DAIKIN	**AIR COOLED COMMERCIAL REFRIGERATION SLIM UNIT COOLER**
INSTALLATION, MAINTENANCE	**IOM NO:** O-UC12-FEB23-3

Low Temperature

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O-UC12-FEB23-3

IMPORTANT!

READ BEFORE THE PROCEEDING!

GENERAL SAFETY GUIDELINES

This guideline is intended for users to ensure safe installation, operation, and maintenance of Daikin's unit cooler. This guideline is not intended to replace the system expertise available from the system manufacturers.

This equipment when connected to the outdoor unit is a relatively complicated apparatus. During installation, operation, maintenance or service, individuals may be exposed to certain components or conditions including, but not limited to refrigerants, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized operating/service personnel. It is expected that these individuals possess independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood this document and any referenced materials. This individual shall also be familiar with and comply with all applicable governmental standards and regulations pertaining to the task in question.

SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to specific situations:

 WARNING	Warning! Risk of serious injury or death to person!
 CAUTION	Caution! Danger which can lead to serious damages!
 NOTICE	Notice! Risk of damage to equipment!

DISPOSAL

At the end of the system's useful life, a suitably qualified engineer or serviceman should decommission it. The refrigerant and lubricant are classed as hazardous waste and as such must be reclaimed and disposed of in the correct manner. The system components to be disposed or recycled as appropriate in the correct manner.

CHANGEABILITY OF THIS DOCUMENT

In complying with Daikin' policy for continuous product improvement, the information contained in this document is subject to change without notice. Daikin makes no commitment to update or provide current information automatically to the manual owner. Updated manuals, if applicable, can be obtained by contacting the nearest Daikin Service office.

Operating/service personnel maintain responsibility for the applicability of these documents to the equipment. If there is any question regarding the applicability of these documents, the technician should verify whether the equipment has been modified and if current literature is available from the owner of the equipment prior to performing any work on the equipment.

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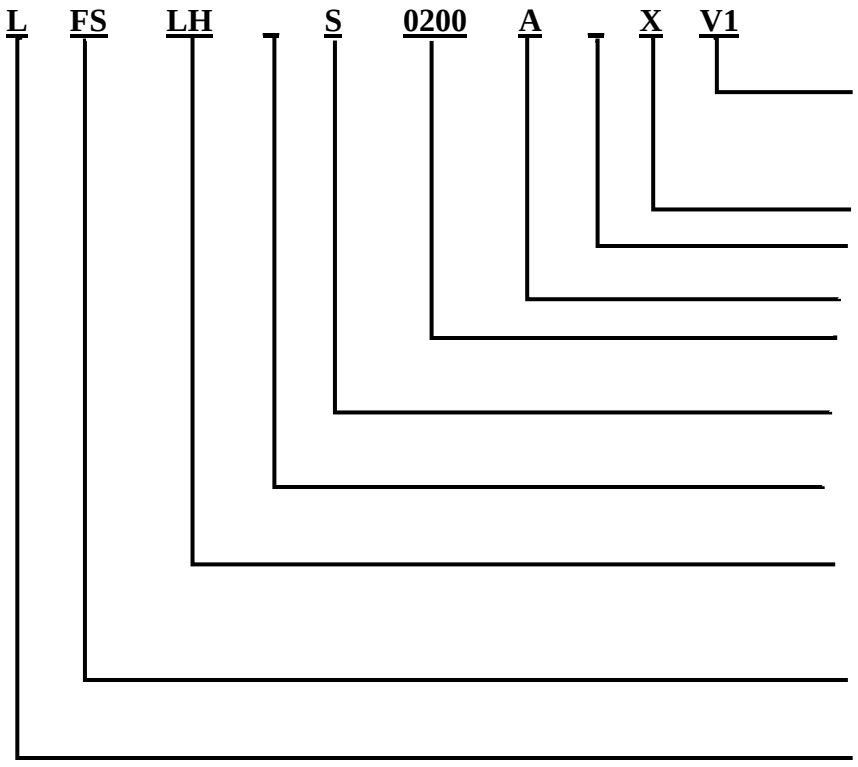
Nomenclature



Power supply,
V1 – 1ph/50Hz/220~240V;
Y1 – 3ph/50Hz/380~415V

Special symbol.

Minor change revision.

Model change revision

Cooler nominal capacity in kW
0200 – 2.0kW

Refrigerant:
P – R407C; Q – R410A; S – R404A

Special specification symbol, usually omitted

Function symbol
LN – Medium Temp. evaporator without heater;
LH – Low Temp. evaporator with heater

Unit Category:
FS- Indoor Slim Unit

Application Type:
L - Low temperature

Product Features

These evaporator DX units are designed for specific use in small cold rooms at negative temperature -28 °C to -13°C and it is compatible with multiple refrigerants: R404A, R410A, R507A, R448A and R449A. The design of the unit enables the maintenance access in ease.

