



M-SERIES

Air Conditioners

SVZ-AP12,18, 24, 30, 36NL*

SERVICE MANUAL

For use with R454B

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1. Safety Precautions

Always observe for safety!

Before obtaining access to terminal, all supply circuits must be disconnected.

1.1. Symbols used in the text



WARNING

Describes precautions that should be observed to prevent danger of injury or death to the user.




CAUTION





Describes precautions that should be observed to prevent damage to the unit.



FLAMMABLE REFRIGERANT WARNING

This unit uses a flammable refrigerant. If refrigerant leaks and comes in contact with fire or heating part, it will create harmful gas and there is risk of fire.

 : Indicates a part which must be grounded.

Meaning of symbols displayed on unit			
	Refrigerant Safety Group A2L	Warning! (Risk of fire)	<u>This unit uses a flammable refrigerant.</u> If refrigerant leaks and comes in contact with fire or heating part, it will create harmful gas and there is risk of fire.
	Read the OPERATING INSTRUCTIONS carefully before operation.		
	Service personnel are required to carefully read the OPERATING INSTRUCTIONS and INSTALLATION MANUAL before operation.		
	Further information is available in the OPERATING INSTRUCTIONS, INSTALLATION MANUAL, and the like.		

1.2. Cautions for service



CAUTION

1. Perform service after recovering the refrigerant left in unit completely.
2. Do not release refrigerant in the air.
3. After completing service, charge the cycle with specified amount of refrigerant.

1.3. Warning for service



WARNING

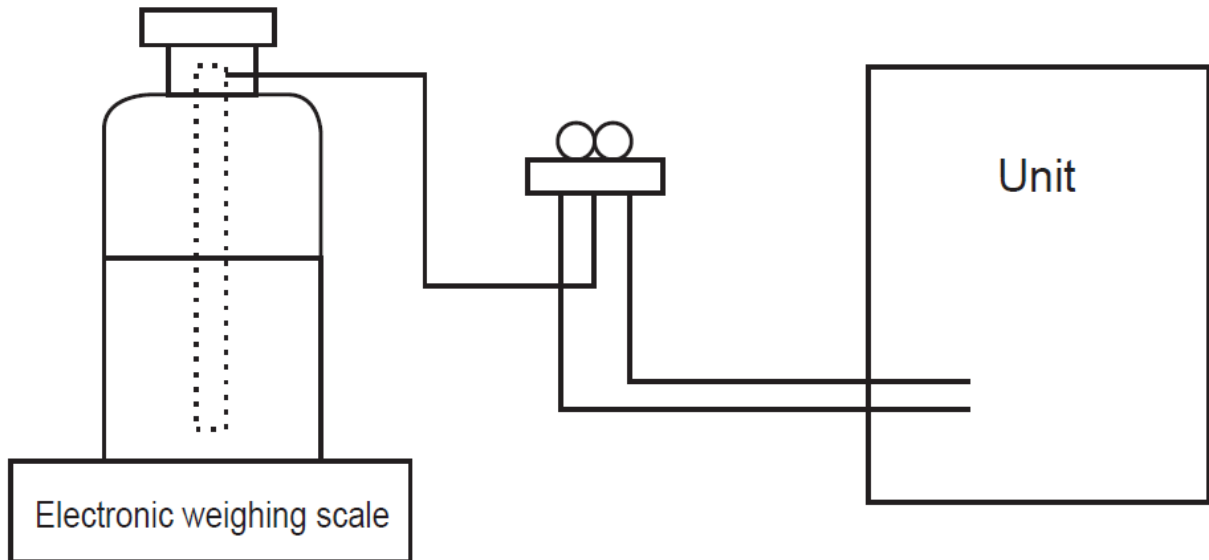
1. Do not alter the unit.
2. For installation and relocation work, follow the instructions in the Installation Manual and use tools and pipe components specifically made for use with refrigerant specified in the outdoor unit installation manual.
3. Ask a dealer or an authorized technician to install, relocate and repair the unit.
4. This unit should be installed in rooms which exceed the floor space specified in outdoor unit installation manual. Refer to outdoor unit installation manual.
5. Refrigerant pipes connection shall be accessible for maintenance purposes.
6. If the air conditioner is installed in a small room or closed room, measures must be taken to prevent the refrigerant concentration in the room from exceeding the safety limit in the event of refrigerant leakage. Should the refrigerant leak and cause the concentration limit to be exceeded, hazards due to lack of oxygen in the room may result.
7. Keep gas-burning appliances, electric heaters, and other fire sources (ignition sources) away from the location where installation, repair, and other air conditioner work will be performed. If refrigerant comes into contact with a flame, poisonous gases will be released.
8. When installing or relocating, or servicing the air conditioner, use only the specified refrigerant written on outdoor unit to charge the refrigerant lines. Do not mix it with any other refrigerant and do not allow air to remain in the lines. If air is mixed with the refrigerant, then it can be the cause of abnormal high pressure in the refrigerant line, and may result in an explosion and other hazards.
9. After installation has been completed, check for refrigerant leaks. If refrigerant leaks into the room and comes into contact with the flame of a heater or portable cooking range, poisonous gases will be released.
10. Do not use low temperature solder alloy in case of brazing the refrigerant pipes.
11. When performing brazing work, be sure to ventilate the room sufficiently. Make sure that there are no hazardous or flammable materials nearby. When performing the work in a closed room, small room, or similar location, make sure that there are no refrigerant leaks before performing the work. If refrigerant leaks and accumulates, it may ignite or poisonous gases may be released.
12. Do not install the unit in places where refrigerant may build-up or places with poor ventilation such as a semi-basement or a sunken place in outdoor: Refrigerant is heavier than air, and inclined to fall away from the leak source.
13. Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
14. The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).
15. Do not pierce or burn.
16. Be aware that refrigerants may not contain an odor.
17. Pipe-work shall be protected from physical damage.
18. The installation of pipe-work shall be kept to a minimum.
19. Compliance with national gas regulations shall be observed.

20. Keep any required ventilation openings clear of obstruction.
21. Servicing shall be performed only as recommended by the manufacturer.
22. The appliance shall be stored in a well-ventilated area where the room size corresponds to the room area as specified for operation.
23. Maintenance, service, and repair operations shall be performed by authorized technician with required.

1.4. Additional refrigerant charge

(When charging directly from cylinder.)

1. Check that cylinder for R454B available on the market is a siphon type.
2. Charging should be performed with the cylinder of siphon stood vertically. (Refrigerant is charged from liquid phase.)



1.5. Service tools

Use the below service tools as exclusive tools for R454B refrigerant.

No.	Tool name	Specifications
①	Gauge manifold	Specifications <ul style="list-style-type: none"> • Only for R454B • Use the existing fitting specifications. (UNF1/2) • Use high-tension side pressure of 768.7 PSIG [5.3 MPa.G] or over.
②	Charge hose	<ul style="list-style-type: none"> • Only for R454B • Use pressure performance of 738.2 PSIG [5.09 MPa.G] or over.
③	Electronic weighing scale	-
④	Gas leak detector	<ul style="list-style-type: none"> • Use the detector for R454B.
⑤	Adapter for reverse flow check	<ul style="list-style-type: none"> • Attach on vacuum pump.
⑥	Refrigerant charge base	-
⑦	Refrigerant cylinder	<ul style="list-style-type: none"> • Only for R454B • Cylinder with siphon
⑧	Refrigerant recovery equipment	-

2. Refrigerant R454B



FLAMMABLE REFRIGERANT WARNING

- Refrigerant is **FLAMMABLE** and may cause **INJURY, DEATH, or significant DAMAGE** to equipment if improperly handled.
 - Carefully read all labels affixed to the unit.
 - Carefully read and follow all safety precautions for the unit.
 - Verify any person performing work near where flammable refrigerant is used is properly informed prior to work commencing of the risks and safety precautions associated with flammable refrigerant and the nature of the work being done.

2.1. Precautions for devices that use R454B



FLAMMABLE REFRIGERANT WARNING

- IGNITION SOURCES: Verify the following safety precautions are followed to prevent refrigerant ignition and ensure proper operation without equipment damage, injury, or death.
 - Verify equipment is installed in a room that does not contain continuously operating ignition sources (for example: open flames, an operating gas appliance, or an operating electric heater).
 - Verify equipment is installed in a room large enough to properly accommodate the release of the full system charge.
 - Ensure actual system refrigerant charge is in accordance with the room sizes Amin and T_{Amin}, found in **Appendix A** of this manual.
 - Improper room sizes can lead to dangerously high concentrations of refrigerant vapor.
 - Ensure appropriate fire extinguishing equipment (dry powder or CO₂ fire extinguisher) is available and adjacent to worksite whenever any hot work is required on the refrigerating equipment or any associated parts.
 - DO NOT use ignition methods, such as a halide torch, to detect refrigeration leaks. Electronic leak detectors may be used as long as they pose no risk as potential ignition source.
 - Verify the electronic refrigerant leak sensor is calibrated to the refrigerant used and appropriate percent of gas is confirmed.
 - When installing field pipe joint connections, avoid locations with possible ignition sources such as UV lights, electric heaters, gas appliances, pilot flames, brushed motors and similar devices.
 - Ensure the worksite is free from faulty equipment and appliances that could be a potential ignition source.
 - Failure to do so may result in ignition risk due to outdated and unsafe equipment.
 - Place “No Smoking” signs in the worksite.
 - Markings and labels on the equipment must remain legible. Correct all labels or service markings that are illegible. Labels and service markings contain information that is critical to the next service technician



FLAMMABLE REFRIGERANT WARNING

- VENTILATION: Be aware that refrigerants may not contain an odor. If the refrigerant gas comes into contact with a flame, poisonous gases will be released.
 - Limit or avoid work in confined spaces. Prior to installation, verify service connections and field joints are placed in ventilated and easily accessible areas.
 - Do not perform any hot work without proper ventilation in the work space.
 - Confirm that all ventilation outlets and machinery are not obstructed, and are operating adequately.
 - Failure to provide constant ventilation allows for the concentration of refrigerant vapor in the work area.
 - If refrigerant gas leaks during installation work, ventilate the room.
 - If the refrigerant gas comes into contact with a flame, poisonous gases will be released.



FLAMMABLE REFRIGERANT WARNING

- LEAK DETECTION: Check the work area for any potential toxic or flammable gases using an appropriate refrigerant detector prior to, during, and after work is complete.
 - If a leak is suspected, immediately remove/extinguish all naked flames.
 - Ensure all refrigerant is recovered and system is isolated prior to making repairs. For PAA connections, use flare connection as the equipment as designed for. Mitsubishi Electric US, Inc. is not responsible for improper brazing connections done by the installer.
 - Instructions for the removal of refrigerant can be found in *Handling and service of R454B* chapter of this manual.
 - Hazardous vapors may exist in mechanical rooms. Use appropriate leak detection equipment (non-sparking) that is adequately sealed and intrinsically safe.
 - Ensure leak detection equipment set at a percentage of the LFL (lower flammability limit) of the refrigerant employed, and the appropriate percentage of gas (25% maximum) is confirmed.
 - Recover refrigerant via the outdoor unit service ports only. Do not vent refrigerant. Always follow the decommissioning procedure.
 - Do not pierce or burn.



