIT IS PRECHARGED WITH R32 - DO NOT RELEASE THE OUTDOOR UNIT SERVICE VALVES) UNTIL THE SYSTEM IS EVACUATED.

1. Release the nitrogen holding charge in the indoor unit to atmosphere. Connect a vacuum pump to the service ports on the outdoor unit valves and evacuate the indoor unit and connecting pipework to 1000 microns (1 Torr) or better and allow to be held for a minimum of 15 minutes.

2. Replace the caps on the service ports, (torque to 25NM).

Refrigerant Charge R32 for 3.0 Metres Always add refrigerant in the liquid phase	
System	Pre Charge (kgs)
CXL/CKL 40	0.46
CXL/CKL 60	0.81
CXL/CKL 80	1.65

ADDING REFRIGERANT

1. The charging of refrigerant section of the risk assessment template or equivalent should be carried out before commencing refrigerant charging.

2. A 3-minute delay occurs between successive compressor operations.

3. R32A should be introduced through the Schrader valve on the indoor unit, or the service port on the suction service valve on the outdoor unit. **No other refrigerant must be used.**

NOTE: LABEL R32 POE (supplied loose) TO BE FIXED ABOVE SERVICE VALVES.

1. Run the system for a few minutes to allow it to stabilize. Where possible, charge to a sweat line on the evaporator. Typical suction pressure on short lines at UK conditions should be approx. **6.2bar (90 psig)**

Additional Charge									
System	3m	6m	9m	12m	15m	18m	21m	24m	25m
CXL/CKL 40	0	0.06	0.12	0.18	0.24	0.3	0.36	0.42	0.44
CXL/CKL 60	0	0.06	0.12	0.18	0.24	0.3	0.36	0.42	0.44
CXL/CKL 80	0	0.09	0.18	0.27	0.36	0.45	0.54	0.63	0.66

Total Charge									
System	Pre Charge (kgs) 3m	6m	9m	12m	15m	18m	21m	24m	25m
CXL/CKL 40	0.46	0.52	0.58	0.64	0.7	0.76	0.82	0.88	0.9
CXL/CKL 60	0.81	0.87	0.93	0.99	1.05	1.11	1.17	1.23	1.25
CXL/CKL 80	1.65	1.74	1.83	1.92	2.01	2.1	2.19	2.28	2.31

2G SYSTEM ELECTRICAL DATA AND FUSES

The installer supplies mains, control and interconnecting cables: equipment must be earthed.
Wiring must be carried out in accordance with local and national codes.
Mains supply cables must be size compatible with the recommended fuse.
Cable clamps for use with stranded cables are to be used to secure incoming/outgoing cables. Installers must supply a method of securing solid sheathed cables.

FUSES: The system and its supply/interconnecting wiring must be protected by fuses, preferably High Rupture Current (HRC) motor rated types (to BS EN60269) or miniature circuit breakers to (BS EN60898) or local codes having similar time lag characteristics, that allow starting of the compressor yet still afford close overcurrent protection under running conditions. The ratings below are for HRC motor rated fuses.

Indoor	Rated Running Current
CXL 40	0.8A
CXL 60	0.8A
CXL 80	0.8A

Indoor	Outdoor	1ph Fuse Size
CXL 40	CKL 40	16A
CXL 60	CKL 60	20A
CXL 80	CKL 80	20A

Outdoor	Rated Running Current	Maximum Rated Current	Starting Current	Power kW	Max Power kW
CKL 40	5.4A	7.0A	26A	1.2	1.6
CKL 60	7.6A	9.9A	40A	1.7	2.2
CKL 80	9.2A	12.0A	61A	2.0	2.6

2H CONDENSING UNIT MAINTENANCE

The refrigerant recovery section of the risk assessment template or equivalent should be carried out before commencing refrigerant recovery.

Before engaging in any maintenance or repairs ensure

- Use of trained certified persons*.
- Well ventilated working environment.
- Use of a flammable gas leak detector.
- Correct selection of tools and equipment compatible with A2L refrigerants.
- Recovery of remaining refrigerant.
- Purging pipework with a suitable inert gas, prior to, during and for a suitable period after carrying out flame brazing to ensure that a flammable mixture cannot be formed.
- Adequate fire watch.
- Pressure testing of repair in accordance with EN378.
- Evacuation and dehydration in accordance with EN 378.
- Charging of the system in accordance with EN 378.
- Leak checking of the repair and system in accordance with EN 1516/2017.

Any other information identified within the site-specific risk assessment is available and taking into account.

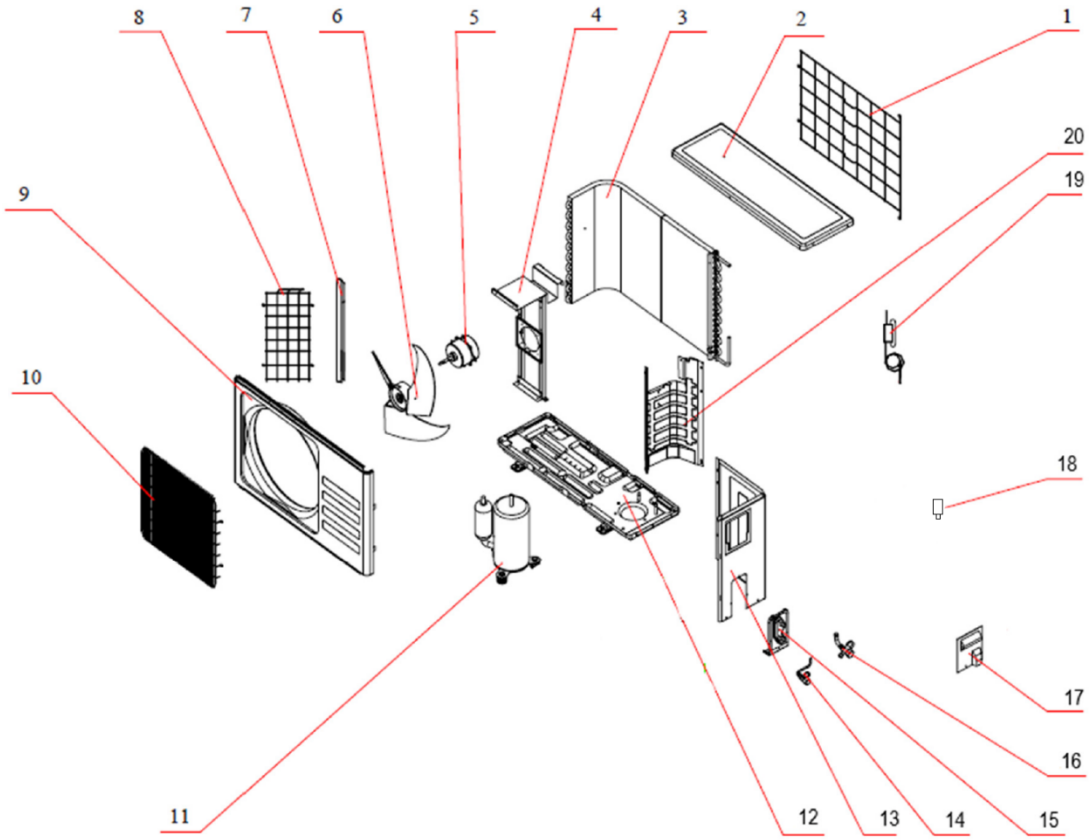
***NOTE: it is the responsibility of the operator to ensure the technician is certified to the correct standard (EN13313 or equivalent).**