- The coil is constructed from bare aluminum fins patterned V Wave with fins spacing 5mm, copper bare tubes with nominal diameter of 10mm. This fins pattern stands out for better performance of air flow and heat transfer.
- Superheat measurement, air tightness test and vacuuming could be done easily via the provided shredder port 7/16-20UNF which built into the suction header.
- Drain pan fitting ¾" BSP is supplied loose and must be fitted on site.
- Galvanized mild steel casing with polyester powder coating.
- Branded EBM single phase fan 230V/~/50Hz, 4 poles with protection class IP54. Low power consumption and integrate thermal protection by thermos contacts which ensure reliable protection against thermal overload.
- An electrical defrost heater is included at the lower portion of the coil, eliminating the needs for the drain pan heater.
- All the wiring from the motor and heater is terminated at the electrical box mounted externally.
- This product is only suitable for fixed installation and the fan is blow through coil, which allows the coil to remove the fan heat.

Specification

General

Model		LFSLHS0200AXV1	LFSLHS0300AXV1
Nominal Capacity	**kW**	2.0	3.0
Sound Pressure Level	**dB(A)**	60	60
General	**Power supply (V/Ph/Hz)**	220-240/1/50	220-240/1/50
	Size L/W/H (mm/mm/mm)	1381 x 510 x 238	1981 x 510 x 238
	Weight (kg)	27.0	35.0
	Room Temperature (°C)	-13 to -28	-13 to -28
	Refrigerant	R404A/R410A/R507A/ R448A/R449A	R404A/R410A/R507A/ R448A/R449A
	Max operating pressure (Bar)	25	25
Fan	**Fan Size (mm x Qty)**	300 x 2	300 x 3
	Air Flow (m^3/h)	1350	2025
	Fan Speed (rpm)	1250	1250
	Running current (A)	0.54	0.81
	Power Consumptions (W)	70	105
Air Throw	**Distance (m)**	7	7
Heater	**Power Consumptions (W)**	1300	2000
	Qty	1	1
Finishing	**Casing**	Galvanized & Powder Coated	Galvanized & Powder Coated
	Color	White	White
Connection Pipe Size (OD)	**Outlet (mm)**	15.88	19.05
	Inlet (mm)	12.7	12.7

* Nominal capacities are rated in accordance with EN 328, SC3 (wet coil condition) for R404A with TD = 7K.
* Sound Pressure Level is measured at 1m away from every side of the unit and 1m below fan center line, inside the anechoic sound room.
* Air throw distance is declared based on a final air velocity of 0.4m/s.

Capacity, R404A

Refrigerant	**Nominal Cooling Capacity, Qw for R404A (kW), TD =7K**			
Te / **Model**	-35	-30	**-25**	-20
LFSLHS0200AXV1	1.57	1.74	**2.0**	2.4
LFSLHS0300AXV1	2.34	2.67	**3.0**	3.33

TD = Air inlet temperature - Evaporating temperature at the outlet (Te)
Above table nominal capacities refer to wet coil cooling capacity, Qw

According to EN 328 standard condition refer dry coil condition denoted with Qstd

Standard Condition	Air Inlet Temperature, t_{A1} (^{0}C)	Evaporating Temperature (dew point), Te (^{0}C)	Relative Humidity Air Inlet, %	Wet Coil Factor
SC2	0	-8	85	1.15
SC3	-18	-25	95	1.05

Example: Model: **LFSLHS0200AXV1** and Te -25^{0}C

Dry coil capacity, Qstd = Qw/wet coil factor = 2.0/1.05 = 1.90kW

Capacity Factor

To calculate cooling capacity of different refrigerants, multiply the cooling capacity for R404A with the respective capacity factory.

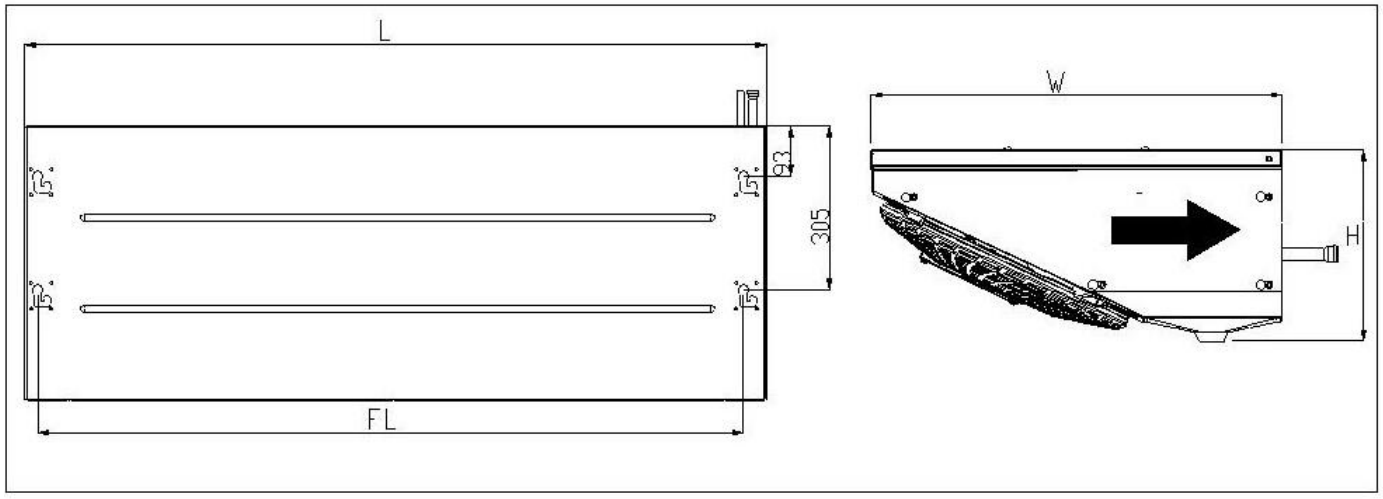
Refrigerant / Model	R404A	R410A	R507A	R448A	R449A
LFSLHS0200AXV1	1	1.1	0.95	1	1
LFSLHS0300AXV1	1	1.1	0.95	1	1