CAUTION

- Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
 - Some chemicals and cleaning products may be incompatible with the coil materials, and may corrode the coil.
- Verify leak detection fluids do not contain chlorine.
 - Leak detection fluids that contain chlorine may react with refrigerant and corrode pipework.
- Confirm that refrigerant piping and other components are installed in a position/location that is unlikely to be exposed to corrosive materials.
 - Corrosion can reduce the longevity of the product, and possibly lead to a hazardous refrigerant leak.
- When it is necessary to replace electrical components, the new components must be fit for the purpose and to the correct specification. Always follow guidelines in the installation and service manuals, and if in doubt, consult with the manufacturer's technical department for assistance.
 - Improperly sourced parts may lead to reduced functionality and product life.

2.2. Installation of R454B system



FLAMMABLE REFRIGERANT WARNING

- Ensure proper protection from physical damage during installation, operation, and service when performing pipework or handling piping material.
- Verify pipe work performed in compliance with national and local regulations and standards.
- Ensure all field joints in pipe work are inspected prior to covering and enclosing.
 - Verify all field pipe joints are properly pressure tested with inert gas.
 - Verify all field pipe joints are vacuum tested prior to refrigerant charging.
 - Verify all indoor field-made joints are tightness tested with 0.25 times the MAXIMUM ALLOWABLE PRESSURE, with NO LEAK DETECTED.

**FLAMMABLE REFRIGERANT WARNING**

Auxiliary devices which may be a POTENTIAL IGNITION SOURCE shall not be installed in the duct work. Examples of such POTENTIAL IGNITION SOURCES are hot surfaces with a temperature exceeding 1292 °F (700 °C) and electric switching devices.

**IMPORTANT**

Approved electric heater kits manufactured for Mitsubishi Electric US, Inc. includes electric heat kits manufactured for Mitsubishi Electric US, Inc. that are allowed for use with the listed air handlers. These tables are found in the chapter *Indoor unit accessories* found in the Installation manual.

**FLAMMABLE REFRIGERANT WARNING**

LEAK DETECTION SYSTEM INSTALLED. This air handler is equipped with a refrigerant leak detection system.

See service manual for service and replacement instructions.

- Unit must remain ON, except for service, installation, or inspection.
- Loss of power to the refrigerant leak sensor mounted in the indoor unit will result in an inability to detect a refrigerant leak. This may cause a fire. Refrigerant leak sensor lifetime is 15 years.
- Only replace refrigerant leak sensor devices with sensors approved for use by Mitsubishi Electric US, Inc.
- Do not install equipment in a configuration where false ceilings or drop ceilings are used as a return air plenum.


2.2.1. Safety checks for systems using R454B**1. Complete prior to installation**

- Verify the REFRIGERANT CHARGE is in accordance with the room size, found in the charts below in *Minimum floor and minimum conditioned space area*, where refrigerant containing parts are installed.
- Verify ventilation openings are not obstructed and the required ventilation is present.

**IMPORTANT**

Alarm-triggered mechanical ventilation is not supported at this time.

- Verify markings and signs for the equipment are visible and legible. Correct all illegible markings and signs.

- Verify refrigeration pipe and components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.
 - Verify common household chemicals and appliances are properly stored away from the return vents and air handler
 - Vapors and gases from chemical such as propane, butane, methane, insecticides, aerosol or cleaning sprays, and paint or small smoke producing appliances may falsely trigger the leak detection system and impede the proper function of the unit.
2. **Checks to electrical devices**
- Repair and maintenance of electrical components include initial safety checks and component inspection procedures.
- Verify capacitors are discharged in a safe manner to avoid possibility of sparking.
 - Verify there are no live electrical components.
 - Ensure wiring is not exposed while charging, recovering, or purging the system.
 - Verify continuity of earth bonding.
 - If a fault exists that could compromise safety, do not connect electrical supply to the circuit until fault is repaired.
 - If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. Report any malfunction or faulty equipment/operation to the owner of the equipment so all parties are aware.
3. **During repairs to sealed components**
- Verify all electrical power supplies are disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during service, then permanently operating leak detection must be installed at the most critical point to warn of a potentially hazardous situation.
 - Verify the casing is not altered in any manner that affects protection.
- Verify no visible physical damage to cables exists.
 - Verify connections are not excessive.
 - Verify terminals are installed according to specification.
 - Verify there is no damage to seals.
 - Verify gland fitting are installed properly and according to specifications.
- Ensure equipment properly secured.
 - Ensure seals or sealing materials are not degraded and operating properly.
 - Verify all replacement parts in accordance with the manufacturer specifications.
4. **Intrinsically safe components can only be replaced but never repaired**
- Do not apply any permanent inductive or capacitance loads to the circuit without ensuring it will not exceed the permissible voltage and current permitted for the equipment in use. Intrinsically safe components are the only type of components that may be worked on while live in the presence of a flammable atmosphere.
 - Ensure test apparatus meets correct rating specification.
 - Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.
-  **NOTE**

The use of silicon sealant can inhibit the effectiveness of some types of leak detection equipment.

Intrinsically safe components do not have to be isolated prior to working on them.
5. **Cabling**
- Verify cabling is installed in a location that avoids wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects.
 - Check the cables for effects of aging or continual vibration from sources such as compressors or fans.

2.2.2. Minimum floor and conditioned space area requirements

For safe and acceptable installation, there are a number of requirements that must be met to ensure that in the event of a refrigerant leak, refrigerant vapors do not have the opportunity to collect and create a hazardous concentration levels of refrigerant vapors.

These requirements are in relation to the following categories:

- Area of the conditioned space (**TA_{min}**)
- Area of the indoor unit installation space (**A_{min}**)
- Installation height of the indoor unit, measured from the floor to the bottom of the air handler (h_0)
- Opening conditions for connected rooms and natural ventilation (**Anv**).
- Ducting and damper configurations

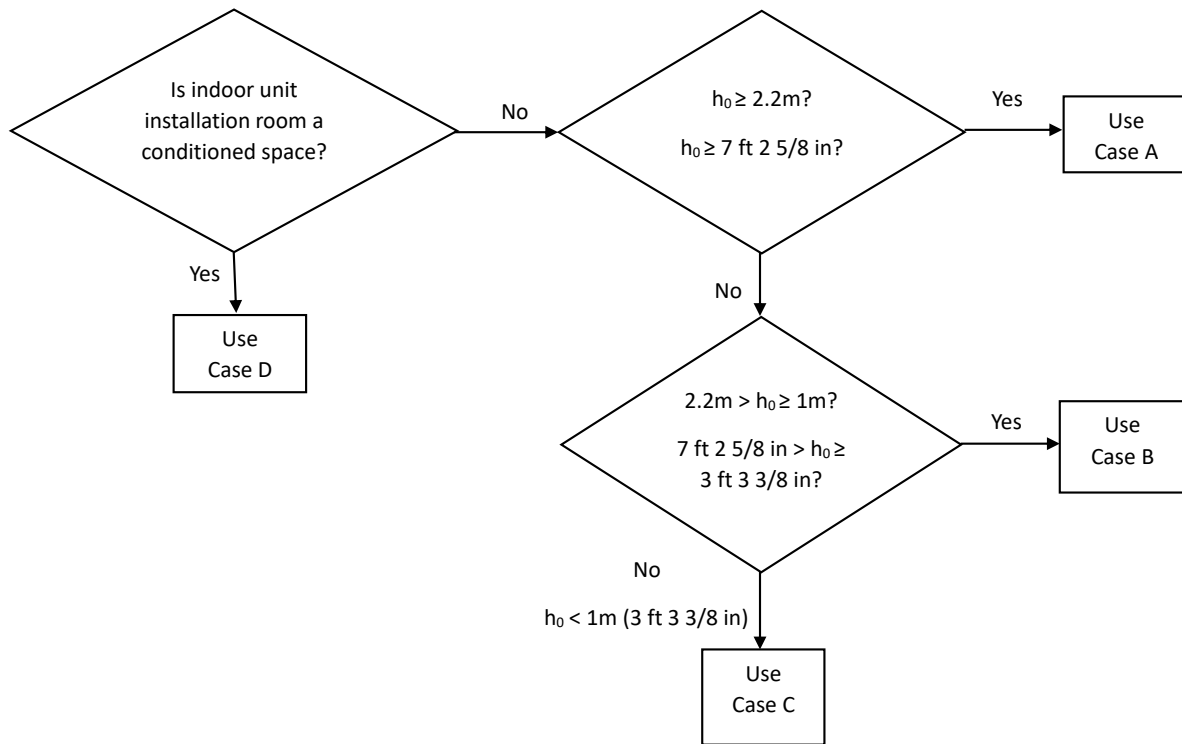
For all installations, the following guidelines must be followed:

- Residential installations and ductwork should be designed to comply with ACCA's Manual D (ANSI / ACCA 1 Manual D 2016, Residential Duct Systems).
 - Failure to comply with industry best practices can result in poor performance, including unbalanced heating / cooling / airflow.
- When zone dampers are used, they must be configured such that they will open fully during a refrigerant leak error.
 - Pre-existing zone dampers that do not meet this requirement must be permanently opened fully and disabled.
- Manual dampers must not be completely closed during or after installation. Balancing is acceptable.
 - Closing dampers can reduce the conditioned space area beyond intended acceptable limits.
- Vent registers, grilles, and covers must not completely obstruct air flow from any vent.
 - A blocked vent can reduce the conditioned space area beyond intended acceptable limits.
- At least one room (not including the indoor unit installation room) must have a dedicated return duct.
 - Spaces without return ducts have a risk of refrigerant accumulation during a leak event.
- The height of the ceiling in the indoor unit installation room must be at least 2.2 m (7 ft - 2.7 in).
 - Area calculations have been calculated using this assumption.
- The area of the indoor unit installation room must be at least 20% of the total area of **A_{min}**.
- Rooms adjacent to the indoor unit installation room can be considered part of the **A_{min}** area for the purpose of contributing to **A_{min}** area when the following conditions are met:
 - The rooms are on the same floor.
 - The rooms are connected by a permanent opening that cannot be closed, with an area greater than **Anv** that is below 300 mm (11.8 in) from the floor, at least 50% of which is below 200 mm (7.8 in) from the floor.
 - The rooms are connected by a second permanent opening that cannot be closed, with an area greater than 50% of **Anv** that is above 1.5 m (4 ft - 11.1 in).
- Natural ventilation requirements can be satisfied by use of ventilation ducting, passive through-wall ducts, drop ceilings, louvered doors, door undercuts, space between wall and floor, etc.
 - For openings which extend to the floor, the minimum height is 20 mm (0.8 in) above the top of the floor covering (i.e. tiles and carpet pile).
- Enhanced tightness refrigeration systems (ETRS) are approved for fixed **Anv** requirements.
 - Almost every combination of Mitsubishi Electric US, Inc. indoor unit / outdoor unit are considered an enhanced tightness refrigeration system (ETRS).
 - The only known non-ETRS compliant combination is the SVZ-AP12NL indoor unit when paired with SUZ (09-15 kbtu) outdoor unit. This combination is ETRS compliant when installed at $h_0 < 1.8$ m.