IMPORTANT
ISOLATE THE UNIT PRIOR TO COMMENCING ANY MAINTENANCE OR REPAIR WORK

GENERAL

1. Ensure unit is not blocked or enclosed and there is adequate free airflow in and round the condensing unit.
2. Visually inspect the unit for wear and tear.
3. Remove the access panels (retain the screws).
4. Clean the base and insides of the unit.
5. Check all electrical connections are secure.
6. Check the face of the coil for cleanliness. Comb the fins if necessary.
7. Check the tightness of the compressor fixing bolts.
8. Check the fan rotates freely.
9. Check the pipework insulation condition.
10. Suction and discharge pressure.
11. Operation of head pressure control.
12. Visually check for oil patches.
13. Check safety labels are clear

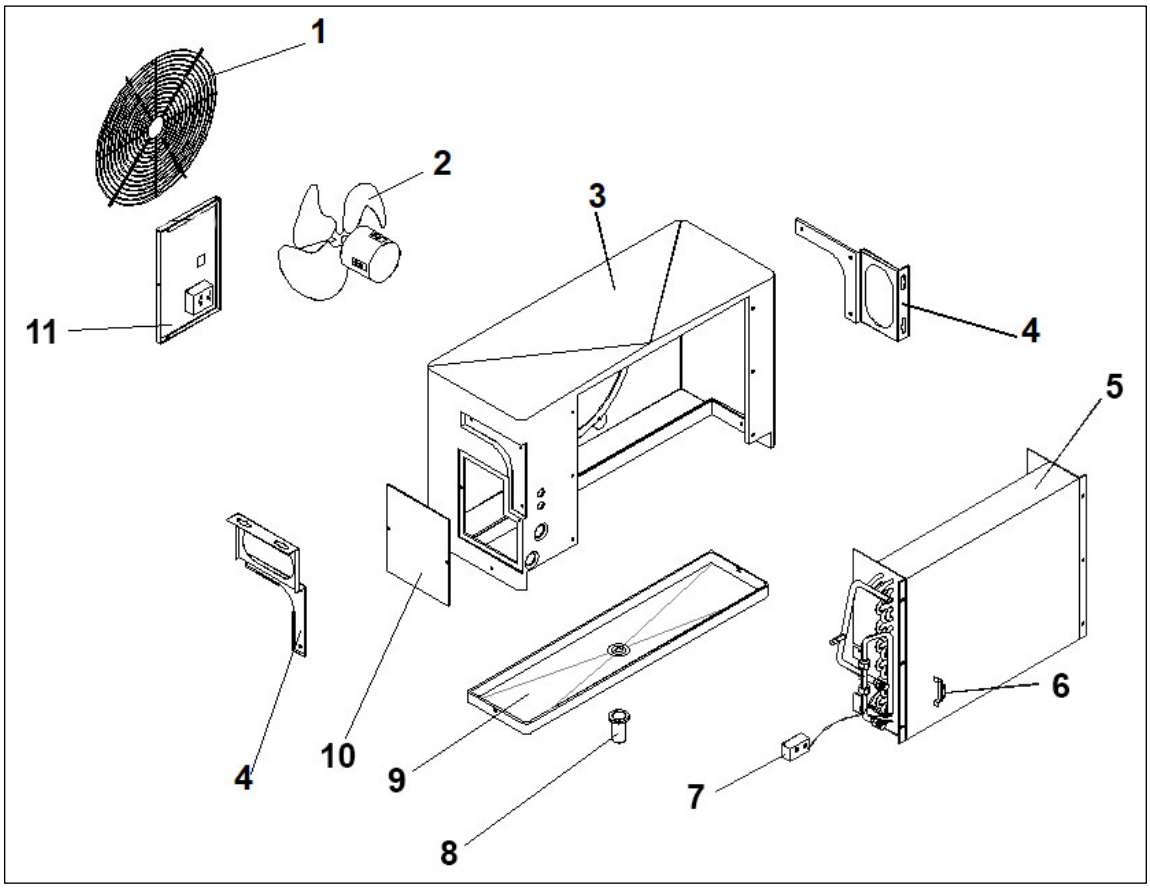
2I CONDENSING UNIT IDENIFICATION



1	Coil Grille	11	Compressor
2	Lid	12	Base
3	Condenser Coil	13	Right Hand Panel
4	Motor Bracket	14	Service Valve
5	Motor	15	Service Panel
6	Fan	16	Service Valve
7	Left Grille Support	17	Electrics cover
8	Rear Post	18	HP Switch
9	Front Panel	19	Capillary Assembly
10	Fan Guard	20	Partition Plate