TD Correction Factor

To calculate cooling capacity for different temperature difference, multiply the cooling capacity obtained from section 2.2.2 with respective TD correction factor.

TD(K)	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5
Correction Factor	0.64	0.71	0.79	0.86	0.93	1	1.07	1.14	1.21	1.29	1.36

Unit Dimension



Model	L (mm)	FL (mm)	W (mm)	H (mm)
LFSLHS0200AXV1	1381	1313	510	238
LFSLHS0300AXV1	1981	1913	510	238

Health and Safety

CAUTION

Only a qualified refrigeration engineer/technician, who is familiar with refrigeration systems and components including all controls, should perform the installation and start-up of the system. To avoid potential injury, use care when working around coil surfaces or sharp edges of metal cabinets. All piping and electrical wiring should be installed in accordance with all applicable codes, ordinances, and local by-laws.

Before Installation

- Ensure the units received are the correct models for the intended application.
- If the holding charge (4 bars ± 1bar nitrogen) is not present, do not use the product and contact the sales representative immediately. (Manufacturer's warranty is void for damage caused by incorrect application or unit mishandling).
- The holding charge should be safely released through the schrader port on the suction header.
- Check there is no damage to the units (piping not dented, fan motor's electrical box with no sign of cracks). Any damage should be reported to the supplier immediately.
- Check to ensure tightness for the wiring and the fan.
- Check that the proposed equipment locations are suitable and provide adequate support for the weight of the units.

Offloading and Lifting

- Whenever handling a unit with packaging, it should be from the base (refer the marking on the carton box) and, where possible, all packing and protection is kept in position.
- When offloading the unpacked unit on the ground, the drain pan shall face upwards to avoid denting the drain pan (slope).
- Lift the unit from two ends for installation. If a lifting instrument is used, ensure cushion is used to protect the unit casing from damage.
- Do not drop the unit. Should this inadvertently happen, it should be immediately inspected for damage.

During Installation and subsequent maintenance

- Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations and experienced with this type of equipment.
- Safe working methods are identified, and operatives have suitable PPE.
- Ensure the working area has adequate ventilation during brazing procedures.
- The units contain moving machinery and electrical power hazards, which may cause severe injury or death. Disconnect and shut off power before installation or service of the equipment.
- Refrigerant release into the atmosphere is illegal. Proper evacuation, recovery, handling, and leak testing procedures must always be observed.
- Units must be **grounded to the screw terminal** labelled 
- No maintenance work should be attempted prior to disconnecting the electrical supply.
- The electrical covers and fan guards must remain always fitted.
- Use of the units outside of the design conditions and the application for which the units were intended may be unsafe and be detrimental to the units, regardless of short- or long-term operation.
- The units are not designed to withstand loads or stress from other equipment or personnel. Such extraneous loads or stress may cause failure/leak/injury.