- For ETRS-compliant systems, the value for: $A_{nvETRS} \geq 114cm^2$ or $22in^2$
- For Non-ETRS-compliant systems, the minimum opening size can be determined from the following

equation: $A_{nv} = 0.0317 \times (m_c - 0.337 \times (\sqrt{A})) \times \sqrt{0.563 \times \sqrt{A}}$

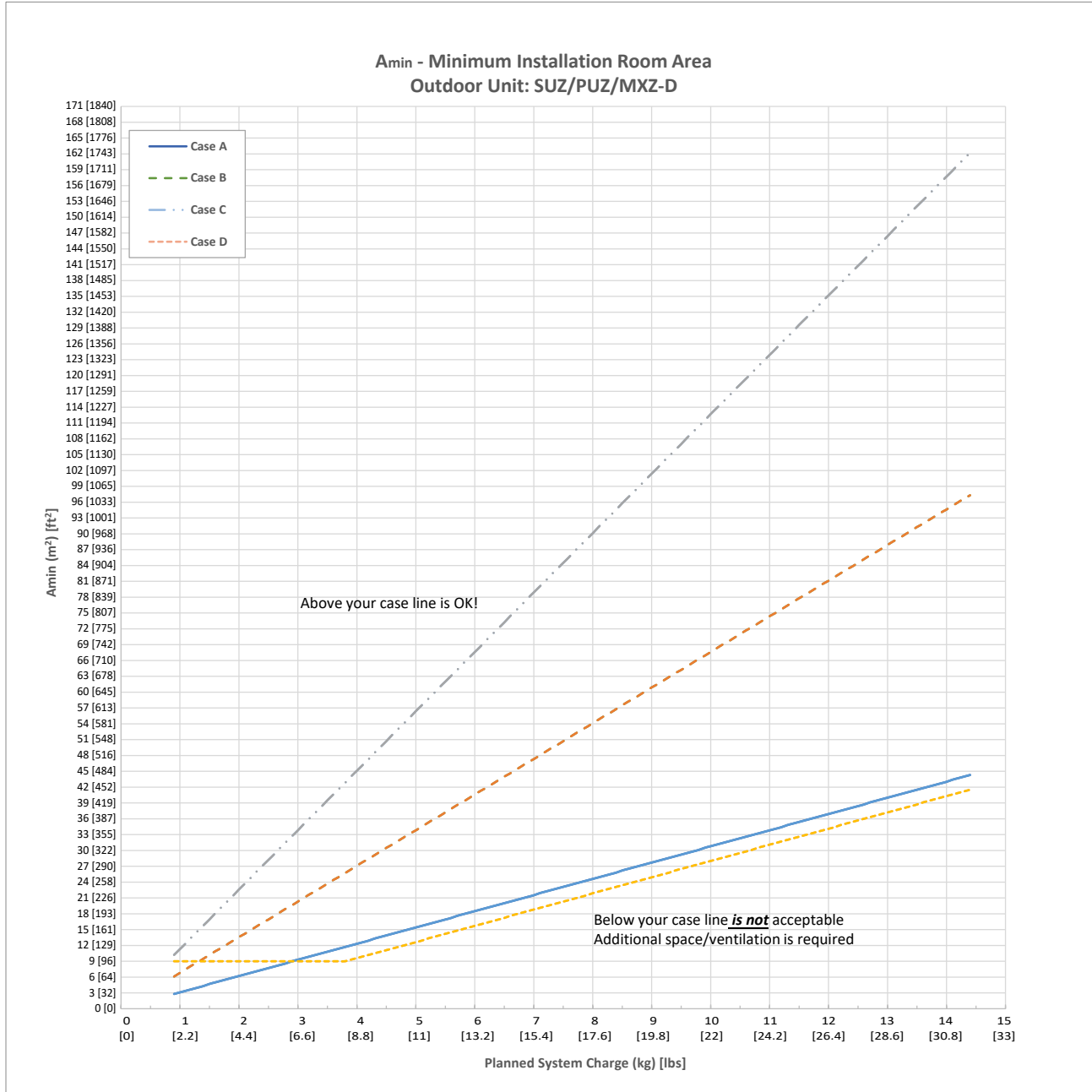
- Where **A** is the area of the installation room in square meters, and **m_c** is the planned total system charge in kilograms.
- Use the tables on the following pages to determine **A_{min}** and **T_{Amin}** requirements.
 1. Match the chart title to the outdoor unit being paired with the air handler.
 2. Use the following flow chart to determine which case line is correct for your application.
 3. Confirm the planned system charge, **m_c**, and trace up to the correct case line.
 4. Trace left from the intersection with the correct case line to determine **A_{min}** and **T_{Amin}**.
 5. This information is available in **Appendix A** at the end of this manual.

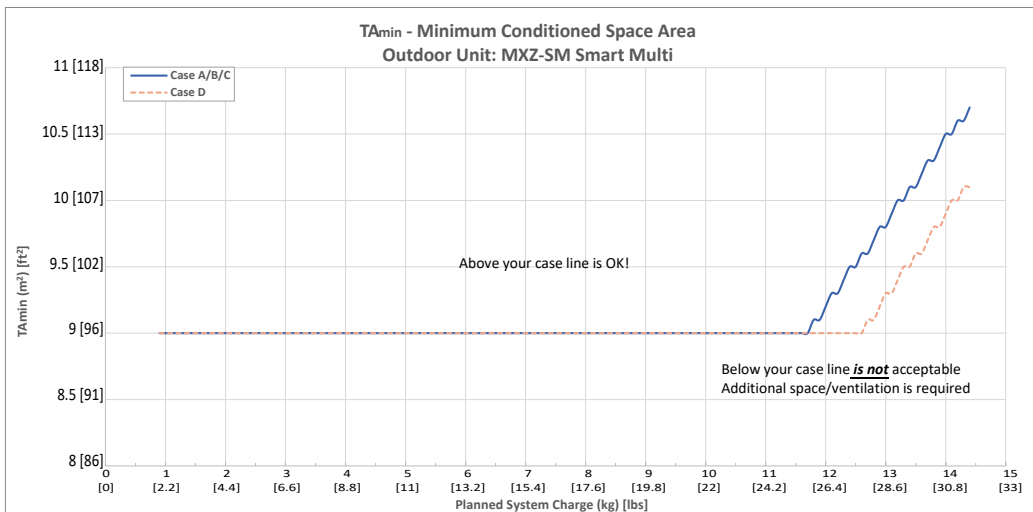
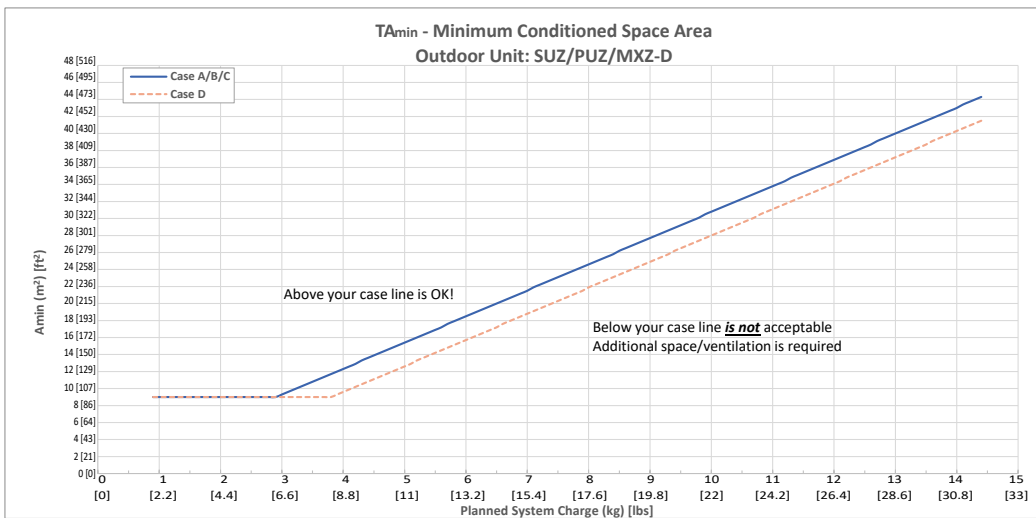
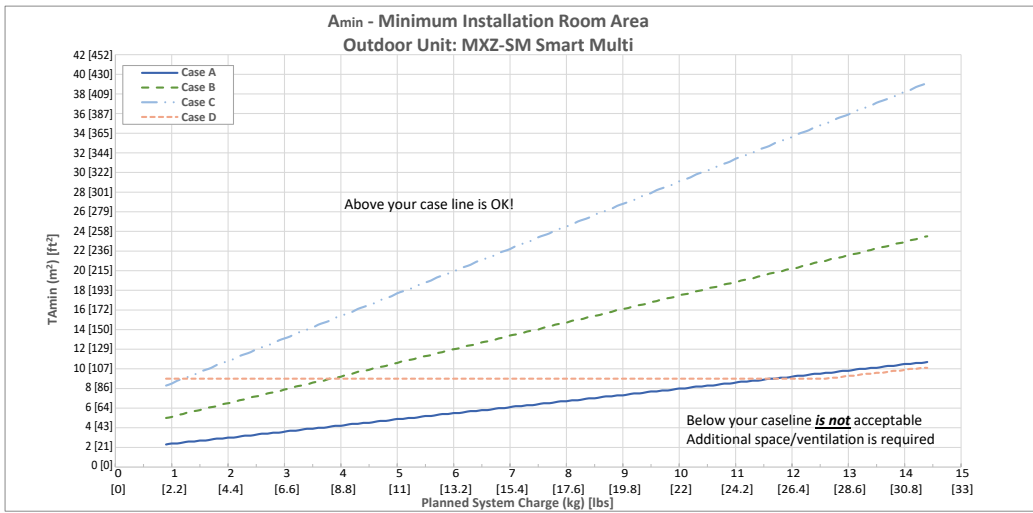


NOTE

For systems certified as ETRS the following ventilation requirement can be substituted:

$$A_{nvETRS} \geq 114cm^2 \text{ or } 22in^2$$





2.3. Handling and service of R454B system



FLAMMABLE REFRIGERANT WARNING

- Follow all national and local regulations and policies regarding refrigerant removal, evacuation, and recovery processes.
- Follow all safety precautions and procedures found in the installation and service manuals.
- Flammable refrigerant systems may only be purged with oxygen-free nitrogen.
 - Never use compressed air or oxygen for purging flammable refrigerant systems.
- Do not place vacuum pump air outlet near potential ignition sources.
- Verify proper ventilation available.

2.3.1. Removal and evacuation of refrigerant R454B



FLAMMABLE REFRIGERANT WARNING

- Verify vacuum pump outlet is secured away from potential ignition sources.
- Verify proper ventilation is available.

1. Safely remove refrigerant following local and national regulations.
2. Evacuate
3. Purge the circuit with inert gas.
4. Evacuate
5. Continuously flush or purge with inert gas when using a flame to solder or de-solder.
6. Open the circuit
7. Recover the refrigerant charge into the correct recovery cylinders if venting is not allowed by local and national codes.

2.3.2. Purging the system with R454B



NOTE

This process might need to be repeated several times.