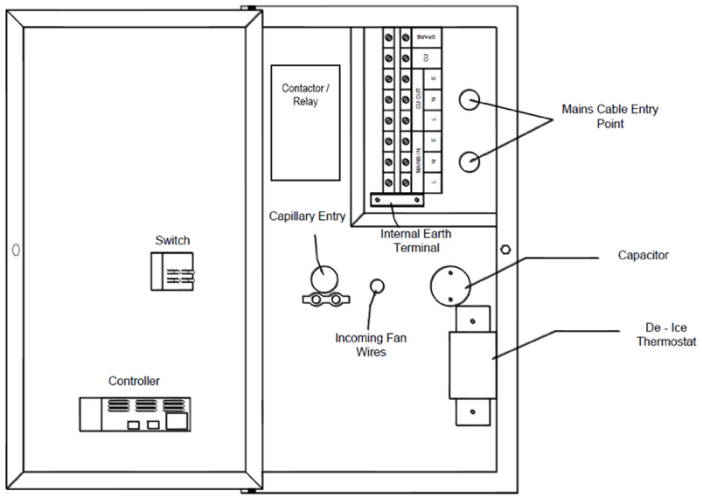
3 – EVAPORATORS

3A COMPONENT IDENTIFICATION

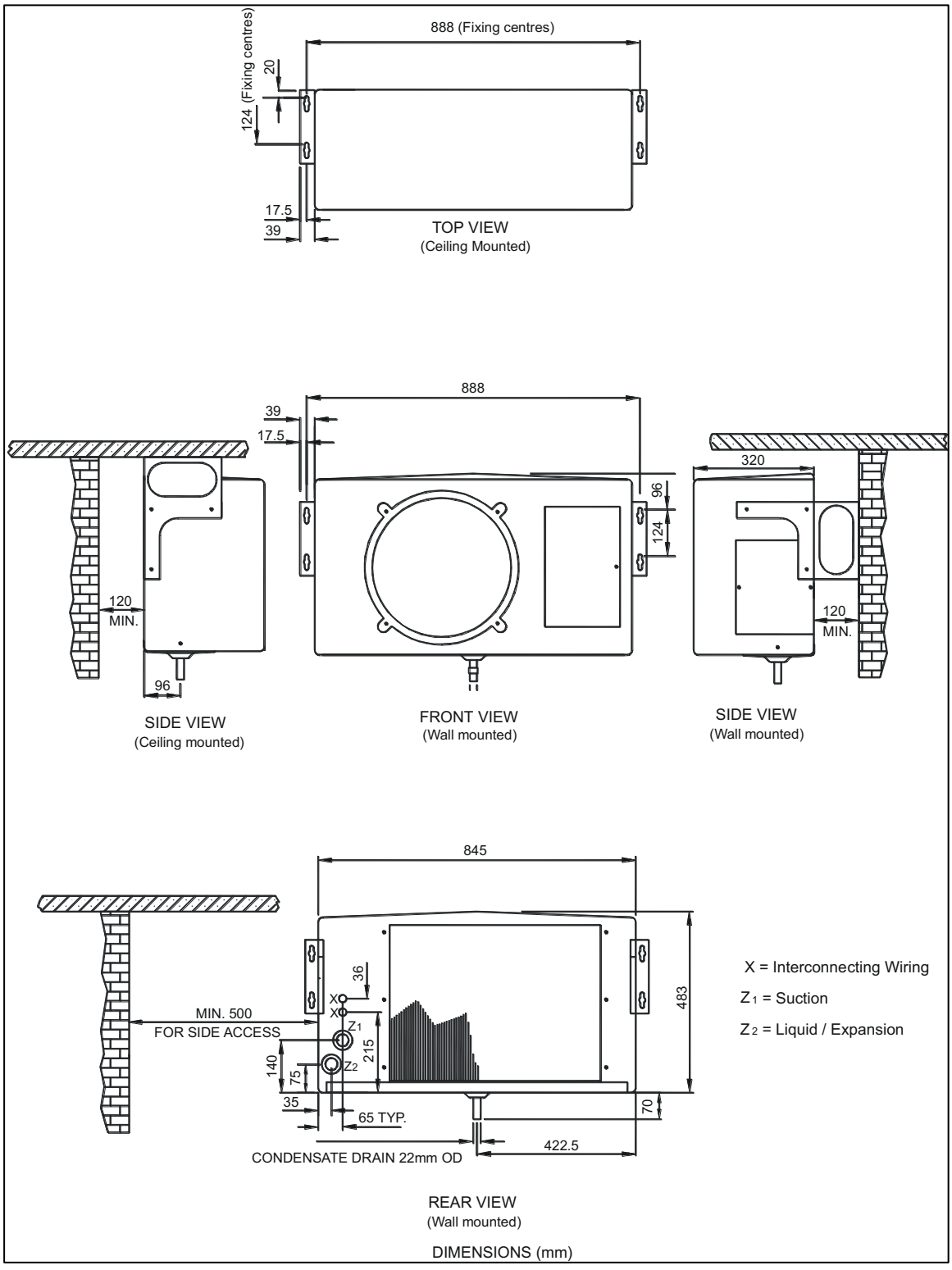


1	Grille	**7**	De-ice stat (option)
2	Fan / motor	**8**	Drain stub adaptor
3	Case	**9**	Drain tray
4	Wall / ceiling mounting brackets	**10**	Side access panel
5	Coil assembly	**11**	Electrics box door
6	Thermostat bulb & bracket		

INSIDE VIEW OF ELECTRICS BOX



3B UNIT DIMENSIONS



MODEL	UNPACKED				PACKED			
CXL	HEIGHT	WIDTH	DEPTH	WEIGHT	HEIGHT	WIDTH	DEPTH	WEIGHT
40	483	845	320	20	530	950	370	23
60	483	845	320	23	530	950	370	26
80	483	845	320	25	530	950	370	28

3C SPECIFICATION

AIR FLOWS

Model	l/s
CXL 40	0.66
CXL 60	0.58
CXL 80	0.55

SOUND POWER AND SOUND PRESSURE LEVELS

MAXIMUM SPEED	SOUND POWER LEVELS Frequency Hz						SOUND PRESSURE
	125	250	500	1K	2K	4K	dB(A)
CXL 40	71.7	69.2	69.1	67.1	63.2	58.5	40.5
CXL 60	70.1	68.2	68.6	66.1	63.2	57.5	39.9
CXL 80	70.1	68.2	68.6	66.1	63.2	57.5	39.9

UNIT ELECTRICAL LOADS [230V 50Hz 1Ph (A)

Indoor	Rated Running Current
CXL 40	0.8A
CXL 60	0.8A
CXL 80	0.8A

3D EVAPORATOR INSTALLATION

When installing a cellar cooling system utilising an A2L refrigerant it is important to ensure that sufficient free space is allowed around the evaporator. The correct amount of space will ensure that, in the unlikely event of a leak occurring, a flammable mixture is not created.