Installation

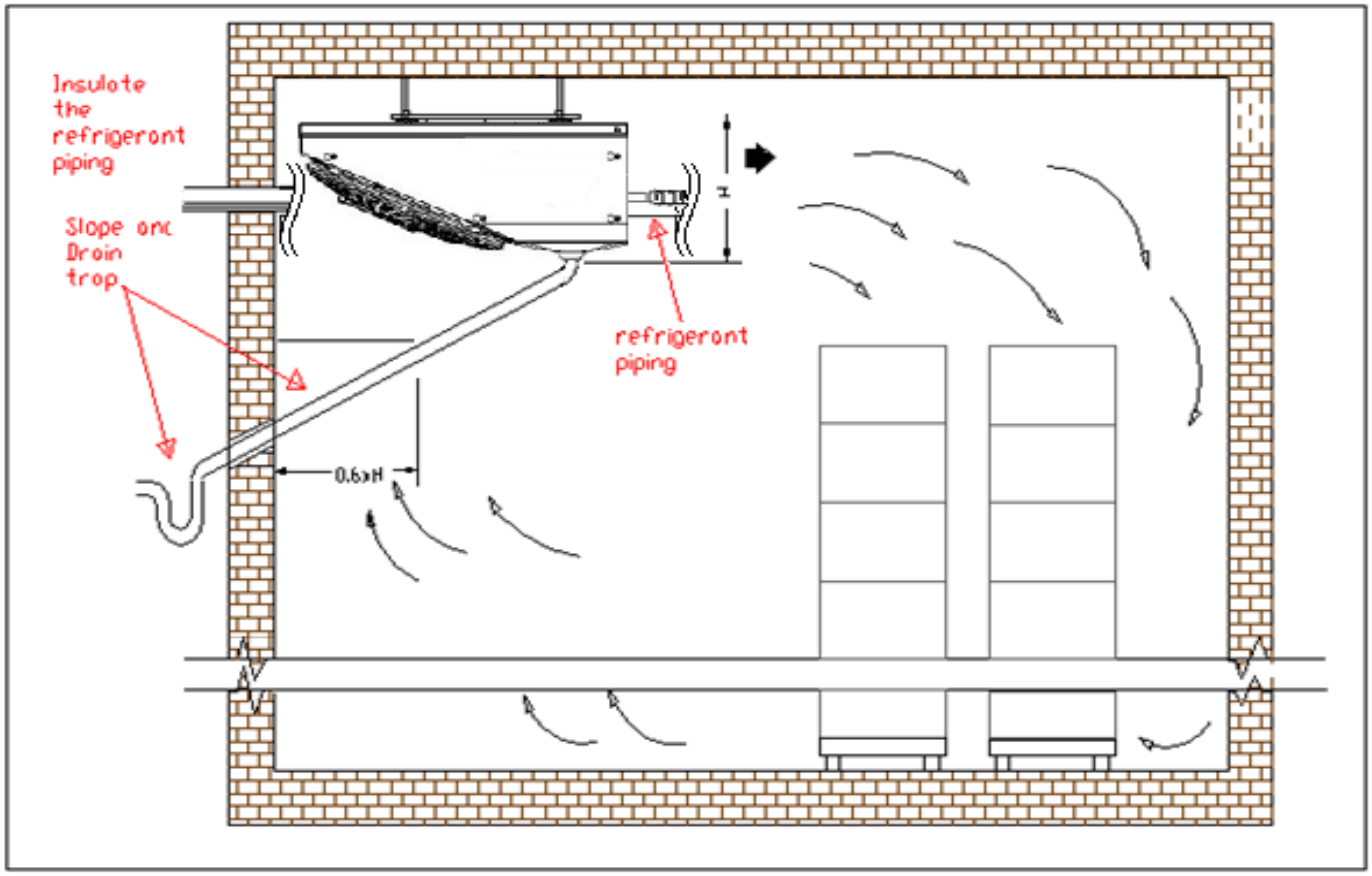
Unit location and Fixing

- All indoor units must be level in all directions, to ensure water condensation can be properly drained out.
- The indoor units can be mounted directly to the ceiling utilizing the fixing holes on the top of the unit. No additional brackets are required.
- Position the indoor unit where the optimum airflow can be achieved. Avoid locating in corners or in alcoves which may restrict airflows. For best performance, it is desirable to arrange the air blowing toward the door to minimize the entrance of warm moist air when door is open. Light fixtures, shelving and product boxes must be arranged in such that it does not block the air intake and air discharge from the unit cooler.
- A minimum 10mm raw bolt type fixing is required with a large steel washer to bear the indoor unit weight. It is important to ensure that the wall/ceiling can withstand the unit weight and that all fixings are secure.
- The installation location should allow sufficient space for air flow and maintenance around the units:

NOTICE

- **The fan face must be located a minimum of 600mm (H) from walls to assure unrestricted air intake.**
- **Ensure that the ceiling can withstand the unit weight and that all fixings are secure.**

Figure 1: Minimum Wall Distance and Drain Trap



Field piping

Use of incorrect pipe sizes affects the system's oil return and pressure drops. Refer information given on *Page 3*. All local codes of practice must be observed in the installation of refrigerant piping.

NOTICE

To ensure satisfactory operation and performance, the following points should be noted for field piping arrangements:

- Pipework routes must be as simple and as short as possible.
- Use of incorrect pipe sizes can affect system pressures/temperatures and gas velocity for proper oil return.
- Avoid low points on pipework where oil can accumulate.
- Use only clean, dehydrated refrigeration grade copper tube with long radius bends.
- When brazing use only silver alloy rods.
- Run braze without over filling to ensure there is no leakage into the tube.
- To prevent oxidization, blow oxygen free nitrogen through pipework when brazing.
- Protect the casing of the unit when brazing connections.
- Install insulation with a minimum wall thickness of 3/8" on suction lines to prevent sweating and ensure only superheated vapor is returned to compressor suction.
- Adequately support all pipe work at a maximum of 2-meter intervals.