1. Break the system vacuum with oxygen-free nitrogen.
2. Continue to fill until the working pressure is achieved.
3. Vent to atmosphere.
4. Evacuate the system.
5. Repeat steps until no refrigerant remains in the system, then fill a final time with oxygen-free nitrogen.
6. When purge is complete, vent the system down to atmospheric pressure to enable work to take place.

2.3.3. Charging R454B system

In addition to conventional charging procedures and safety precautions described in the installation and service manuals, read and follow the following precautions:



FLAMMABLE REFRIGERANT WARNING

- Do not allow contamination of different refrigerants to occur when using charging equipment.
- Keep hoses or lines as short as possible to minimize the amount of refrigerant contained in them.
- Keep all cylinders in an appropriate position according to the instructions.
- Ensure that the refrigerating system is properly grounded prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- DO NOT OVERFILL the refrigerant system.
- Pressure test the system prior to re-charging with appropriate purging gas.
- Leak test the system at completion of charge, prior to commissioning, and before leaving the worksite.

2.3.4. Recovery of R454B



FLAMMABLE REFRIGERANT WARNING

- Do not mix refrigerants in recovery units and especially not in cylinders.
- Never heat the compressor body with an open flame or any other ignition sources to accelerate the process.

Verify the following prior to recovering refrigerant from the system:

- Verify that only the proper cylinders required for flammable refrigerant recovery are used and that they are properly labeled.
 - If in doubt, contact manufacturer for consultation.
- Verify the correct number of cylinders needed for total system charge are available.
- Verify cylinders are in good working order with necessary pressure relief and shut-off valves.
- Verify recovery cylinders are empty, properly evacuated, and cooled before recovery.
- Verify calibrated weighing scales are available and in good working order.
- Verify hoses are complete with leak-free disconnect coupling and in good condition.
- Ensure all recovered refrigerant is processed in accordance with local legislation, in proper recovery cylinder, and with appropriate transfer note arranged.
- If compressors or compressor oils are to be removed, verify they are evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant.
- Verify oil drained from the system is carried out safely.

2.4. Description and testing of leak mitigation functions



NOTE

The refrigerant leak detection system can be tested to verify that leak mitigation actions are functional. These actions serve to slow the leak rate and to disperse any concentrated refrigerant in the ducting.

For systems paired with an MXZ-SM Smart Multi outdoor unit, the unit has a safety-shutoff-valve installed that will close upon a leak detection and the compressor will run for several minutes to collect the refrigerant in the accumulator, then shut off.

The indoor unit fan motor activates to provide circulation airflow.

This process puts stress on system components, so testing should occur only when required, such as during system commissioning, or when advised by Mitsubishi Electric US, Inc. service personnel, or when required by local codes and regulations.

For systems paired with any other outdoor unit (SUZ/PUZ/MXZ *not Smart Multi), leak mitigation actions include automatic cutoff of the outdoor unit compressor and activating the fan motor of the indoor unit for circulation airflow.

2.4.1. Testing procedure

1. Confirm that the system is powered on and in normal operation.
2. Unplug the refrigerant leak sensor cable from the indoor unit control board at the plug connector labeled CNSA.
3. The mitigation actions will be triggered and will continue until the unit is powered off.
4. Power off the system.
5. Reconnect the refrigerant leak sensor cable.
6. Restore power and return the system to normal operation.



FLAMMABLE REFRIGERANT WARNING

The fan will automatically start when refrigerant leak is detected by refrigerant leak sensor. Keep a safe distance from the fan to avoid injury.

2.5. Decommissioning of R454B system



NOTE

LABELING: All equipment that is decommissioned and emptied of refrigerant must have a label stating **FLAMMABLE REFRIGERANT** with the date and signature affixed to the equipment.

Prior to decommissioning, verify the following safety checks:

- Follow all safety precautions and procedures.
- Take oil and refrigerant samples in case analysis is required prior to re-use of recovered refrigerant.
- Verify proper power is available necessary to fully execute procedure.
- Ensure the recovery process is supervised at all times by a trained professional.
- Verify mechanical handling equipment is available, if required, for handling refrigerant cylinders.
- Ensure all personal protective equipment is available and being used correctly.
- Verify recovery equipment and cylinders conform to the appropriate standards.

Follow the steps listed in this procedure to properly decommission the system:

1. Isolate system electrically.
2. Pump down refrigerant system, if possible.
3. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
4. Verify cylinder is situated on the scales before recovery takes place.
5. Start the recovery machine and operate in accordance with instructions.
 - Do not overfill cylinders (no more than 80 % volume liquid charge).

- Do not exceed the maximum working pressure of the cylinder, even temporarily.
6. Once cylinders are properly filled and the process complete:
- Promptly remove the cylinders and the equipment from site.
 - Verify all isolation valves on the equipment are closed.



NOTE

Do not re-use recovered refrigerant in another refrigerant system unless it has been cleaned in accordance with procedure and regulation.

2.6. Disposal of R454B

Recover the refrigerant and recycle it.

If recycling is not possible then it should be incinerated by a licensed facility.

3. Specifications

Model code		12	18	24	30	36
Power Source		208/230V, 1-phase, 60Hz				
Cooling & heating capacity	Btu/h	12,000 / 15,000	18,000 / 21,600	24,000 / 25,000	27,000 / 30,000	33,400 / 33,400
	kW	3.5 / 4.4	5.3 / 6.3	7.0 / 7.3	7.9 / 8.8	9.8 / 9.8
Tonnage		1	1.5	2	2.5	3
Dimensions	Height	1,011 [39-13/16]			1,113.8 [43-7/8]	
	Width	432 [17]			534 [21]	
	Depth	548 [21-5/8]				
Net weight		44 [97]			55 [122]	
Fan	Airflow rate Low/Mid/Hi	278 - 381 - 448	471 - 573 - 675	471 - 573 - 700	613 - 744 - 875	767 - 910 - 910
	Min. circulation airflow ^a	448	675	700	875	910
	External static pressure	in. WG [Pa]			0.30 - 0.50 - 0.80 [75 - 125 - 200]	

^aSpecified in UL60335-2-40.

3.1. Specification notes



IMPORTANT

When a refrigerant leak is detected, the fan starts up to begin circulation. The airflow during this time is shown in the tables above as "Minimum circulation airflow". Please install the duct carefully for proper ventilation.



NOTE

1. Units should be installed by a licensed HVAC and / or electrical contractor according to local and state code requirements.
2. For outdoor units to be connected, refer to the Installation manual that comes with the units.

SVZ-AP12,18, 24, 30, 36NL*

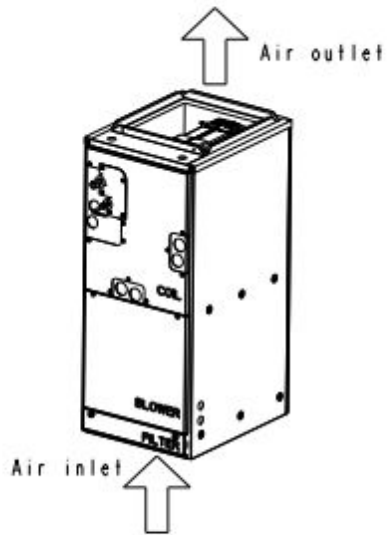
Indoor unit rated conditions		
Cooling	Indoor	80 °F [26.7 °C] D.B.
		67 °F [19.4 °C] W.B.
	Outdoor	95 °F [35 °C] D.B.
Heating	Indoor	70 °F [21.1 °C] D.B.
		47 °F [8.3 °C] D.B.
	Outdoor	43 °F [6.1 °C] W.B.
<ul style="list-style-type: none"> • The indicated capacity is the value when one indoor unit is connected to the outdoor unit. • The external static pressure is set to 0.50 in. WG (125 Pa) at factory shipment 		

Indoor unit guaranteed operating range		
Cooling	Upper limit	95 °F [35 °C] D.B.
		71 °F [21.7 °C] W.B.
	Lower limit	67 °F [19.4 °C] D.B.
		57 °F [13.9 °C] W.B.
Heating	Upper limit	80 °F [26.7 °C] D.B.
	Lower limit	70 °F [21.1 °C] D.B.

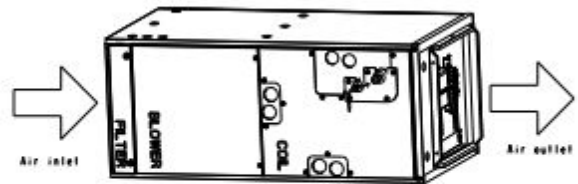
4. Part Names and Functions

Indoor unit

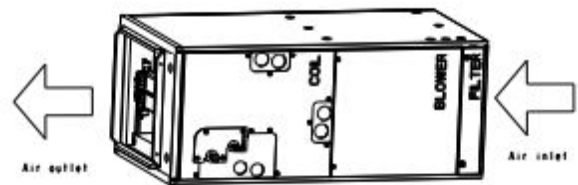
(1) Vertical



(2) Horizontal Right



(3) Horizontal Left



NOTE

For downflow installations, please see downflow kit manuals.

5. Fan Performance and Corrected Airflow



IMPORTANT

*. 200 Pa (0.80 in WG) does not have "Rated point".

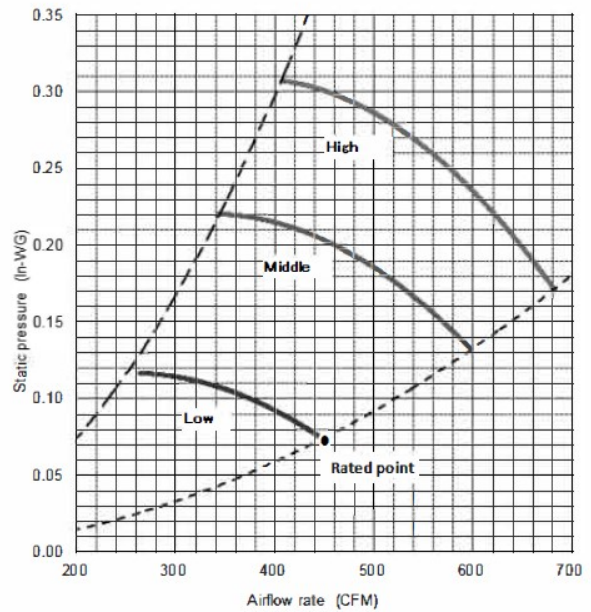
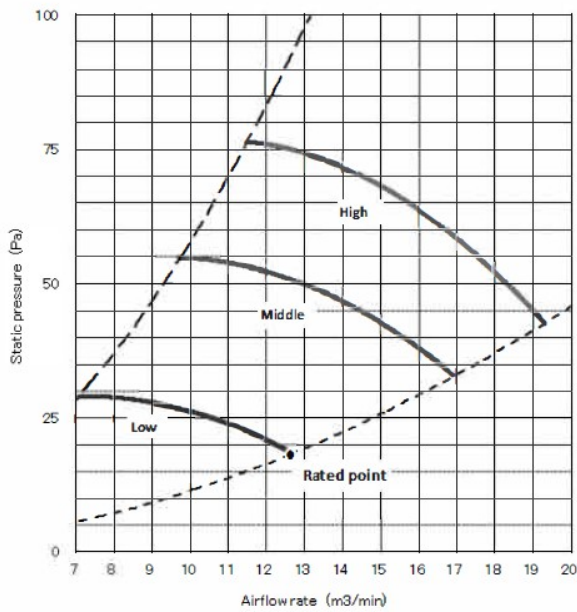