INSTALLATION

CONTENTS		
PARTS DESCRIPTION	QTY	ACTION
Envelope containing operating instructions and Declaration of Conformity	1	Pass to end user
Drain Stub/Nut/Gasket	1	Fitted by installer
Drain stub adaptor	1	Convert to 3/4" drain if required
Screw M5	6	To fix brackets to unit
Washer nylon	6	To fix brackets to unit

The unit may be mounted on a wall or solid ceiling using brackets supplied. It should be matched with the appropriately sized outdoor unit; this instruction should be used in conjunction with the outdoor unit installation instructions.

UNIT COMBINATIONS

Minimum Set Temeprature 8°C	
Indoor	Outdoor
CXL 40	CKL 40
CXL 60	CKL 60
CXL 80	CKL 80

1. Fit all kits prior to installing the unit.

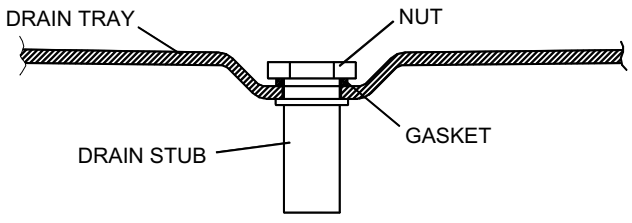
2. Ensure that the mounting surface will support the operating weight of the unit.

3. Mark out the mounting positions and drill holes to suit 6mm rawlbolt shields or equivalent strength fasteners (ensure that the unit is positioned to give sufficient access (min 0.5m) to the removable side panel).

4. Fix the mounting brackets to the unit in the correct position for wall or ceiling mounting.

5. Raise the unit into position and secure the fixings, ensuring that it is square and level.

6. Remove the drain tray then fit the drain stub, nut & gasket. Refit the drain tray



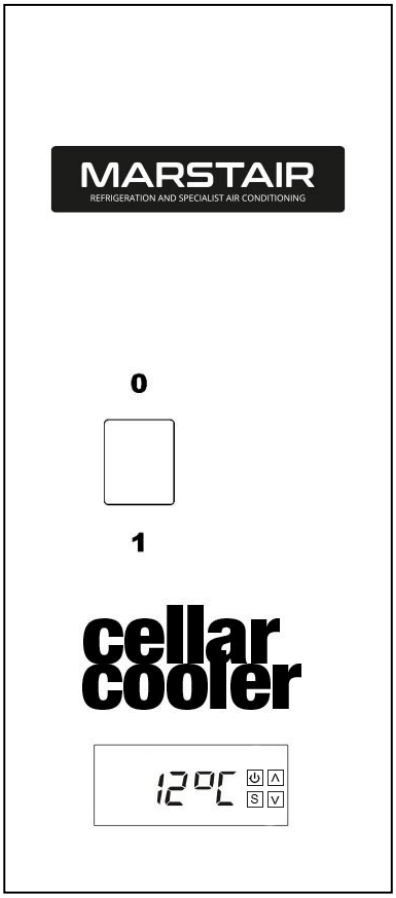
NITROGEN CHARGE

The unit contains a small charge of dry nitrogen, which should be discharged into the atmosphere. This is a non-toxic, non-ozone depleting gas with no global warming potent

3E EVAPORATOR OPERATION

Parameters

Code	Function	Set Range	Default Value	Note
F1	Temperature Set Value	-50.0 - 99.9°C	10.0°C	**Factory Set to 12.0°C**
F2	Difference Set Value	0.3 – 10.0°C	0.5°C	**Factory Set to 1.0°C**
F3	Compressor Delay Time	1 – 10 Minutes	3 Minutes	
F4	Temperature Calibration Value	-10.0 – 10.0°C	0°C	



PLEASE NOTE: On site only parameter F1 (Temperature Set Point) should be changed to suit site conditions. The other parameters should not be changed.

Changing Parameters

To change parameter values do the following:

To scroll through parameters, Press the 'S' key for 3s or more to enter parameter modifying mode. The set indicator light will illuminate, the screen will display the first menu code 'F1'.

Press and hold both the 'S' key and '▲' or '▼' to adjust values as required.

To save the parameter quickly press and release the ' ⏻ ' key to instantly save the modified parameter value and return to display the normal temperature value on the controller.

Please Note: After modifying parameter values if no keys are pressed within 10 seconds then the controller won't save the modified parameter and the screen will return to display temperature.

3F MAINTENANCE

The refrigerant recovery section of the risk assessment template or equivalent should be carried out before commencing refrigerant recovery.

Before engaging in any maintenance or repairs ensure

o Use of trained certified natural persons*.

o Well ventilated working environment.

o Use of a flammable gas leak detector.

o Correct selection of tools and equipment compatible with A2L refrigerants.

o Recovery of remaining refrigerant.

o Purging pipework with a suitable inert gas, prior to, during and for a suitable period after carrying out flame brazing to ensure that a flammable mixture cannot be formed.

o Adequate fire watch.

o Pressure testing of repair in accordance with EN378.

o Evacuation and dehydration in accordance with EN 378.

o Charging of the system in accordance with EN 378.

o Leak checking of the repair and system in accordance with EN 1516/2017.

Any other information identified within the site specific risk assessment is available and taking into account.