Pressure testing

- The unit cooler has been pressure tested in the factory prior to dispatch. The indoor unit contains a holding charge of oxygen free nitrogen.
- Once the pipework installation is complete, it should be pressure tested prior to evacuation to test for leaks.
- A pressure leak test should be carried out using oxygen free nitrogen (OFN). NEVER USE OXYGEN FOR PRESSURE TESTING SYSTEMS. A calibrated nitrogen pressure regulator must always be used. Before starting any pressure testing, ensure the area surrounding the system is safe, inform relevant personnel and fit warning signs indicating high pressure testing. Also, use correct PPE as required.

A simple procedure for testing as follows:

- Connect a pressure hose from the regulator to the schrader connection on the service port of the unit.
- Pressure system slowly up to 3 bar (45 psi) for 5 minutes and check for any signs of leakage.
- Increase pressure slowly up to 10 bar (150 psi) for 5 minutes and check for any signs of leakage.
- Increase pressure slowly up to 20 bar (300 psi) and check for any signs of leakage. Leave system under pressure for 24 hours.

- Listen for any possible leaks and check all joints with bubble spray. If any leaks are discovered, release pressure slowly from system until empty, repair leak and then restart pressure testing procedure. Never attempt to repair a leak on a pressurized system.

A strength test should also be incorporated according to local regulations.

Once testing has been completed satisfactorily, release the pressure from the system gradually and safely to external atmosphere.

Evacuation and Charging

NOTICE

Moisture prevents proper functioning of the compressor and the refrigeration system. Ensure that a good quality vacuum pump is used to pull a minimum vacuum of 250 microns (0.25 torr).

Once pressure testing has been completed, the system can now be evacuated to remove air and any moisture from the piping. This can be done as follows:

- Ensure any nitrogen charge is safely released from the system.
- Connect a gauge manifold to the schrader connection of the unit.
- Connect a vacuum pump and vacuum gauge to the system.
- Evacuate the system until vacuum is below 250 microns (0.25 torr).

Note: A triple evacuation procedure is recommended for all new systems or where moisture is suspected.

Once the system is isolated and the vacuum pump is switched off, any rise in pressure indicates that either there may be a leak in the system or moisture is still present. In this case, recheck the system for leaks, repair as necessary, and then restart the evacuation procedure. Once completed satisfactorily, the vacuum pump and vacuum gauge can be removed.

Drainage

NOTICE

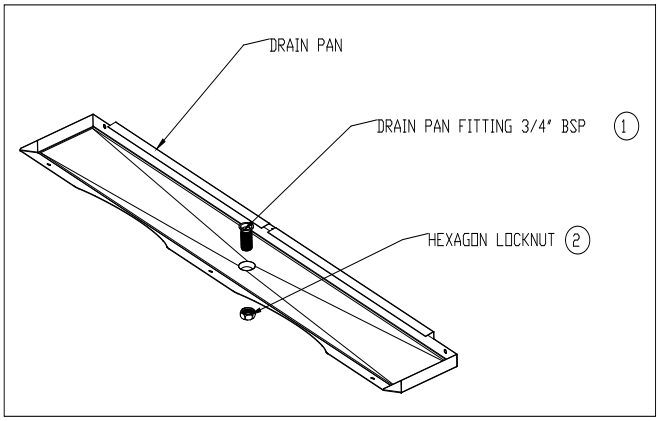
The evaporator drain pan fitting is supplied loose and must be fitted on site.

Correct fitting is vital to ensure leak – free operation. The lock nut on the drain fitting **MUST** be fitted the right way around; otherwise, it will not tighten against the drip tray. One side of the nut has an angled recess – this must be facing towards the drip tray. The fitting does not require any sealant, but a small amount of silicon sealant can be applied between the flared face of the fitting and the drip tray if so desired.

The fitting is tied to the indoor unit's fan guard and consists of:

- 1pcs aluminum alloy drain fitting 3/4" BSP male thread and
- 1pcs hexagon locknut.

To install the drain fitting, firstly unscrew the drain pan from the indoor unit. Locate the drain fitting into drain pan, followed with locknut to secure the drain fitting to the drain pan. Then refit the drain pan to the unit. Follow diagram below to install the drain fitting in the correct way.



The locknut only requires hand tightening and then pinching up with a spanner. Do not over tighten, else the threads may strip from the nut and damage the tray.

Recommended minimum drainpipe diameter is 20mm or 3/4". The drainpipe material could be either copper or plastic. It is not recommended to use flexible hose as it tends to kink easily which might cause blockage and water to back up in the unit.

Drainpipe must be leveled to permit free draining of condensate from unit cooler.

Drain traps need to be installed for trouble free operation. If the unit cooler is operated without the **drain trap**, warm air with higher temperature will draw from outside to the cold room. Thus, warm air will significantly reduce the cooler capacity and may lead to ice formation in the drain pan.