NOTE

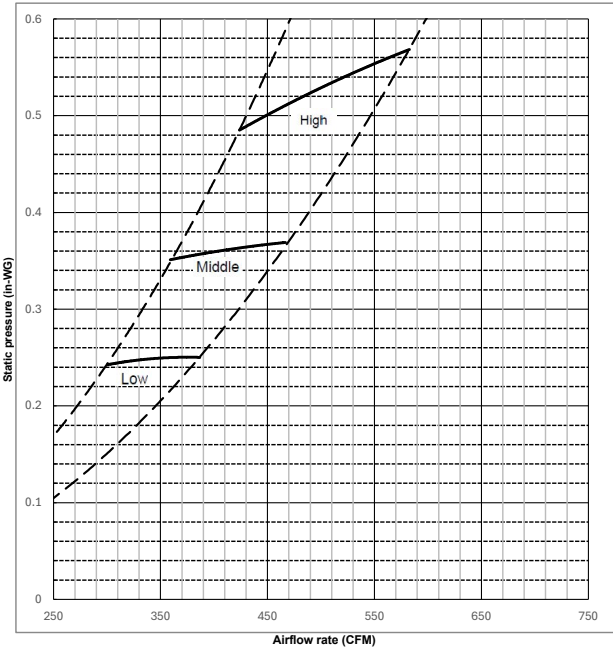
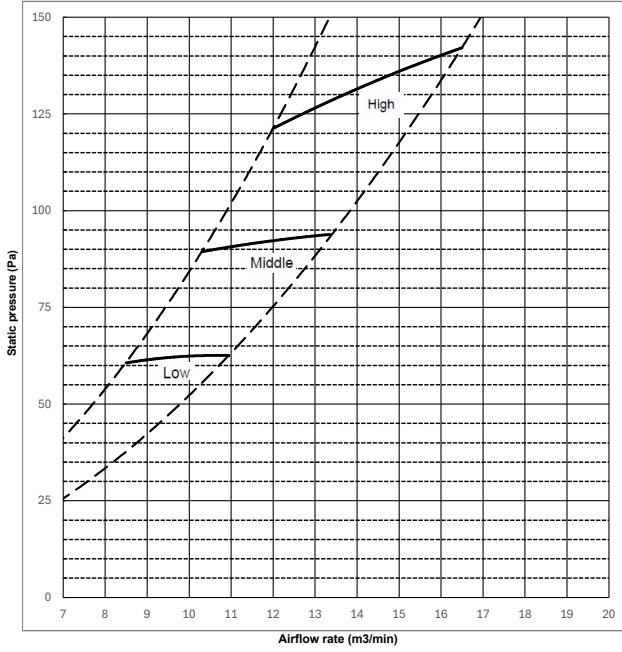
For downflow fan performance and corrected airflow, please see downflow kit manuals.

Table 1. Model code 12 Vertical, Horizontal right, Horizontal left, exclude Downflow position

External static pressure: 75Pa, 0.30 [in. WG], Power source: 208/230 V, 60Hz



External static pressure: 125Pa, 0.50 [in. WG], Power source: 208/230 V, 60Hz



External static pressure: 200Pa, 0.80 [in. WG], Power source: 208/230 V, 60Hz

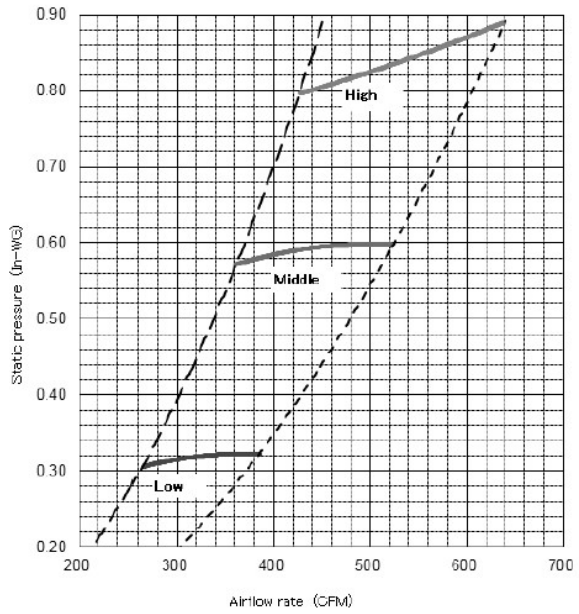
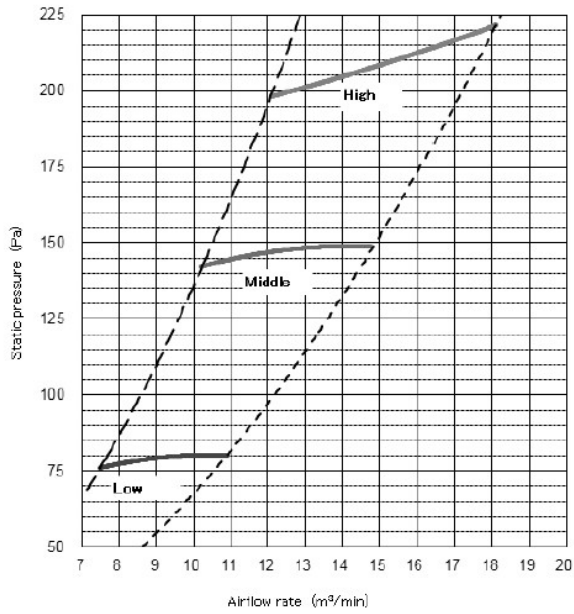
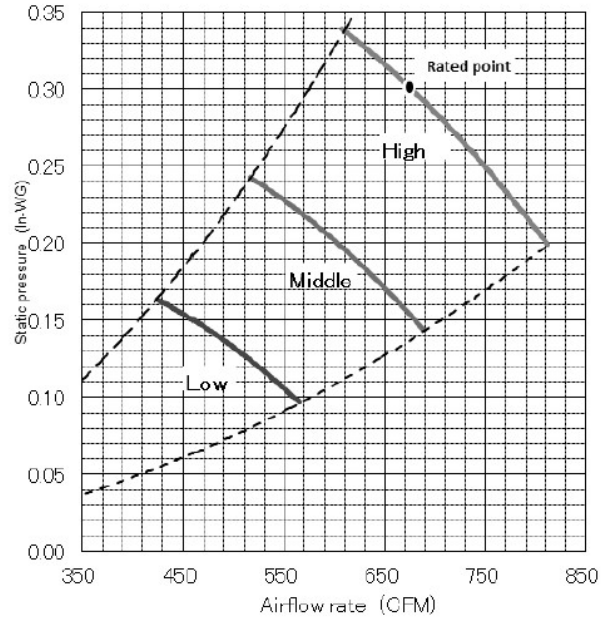
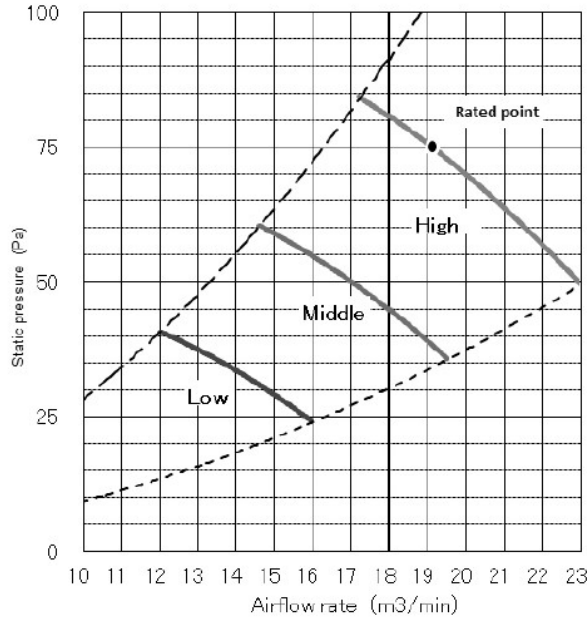
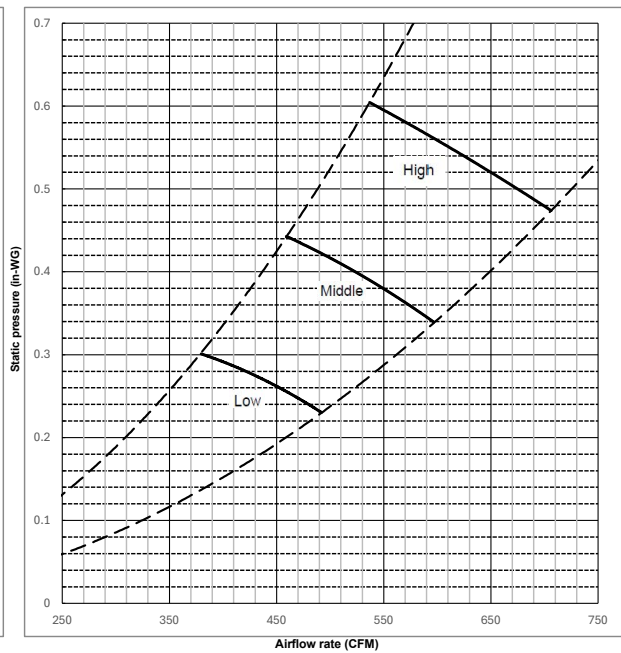
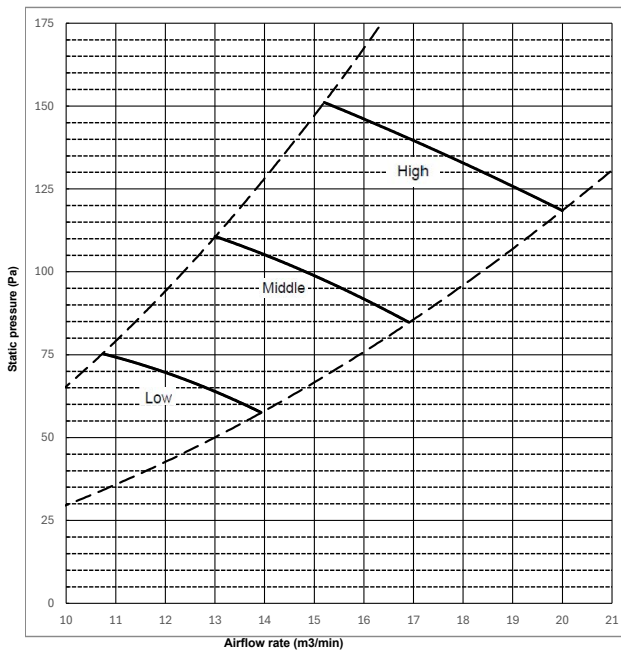


Table 2. Model code 18 Vertical, Horizontal right, Horizontal left, exclude Downflow position