*NOTE: it is the responsibility of the operator to ensure the technician is certified to the correct standard (EN13313 or equivalent).

Regular inspection and periodic maintenance is enough to ensure long time usage.

• Make sure all electric connections are tightened.

• Make sure all fan screws are tightened.

• Make sure each fan is running freely.

• Make sure heat exchanger mounting is level and stable.

• Make sure that the system is evacuated well from air. There should not be air pockets inside of the coil.

• Cables should not be affected by heat of resistance.

• Make sure drainage water easily flows away. Please see water flows away easily with opening drain pan and side cover.

• Check safety labels are clear

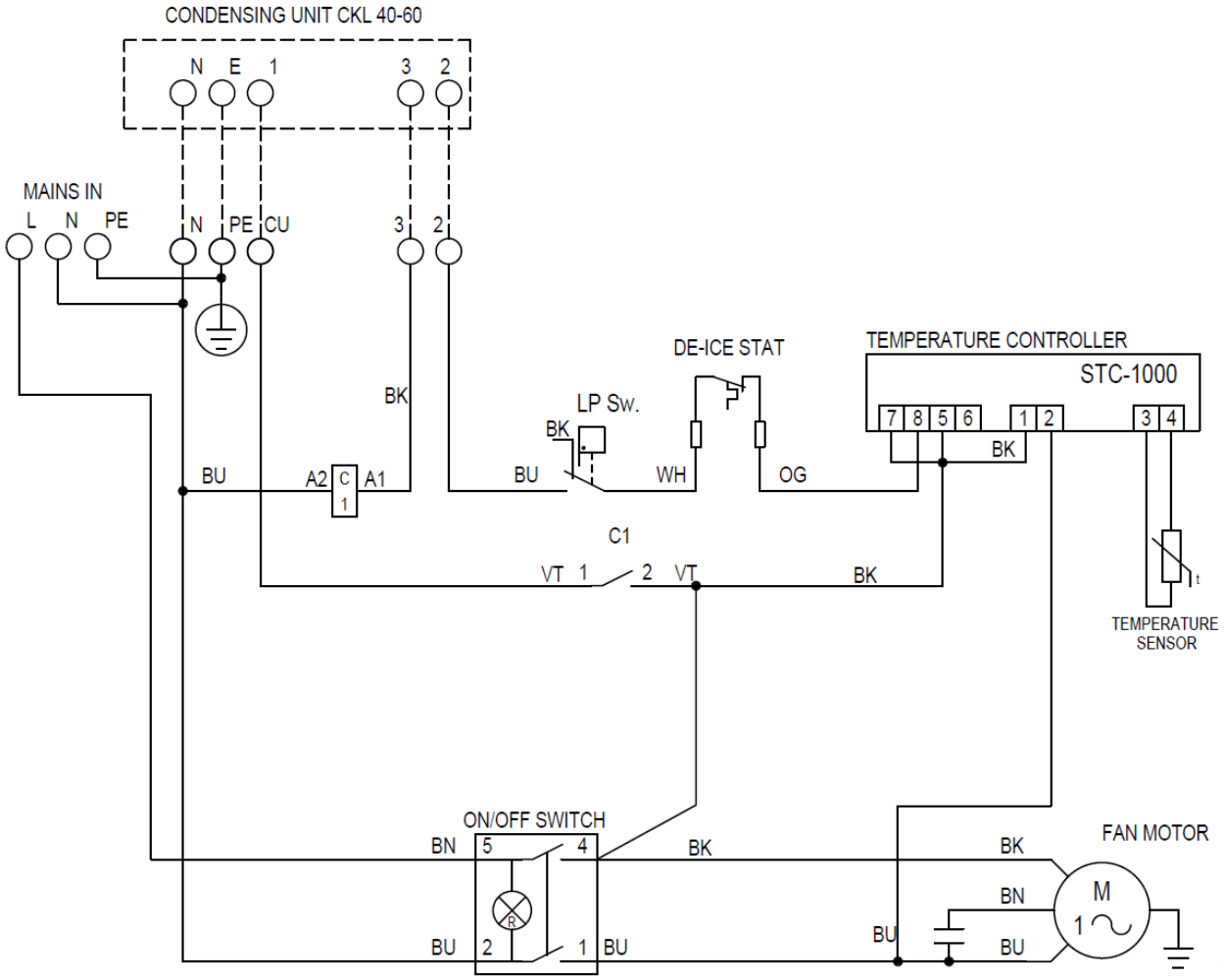
System is to be switched off and isolated during any repairs

3G ALARM INSTALLATION

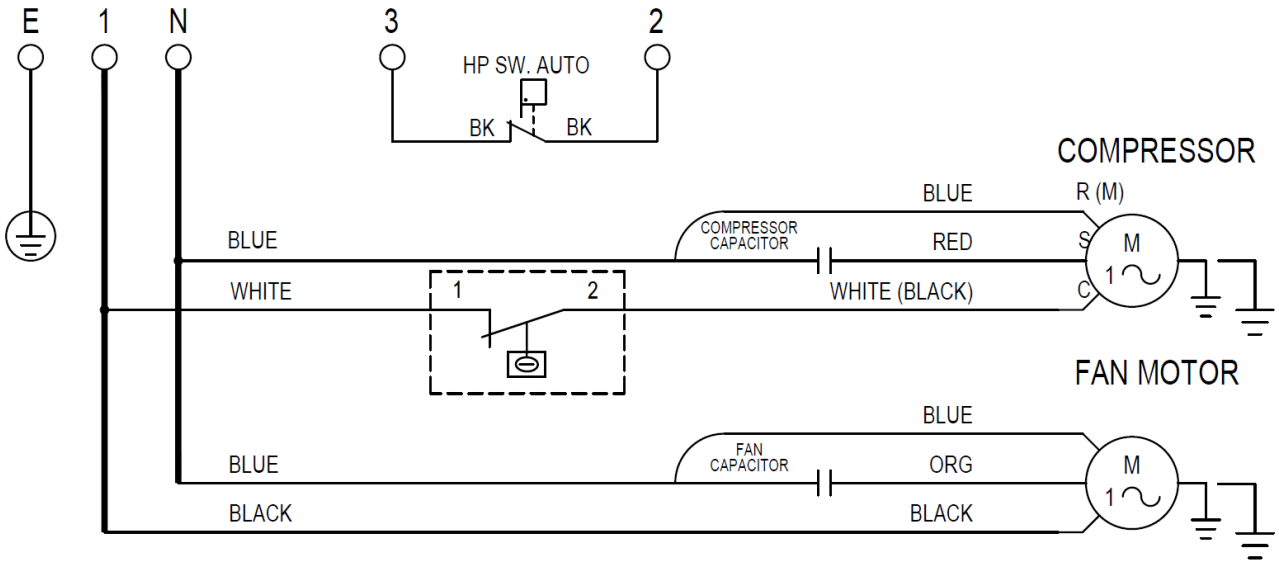
A method of alarm is required identify a potential loss of gas. This can be a cellar temperature "out of limits" alarm, or something more specific like a gas leak detector.
In the case of a leak the alarm should as a minimum either: -
• Alarm lamp flashing or lighting
• Alarm horn sounding
• Display warning on equipment controller
If leak detection is installed, it should be either the sensor type or via existing pressure sensing devices. The leak detection method (sensor type), needs to be calibrated/tested annually and sensitive to < 20% of the lower flammability level of the refrigerant. If the detector uses a drop in pressure, then it needs to be tested for correct operation. If a pressure type of detector is used, due to the inaccuracy of this method, the operator should assume that a flammable mixture could be present within the cellar and appropriate action must be taken