If the temperature surrounding the drain line and trap is below freezing (0°C), it must be wrapped with a drain line heater. Drain pan coupling and drainpipe must be insulated up to the external wall surface of the cool room. Make sure the drain pan and drain line is free from debris to avoid clogging and cause overflowing.

Expansion Valve

- Expansion valve is not pre-fitted into all unit models.
- External pressure equalization type thermostatic expansion valve needs to be used with this type of unit cooler to compensate pressure drop through the evaporator and distributors.
- For one outdoor to one indoor system low temperature application, a maximum operating pressure (MOP) type expansion valve must be used to limit the suction pressure rise to a maximum of 4 bar relative (-5^{0}C). Higher suction pressure than compressor working envelope might cause compressor overload. Do not apply both suction pressure regulator and MOP-type expansion valve in combination with one another.
- When required, access to the adjusting screw of expansion valve to alter the suction superheat. To avoid liquid back to compressor, it is recommended suction superheat 10K to 20 K for normal operating condition.

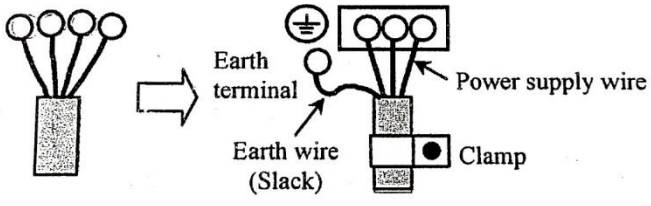
Electrical

WARNING

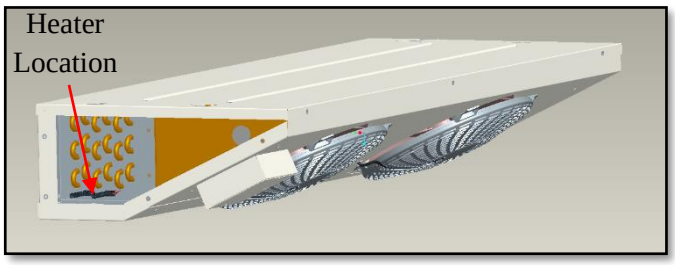
- **The mains electrical supply to the indoor unit must be via a suitably rated isolator and motor rated circuit breaker or fuse.**
- **Check electrical safety (leakage current, withstand voltage, earth continuity) after connected to heaters, fuse, and timers.**
- **Thermal fuse must be supplied by site to protect the defrost heater from overheating.**

Daikin Slim Unit Cooler require a **230 volt / 1 phase / 50Hz** supply which must include Earthing. They are not suitable for any other supply voltages (other than a deviation of +/- 10% of the above values) and are not suitable for 60 Hz supplies.

Units must be earthed, and no maintenance work should be attempted prior to disconnecting the electrical supply. Installation of earth wire should be made to earth screw before connecting the live wires. The earth wire shall be slacked with longer length as shown in below diagram.



- Cable type and sizing must be selected for the application and the electrical installation should conform to the current local standards. The power cable to the indoor unit should be 3 core (2 core + E).
- Cables to the indoor unit should be routed through the bush wires of the electrical metal enclosure.
- Removal of the metal cover plate gives access to the terminal blocks for the fan and heater. The wiring diagram could be found at the inner side of the metal cover plate.
- A defrost heater is pre-inserted at the bottom of the coil. To protect the heater from overheating, it is important to install a thermal fuse (to be supplied by site) in the heater circuit. The thermal fuse should be appropriately located to cut off safely when the heater is overheated.



Commissioning

NOTICE

Before starting the system, ensure that all electrical connections are correctly made and tight, and all covers and guards are fitted.

After the installation is completed, a review of the following items should be performed before the system is placed into operation:

Check electrical connections, fan motors, fan guard and all other fasteners for tightness. Ensure the thermostatic expansion valve bulb is properly located, strapped, and insulated.

With the system operating, check the supply voltage. It must be within +/- 10% of the voltage marked on the unit nameplate.

WARNING

Be alert that during defrosting, the surrounding temperature of the unit may rise dramatically. Kindly keep a safe distance from the unit.

A defrost cycle is needed when the frost build up is such that it impedes the airflow through the coil. The defrost settings is vary for each installation and may need to be changed depending on the time of the year and other conditions.

Check the drain line and make sure drain line is clear and unit is aligned in all position to avoid overflow of condensation water.

Service and Maintenance

A preventative maintenance schedule should be set up as soon as the Unit Cooler is installed. The unit should be inspected periodically for proper operation and buildup of dirt.

1. Inspect and clean the drain pan to ensure there is no blockage. The drain pan should be cleaned regularly with warm water and neutral detergent.

2. The cabinet can be cleaned with water and neutral detergent. DO NOT clean the fans and fins using a water jet or high-pressure cleaner.