External static pressure: 75Pa, 0.30 [in. WG], Power source: 208/230 V, 60Hz



External static pressure: 125Pa, 0.50 [in. WG], Power source: 208/230 V, 60Hz



External static pressure: 200Pa, 0.80 [in. WG], Power source: 208/230 V, 60Hz

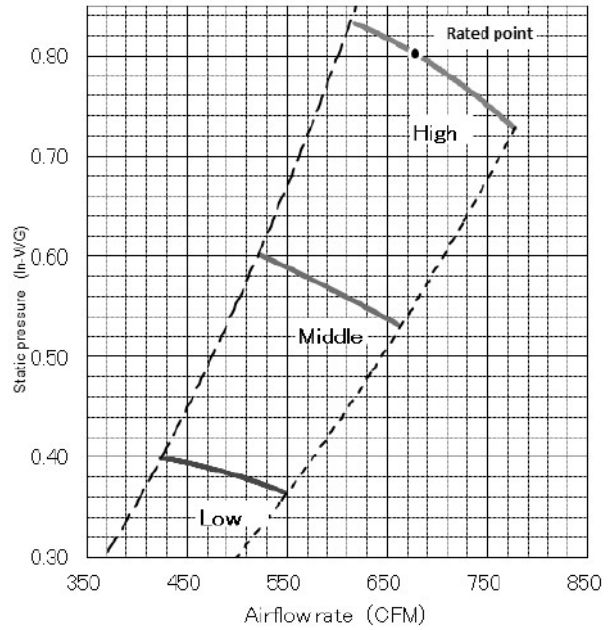
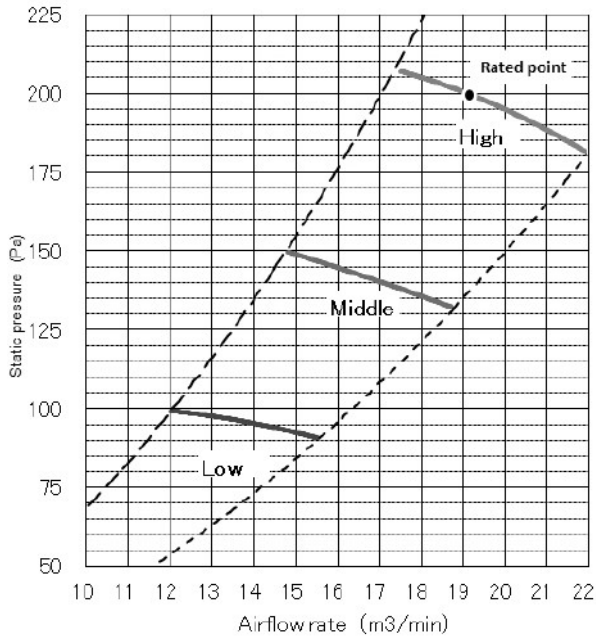
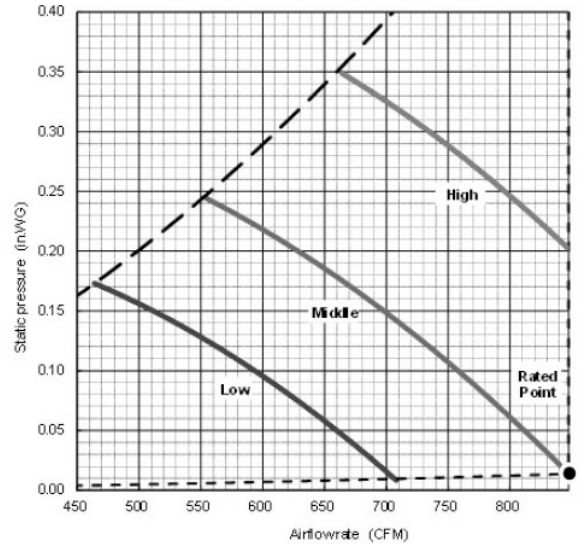
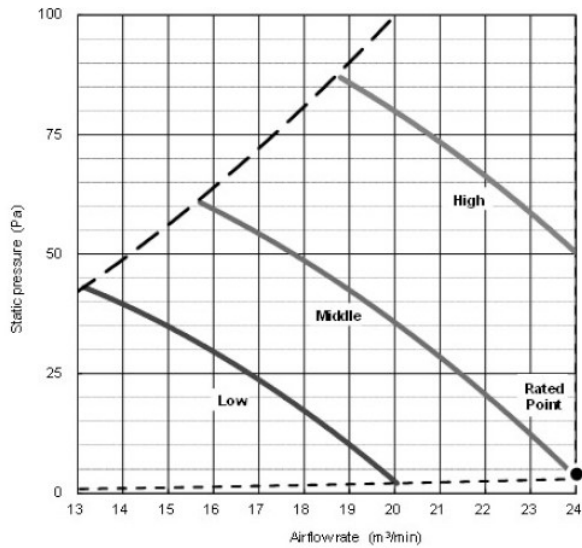
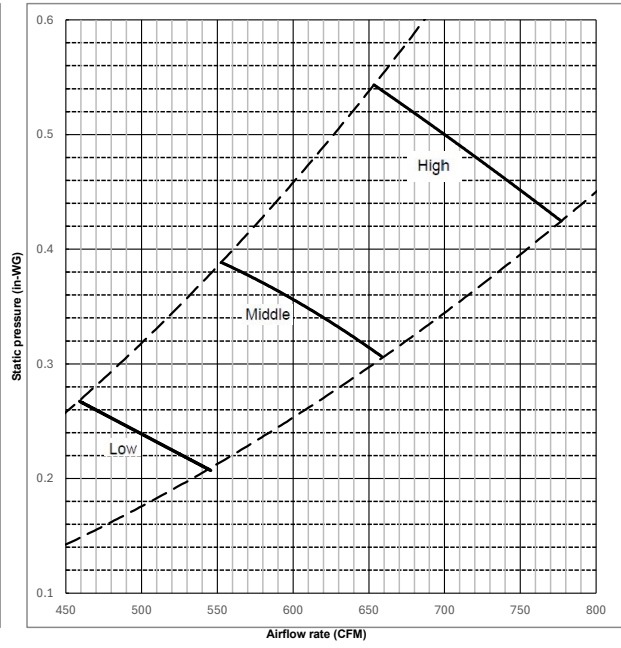
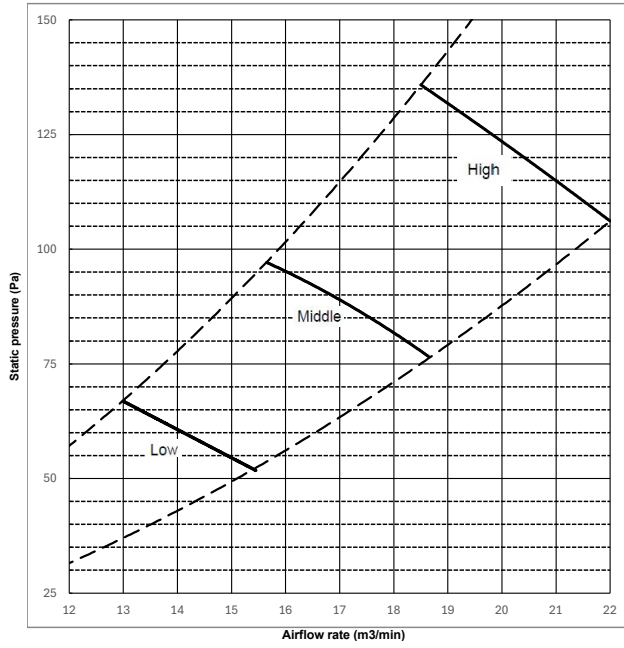


Table 3. Model code 24 Vertical, Horizontal right, Horizontal left, exclude Downflow position