3H WIRING DIAGRAMS

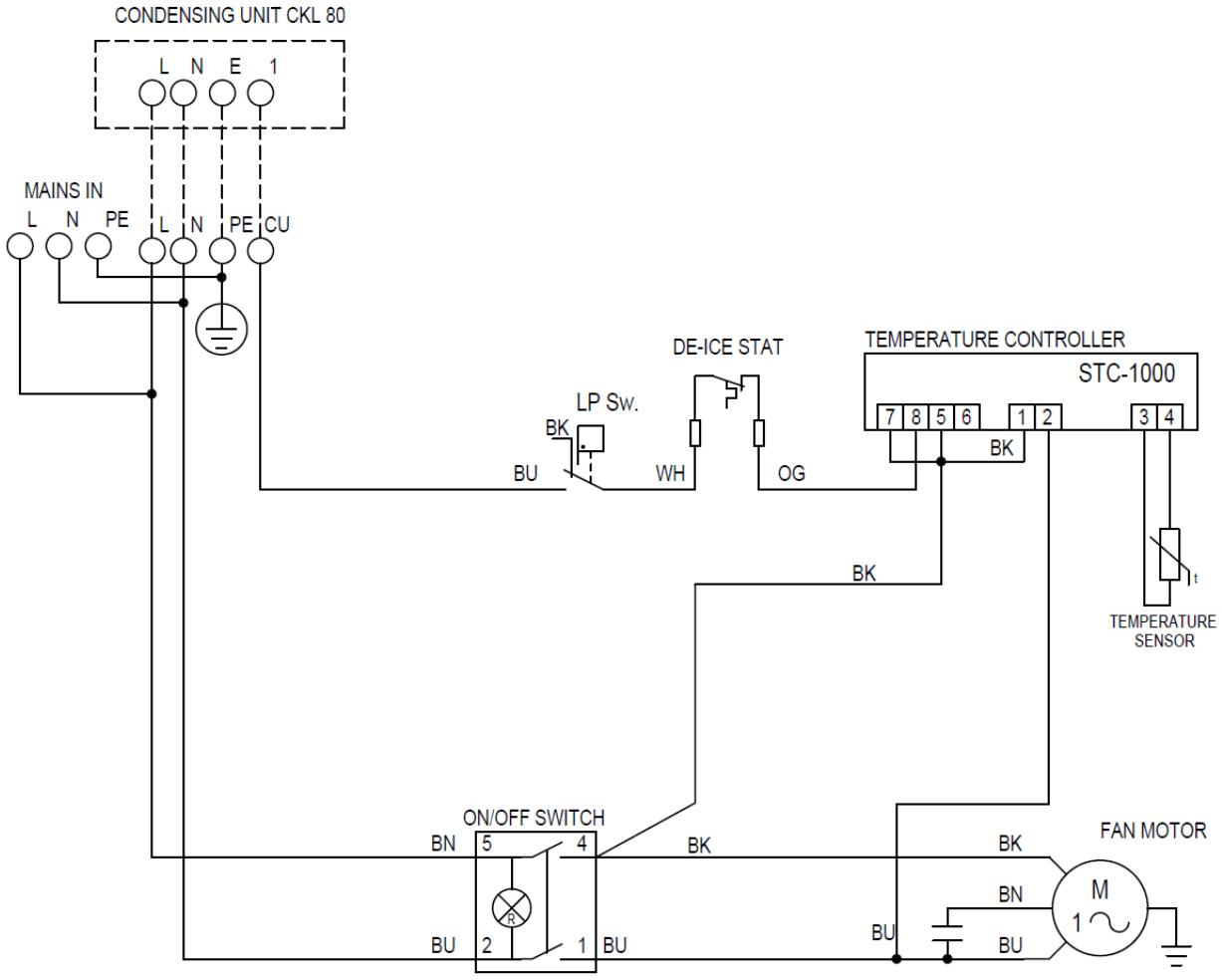
CXL Evaporator 40 & 60 + Interconnecting