3. The evaporator coil should be checked once a month for proper defrosting. Many variables affect coil frosting such as room temperature, type of product being stored, how often new product is brought in and the length of time the door to the room remains open. Summer conditions of high humidity can cause heavier frost loads. It may be necessary to change the numbers of defrost cycles seasonally.

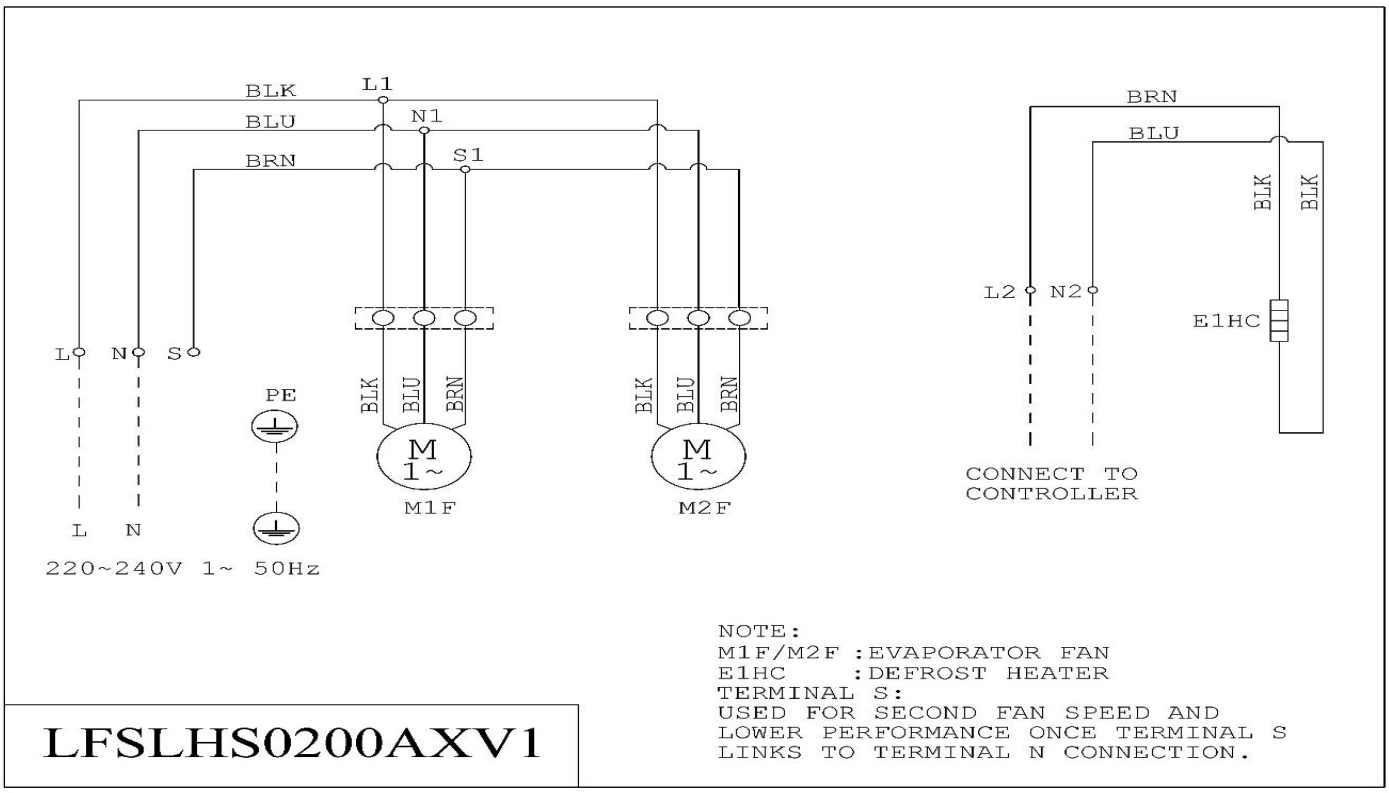
4. At least every six months check all fan motors. Tighten motor mounting screws and fan set screws.

Table 1: Troubleshooting Chart

PROBLEM	POSSIBLE CAUSES	CORRECTIVE ACTION
Excessive buildup of frost on coil.	• Defrost time is too short. • Too high humidity in room.	• Extend defrost period on the temperature controller. • Limit access to cold room; do not keep doors open during stocking.
Accumulation of ice or water in drain pan.	• Drain line plugged. • Drainpipe does not have slope angle. • Indoor unit does not install in level at all directions. • Drain line does not have drain trap.	• Clean drain line. Make sure drain line is insulated properly. • Install the drain line with slope. • Check unit installation and align the unit level at all directions. • Install drain line trap.
Noise	• · Resonance on the vibrating mounting parts. • Vibration of fan or fan mounting misaligned.	• Fix the position of vibrating part correctly. • Fix the position of fan correctly; replace if defective.
Room temperature too high (not cold)	• Incorrect setting on the temperature controller. • The compressor stopped by alarms triggered on the controller. • Incorrect sensor temperature. • Insufficient refrigerant flow to evaporator. • Thick frost built on evaporator coil. • Too frequent defrosting. • Incorrect matching of indoor capacity to outdoor.	• Correct the temperature controller setting. • Check the type of error, fix the error and replace the defective parts if any. • Check the room temperature sensor location. Ensure it was not affected by other sources. • Check for any refrigerant leakage or choking on expansion valve. Repair the fault and charge system if necessary. • Defrost the coil and clean the frost. • Reduce defrost cycle frequency. • Review and reselect the unit combination.