External static pressure: 75Pa, 0.30 [in. WG], Power source: 208/230 V, 60Hz



External static pressure: 125Pa, 0.50 [in. WG], Power source: 208/230 V, 60Hz



External static pressure: 200Pa, 0.80 [in. WG], Power source: 208/230 V, 60Hz

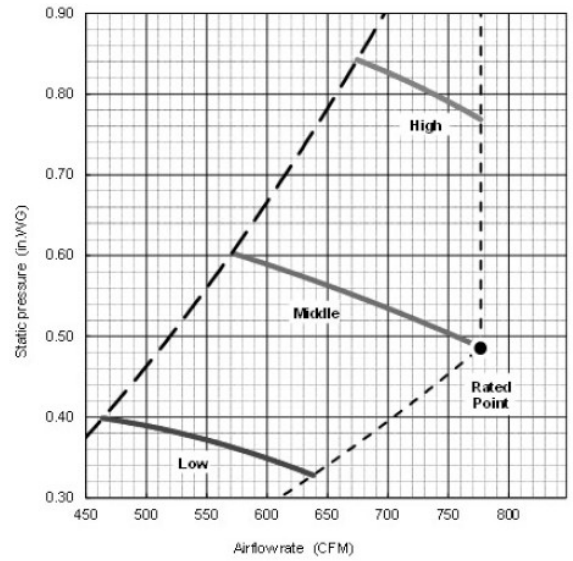
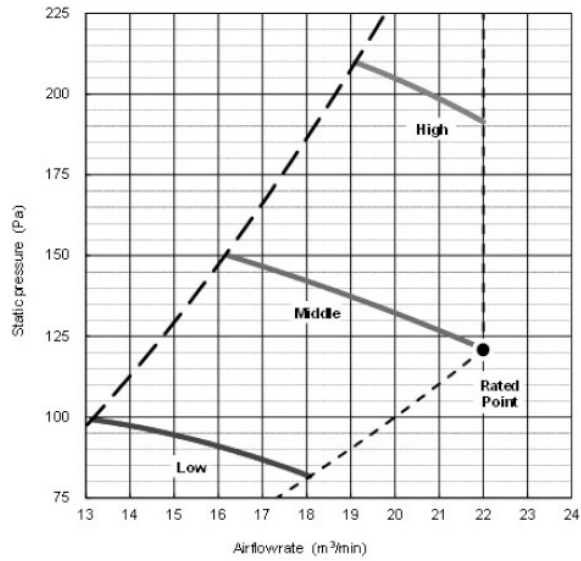
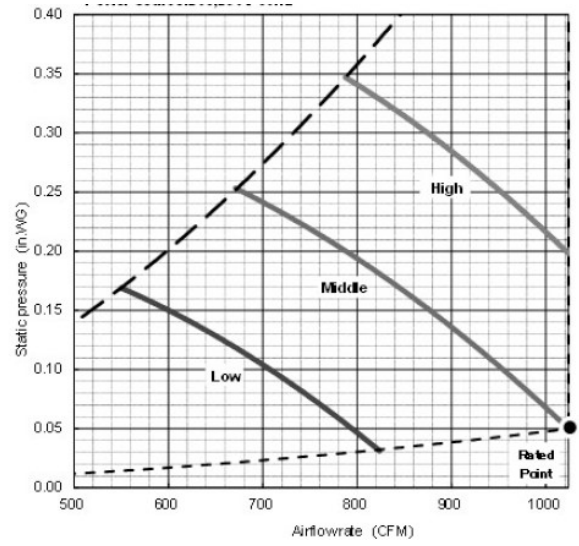
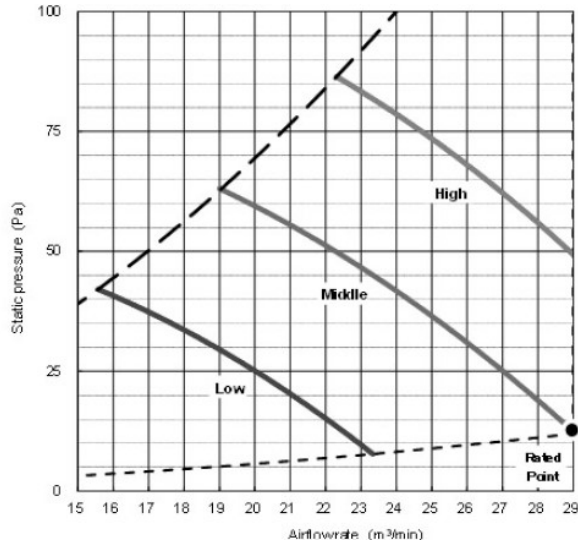
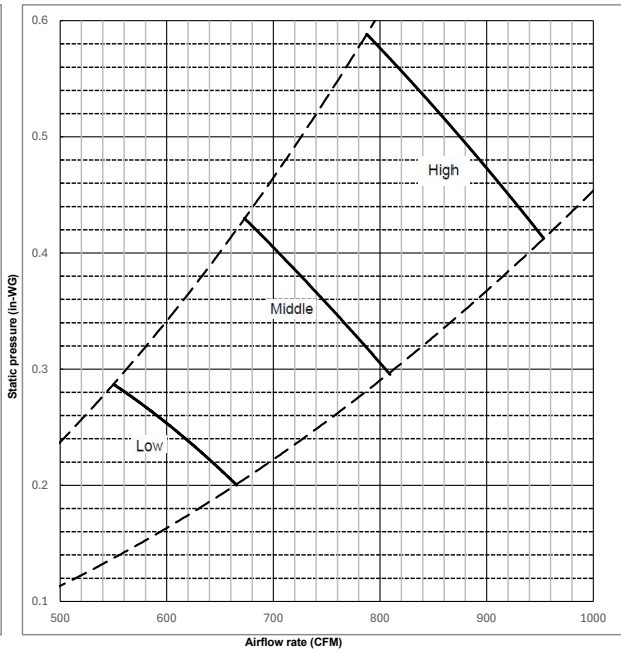
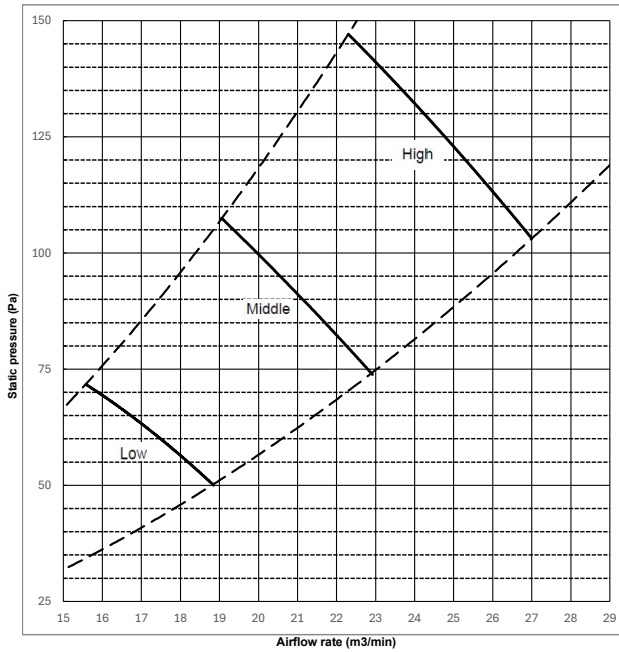


Table 4. Model code 30 Vertical, Horizontal right, Horizontal left, exclude Downflow position

External static pressure: 75Pa, 0.30 [in. WG], Power source: 208/230 V, 60Hz



External static pressure: 125Pa, 0.50 [in. WG], Power source: 208/230 V, 60Hz



External static pressure: 200Pa, 0.80 [in. WG], Power source: 208/230 V, 60Hz

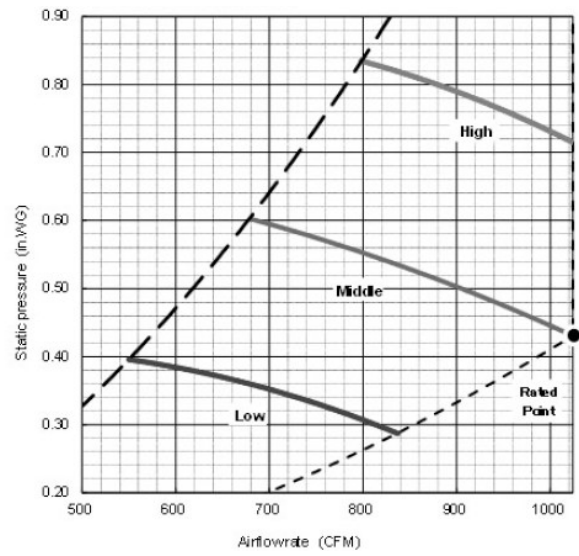
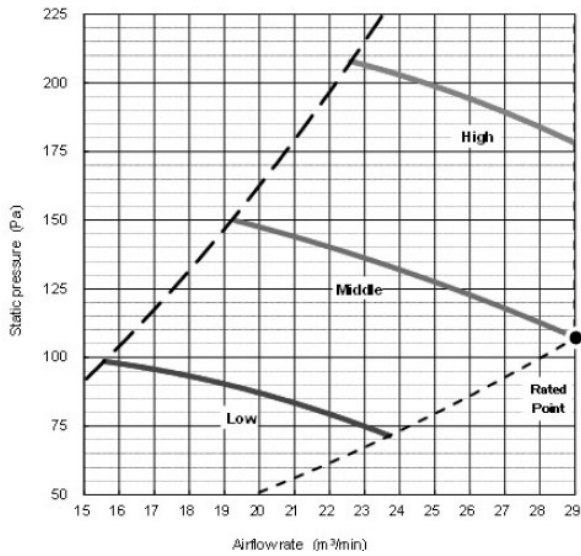
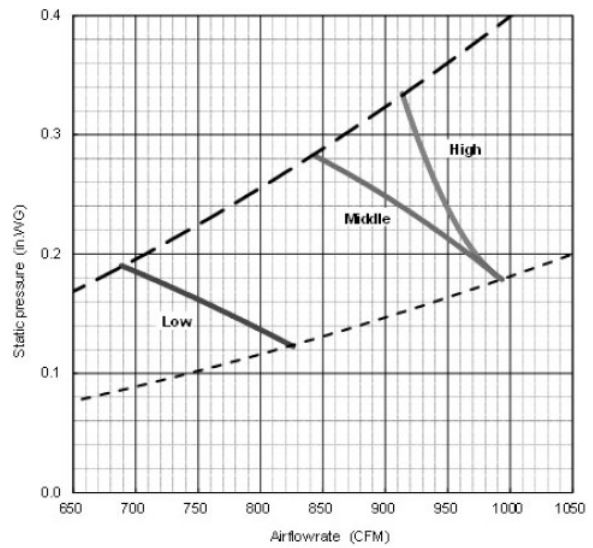
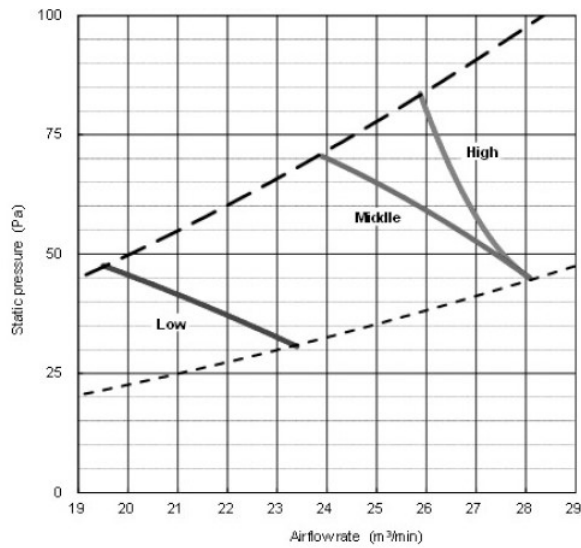


Table 5. Model code 36 Vertical, Horizontal right, Horizontal left, exclude Downflow position

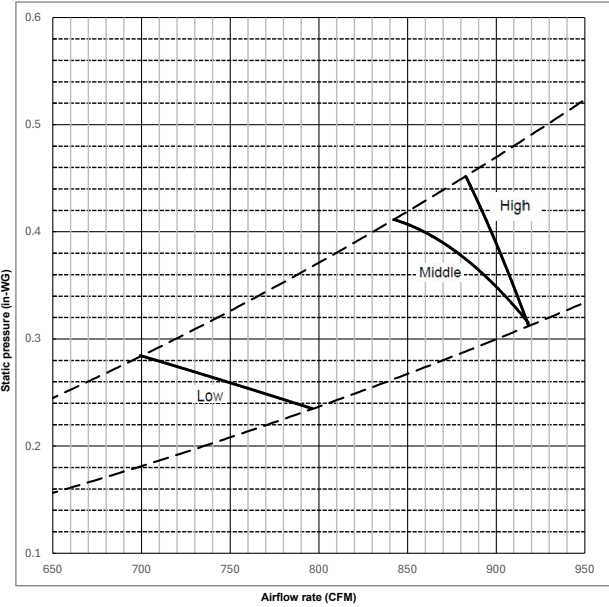
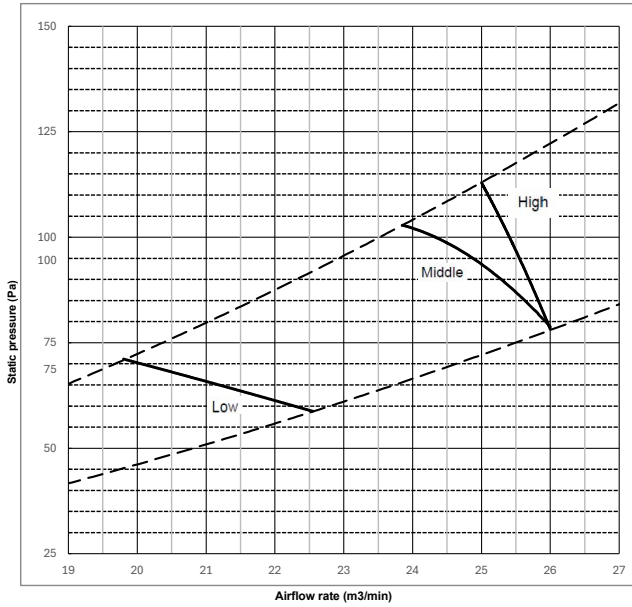
External static pressure: 75Pa, 0.30 [in. WG], Power source: 208/230 V, 60Hz