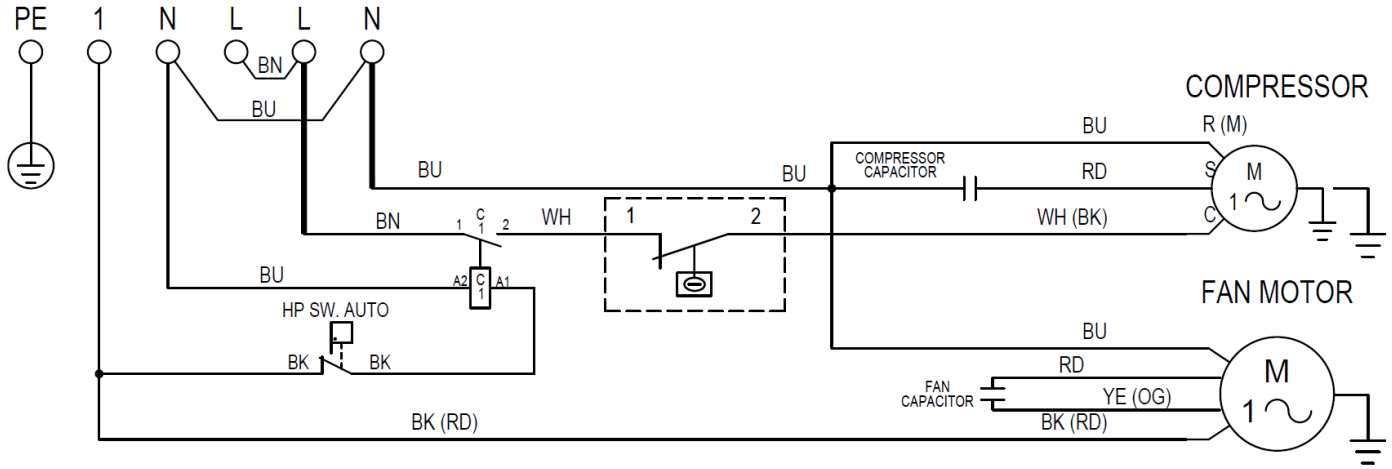
CKL 40 & 60 Condensing unit



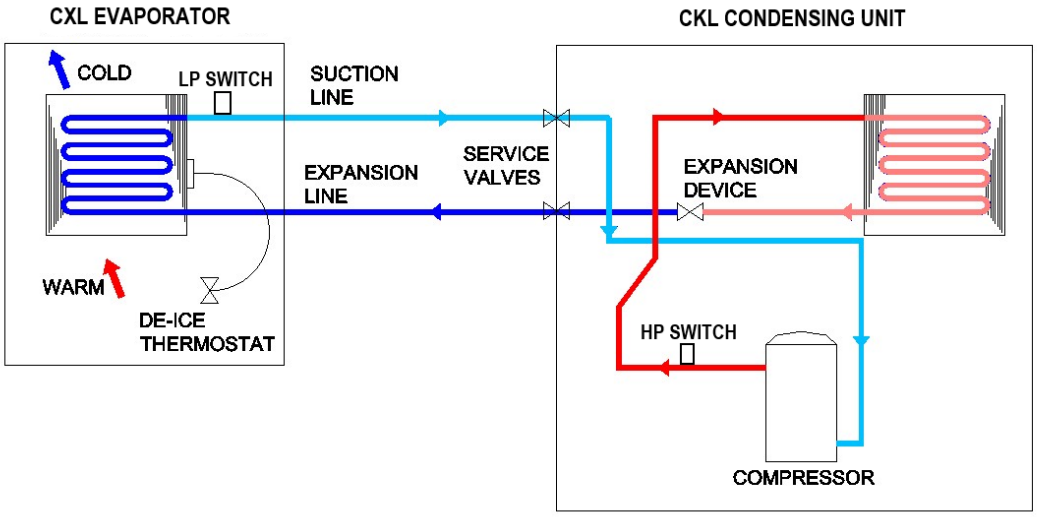
CXL Evaporator 80 + Interconnecting



CKL 80 Condensing unit



3I REFRIGERANT SYSTEM SCHEMATIC DIAGRAM



4 – REFRIGERANT CHARGE LIMITS / MINIMUM ALLOWABLE ROOM SIZES

CXL/CKL 40 & 60 systems

EN 378 allows M1 * 1.5 * LFL charge limits for A2L sealed systems.

R32 = 0.307kg/m3, M1 = 4m3, Allowable refrigerant = 4 * 1.5 * 0.307 = 1.842kg

CXL/CKL 40 & 60 systems up to 25m pipe runs do not exceed 1.842kg.

Ensure allow mechanical joint use thread lock to ensure system can be classed as a sealed system.

CXL/CKL 80 systems

EN 378 allows for larger A2L refrigerant charge levels within its C2 table.

Charge level limits are 20% X LFL & Room size.

Charge levels below 1.842kg can be allowed for using the M1 * 1.5 * LFL allowance above.

The table below shows the minimum allowable room size for CXL/CKL 80 systems.

CXL/CKL 80 - Minimum allowable room size									
Pipe run	3m	6m	9m	12m	15m	18m	21m	24m	25m
Refrigerant Charge	1.65	1.74	1.83	1.92	2.01	2.1	2.19	2.28	2.31
Minimum Room Size	No Limit	No Limit	No Limit	31	32	34	35	37	37

5 – SPARES

Products for spare parts, please ensure the use of official Marstair spares. Any spare parts taken from other companies, Marstair will not be responsible in case of any damage and will be out of warranty.

6 – END OF LIFE REQUIRMENTS

Refrigerant must be recovered by a certificated technician before the plant is dismantled. Modern refrigerant recovery machines should be able to remove well over 95% of the refrigerant in an old system.
All recovered refrigerants can either be:
a) Sent for destruction by incineration at a licenced waste facility

b) Sent to a specialist plant that can re-process the old refrigerant into a gas with properties identical to virgin refrigerant, to create “reclaimed refrigerant”

c) Given a basic cleaning process, to create “recycled refrigerant”

Given the refrigerant supply shortage that will be created by the phase down process, it is worth trying to send the old refrigerant for reclamation as it may have a good residual value. If the old refrigerant is too contaminated it cannot be reclaimed and must be sent for destruction. It is important not to mix different gases in the same recovery cylinder – as this would render them unsuitable for reclamation.
Reclaimed refrigerant can be used in any refrigeration equipment. Recycled refrigerant must always be used with care as it may be contaminated or of unknown composition.

7 – INSTALLATION RISK ASSESSMENT

Installation of an A2L Split Cellar System

Prior to installation, it is important to ensure that the location is suitable for this type of system and that the instructions have been followed with regard to the minimum room volume for the maximum charge weight. This assessment process is designed to augment a detailed risk assessment not replace it.