Wiring Diagram

LFSLHS0200AXV1



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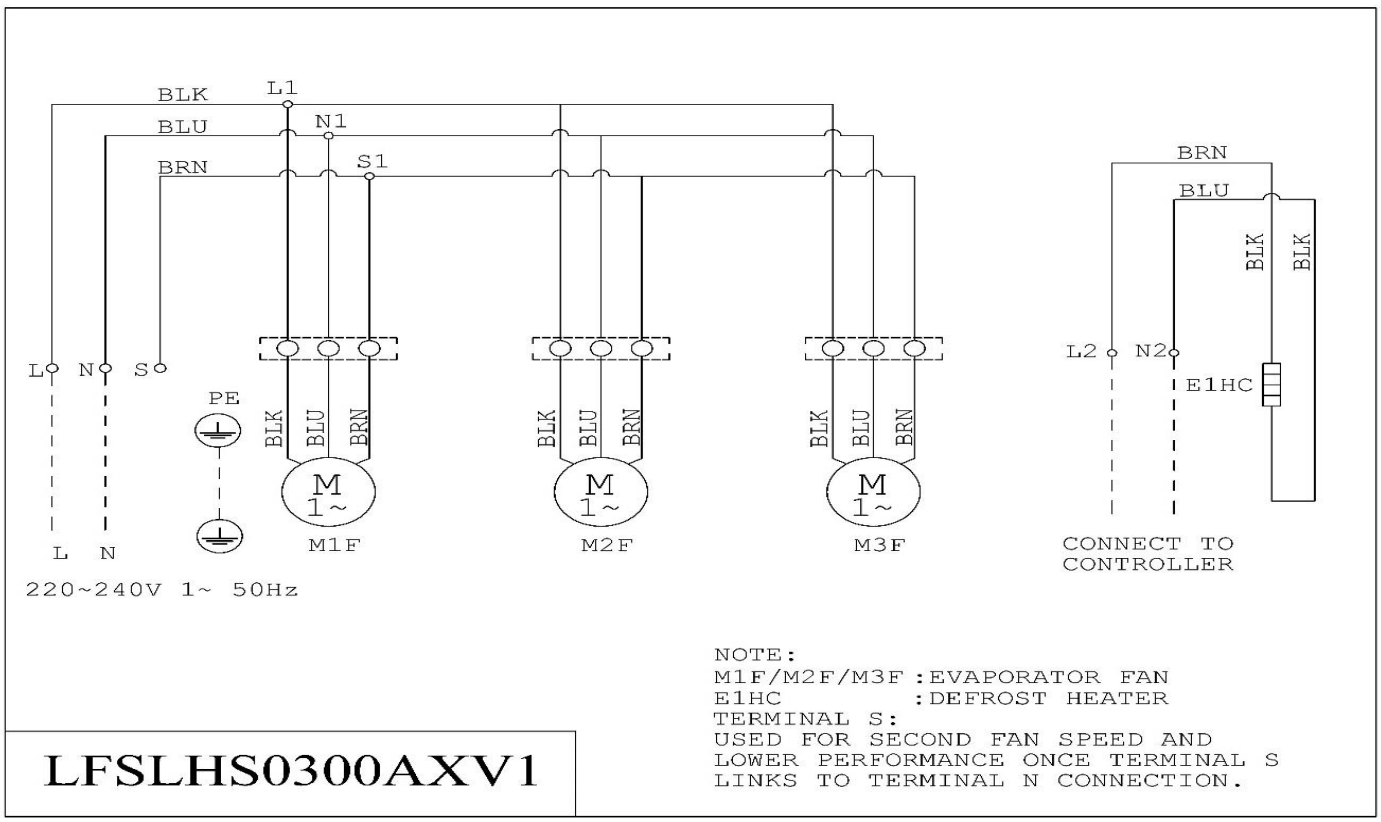

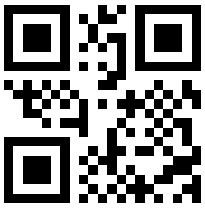

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DAIKIN REFRIGERATION MALAYSIA SDN. BHD. ***(34543-W)***
Shah Alam Plant: 11A, Jalan Utas 15/7, Seksyen 15, 40200 Shah Alam, Selangor, Malaysia.
Banting Plant: Lot 10, Jalan Perusahaan 8, Kawasan Perusahaan Pekan Banting, 42700 Banting, Selangor, Malaysia.
Tel: 603-3187 2911 Fax: 603-3187 8597

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