The A2L DSEAR Assessment has identified that if a cellar split system (typically less than 3kg refrigerant charge), is located correctly in accordance with the instructions, then the most likely point of leakage is a flare connection on the condensing unit, which will be located in free air outside. This will result in Zone 2 NE.

BS EN 60079-10-1 states that this zone may be treated as non-hazardous. Such a zone implies that an explosion, if it takes place, will have negligible consequences.

The following step by step assessment assumes that the site in which you are working has no specific risks or hazards. If this is not the case, a full assessment will be required

INSTALLATION

Question	N/A	YES	NO	Comments
1. Has correct PPE been selected?				If yes go to question 2 If no stop assessment
2. Are suitable first aid facilities available?				If yes go to question 3 If no stop assessment
3. Has the electrical supply been suitably isolated?				If yes go to question 4 If no rectify and reassess
4. Are hot works required for jointing of the refrigeration pipework?				If yes go to question 7 If no go to question 5
5. Are permanent mechanical joints required?				If yes go to question 20 If no go to question 6
6. Have the flare connections been made to a suitable standard?				If yes go to question 20 If no rectify and reassess
7. Are you competent to carry out brazing tasks?				If yes go to question 8 If no stop assessment
8. Brazing certificate number				
9. Has a suitable fire extinguisher been selected and a hot work permit been issued?				If yes go to question 10 If no stop assessment

10. Is the area adequately ventilated?				If yes go to question 11 If no stop assessment
11. Are the pressure regulators in date?				If yes go to question 12 If no rectify and reassess
12. Are the flash back arrestors in date?				If yes go to question 13 If no rectify and reassess
13. Has the oxyfuel equipment been leak tested?				If yes go to question 14 If no rectify and reassess
14. Has the Oxygen Free Nitrogen equipment been leak tested?				If yes go to question 15 If no rectify and reassess
15. Are all the cylinders upright and secure?				If yes go to question 16 If no rectify and reassess
16. Is Oxygen Free Nitrogen purging at the correct flow rate through the pipework?				If yes go to question 17 If no rectify and reassess
17. Has a full shutdown of equipment been completed upon conclusion of hot works				If yes go to question 18 If no rectify and reassess
18. Is a fire watch to be undertaken?				If yes go to question 19 If no rectify and reassess
19. Duration of fire watch				

PRESSURE TESTING

20. F Gas certificate number				
21. Is the system to be pressure tested with Oxygen Free Nitrogen?				If yes go to question 22 If no rectify and reassess
22. What is the required strength pressure test?				
23. What is the required tightness pressure test?				
24. Has the pressure been incrementally increased in a safe manner?				If yes go to question 25 If no rectify and reassess
25. Has the system passed the strength test?				If yes go to question 26 If no rectify and reassess
26. Has the system passed the tightness test?				If yes go to question 27 If no rectify and reassess
27. What was the duration of the tightness test?				
28. Has the system been safely de-pressurised into a well ventilated environment?				If yes go to question 29 If no rectify and reassess

EVACUATION

29. Has a flammable gas leak detector been energised and placed in a suitable location?				If yes go to question 30 If no rectify and reassess
30. Have all possible ignition sources been removed from the work area?				If yes go to question 31 If no rectify and reassess
31. Has a suitable vacuum pump been fitted to the system?				If yes go to question 32 If no rectify and reassess
32. Is the oil level satisfactory?				If yes go to question 33 If no rectify and reassess
33. Is the exhaust able to be discharged into a safe environment away from ignition source?				If yes go to question 34 If no rectify and reassess
34. Has a vacuum gauge been connected to the system?				If yes go to question 35 If no rectify and reassess
35. Has a suitable vacuum been achieved and held for a suitable period of time?				If yes go to question 36 If no rectify and reassess

CHARGING OF REFRIGERANT

36. Is additional refrigerant charge required?				If yes go to question 37 If no go to question 44
37. Is a suitable charging cylinder available fitted with the correct bottle adaptor?				If yes go to question 38 If no rectify and reassess
38. Have you selected a calibrated weighing platform?				If yes go to question 39 If no rectify and reassess
39. Calibration certificate number				
40. Has the charging hose been evacuated of air?				If yes go to question 41 If no rectify and reassess
41. Will the system be charged in liquid or vapour form?				
42. Has the correct additional charge been added in accordance with the manufacturers instructions?				If yes go to question 43 If no rectify and reassess
43. Can the equipment be energised to remove refrigerant from the charging hoses?				If yes go to question 44 If no rectify and reassess
44. Have the isolation valves been opened correctly?				If yes go to question 45 If no rectify and reassess
45. Has the system been leak checked with a suitable leak detector for A2L refrigerant?				If yes go to question 46 If no rectify and reassess
46. Have the running conditions of the system been checked/recorded?				If yes go to question 47 If no rectify and reassess
47. Have the charging hoses been removed safely and with minimum loss of refrigerant?				If yes go to question 48 If no rectify and reassess
48. Is the service valve leak free and cap replaced?				If yes go to question 49 If no go to question 50

REFRIGERANT RECOVERY

49. Have all of the tools, refrigerant and equipment been removed from site?				If yes end assessment If no rectify and reassess
50. Is the area adequately ventilated?				If yes go to question 51 If no rectify and reassess
51. Has a suitable flammable gas leak detector been energised and placed at a low level?				If yes go to question 52 If no rectify and reassess
52. Has a suitable recovery unit been fitted?				If yes go to question 53 If no rectify and reassess
53. Do you have a suitable recovery cylinder with adequate capacity?				If yes go to question 54 If no rectify and reassess
54. Have you placed it on to a suitable calibrated weighing platform?				If yes go to question 55 If no rectify and reassess
55. Calibration certificate number				
56. Have you documented the amount of refrigerant recovered and filled out the appropriate paperwork?				If yes go to question 57 If no rectify and reassess
57. Identify source of leakage and recommence assessment procedure.				

This information is to be given to the end user along with any other risks identified.