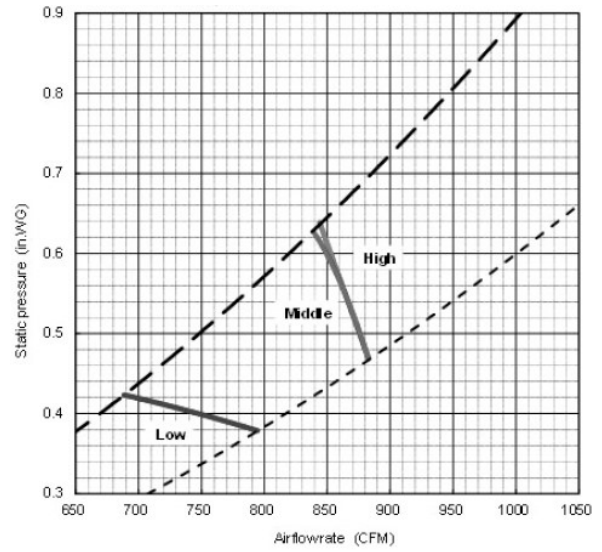
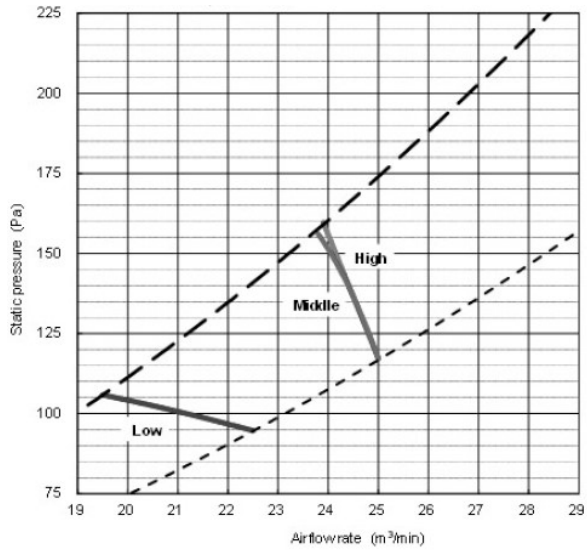
*. "Rated point" may not be inside of the envelope.

*. "Rated point" may not be inside of the envelope.

External static pressure: 125Pa, 0.50 [in. WG], Power source: 208/230 V, 60Hz



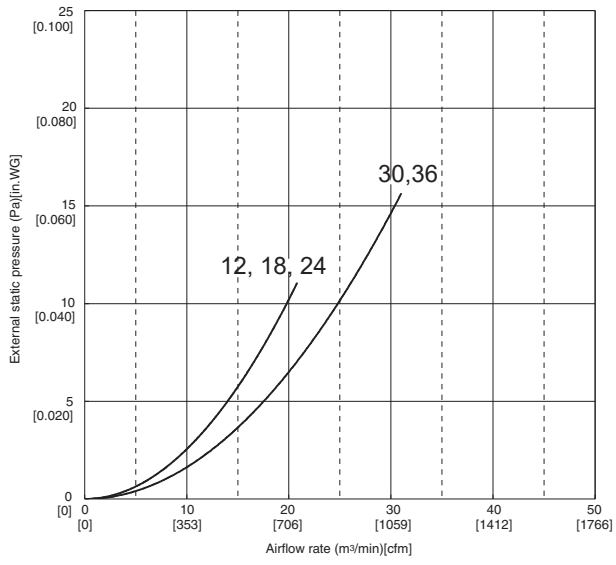
External static pressure: 200Pa, 0.80 [in. WG], Power source: 208/230 V, 60Hz



*. "Rated point" may not be inside of the envelope.

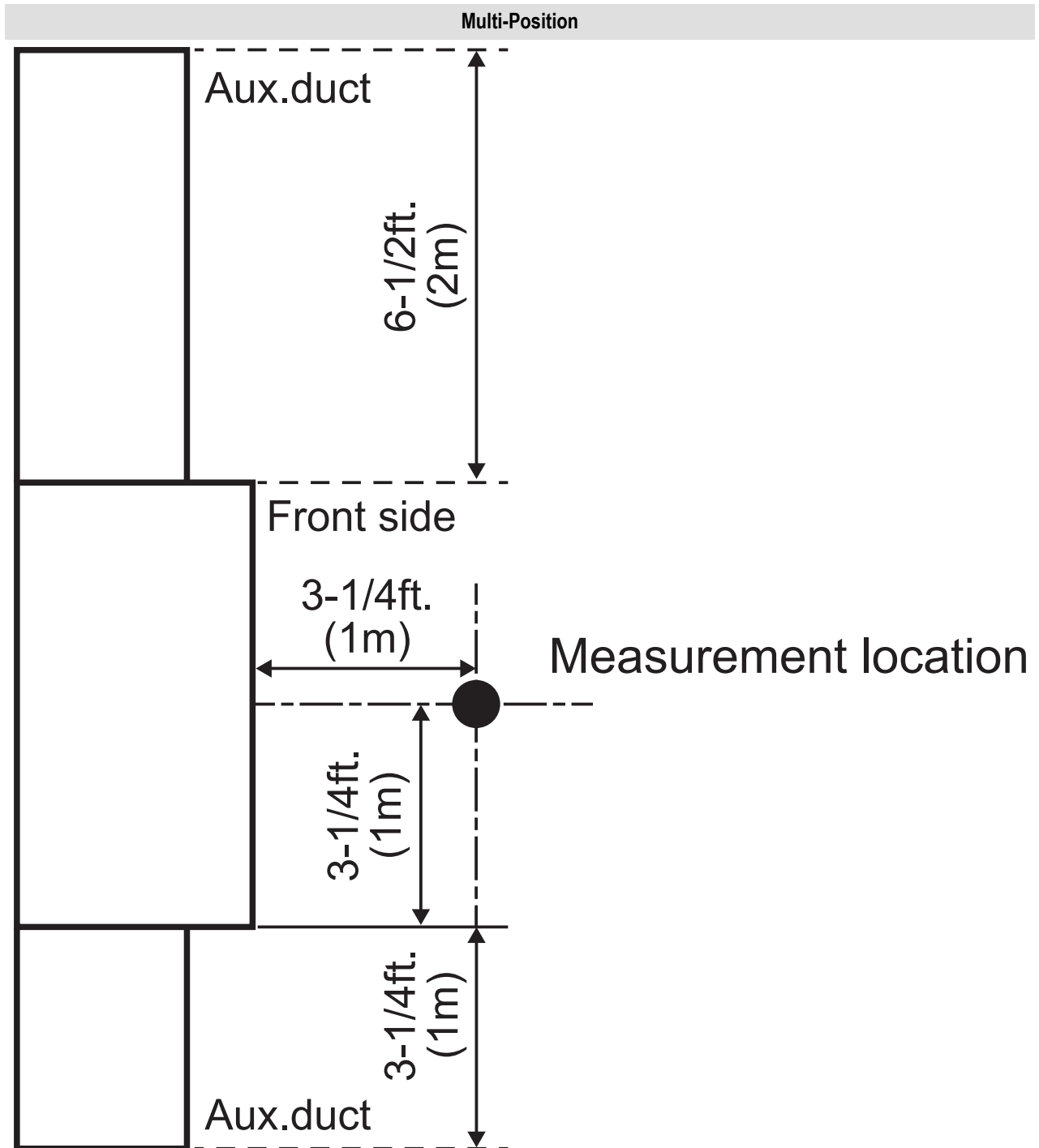
*. "Rated point" may not be inside of the envelope.

Air filter



6. Sound Pressure Levels

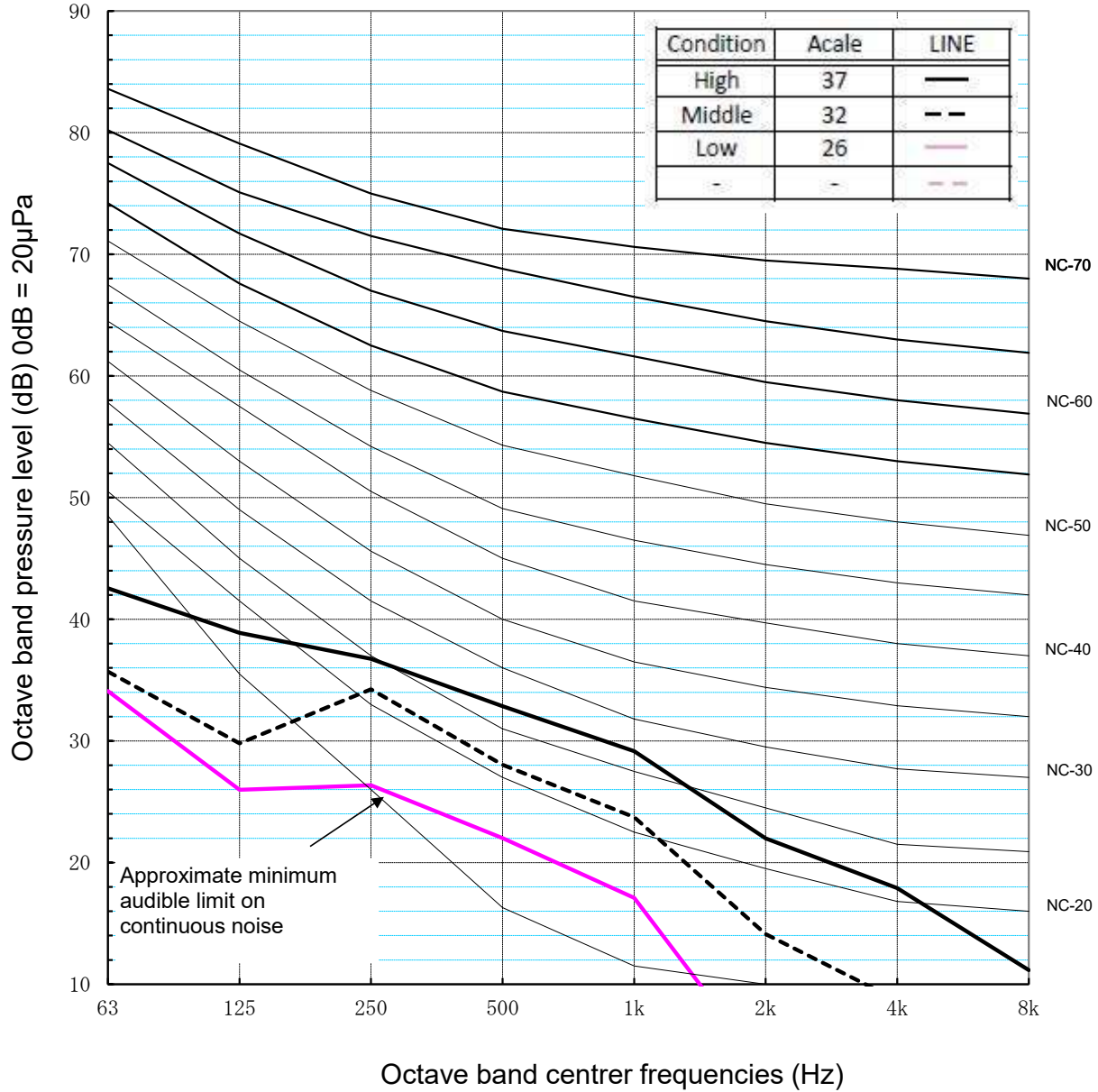
6.1. Sound pressure level



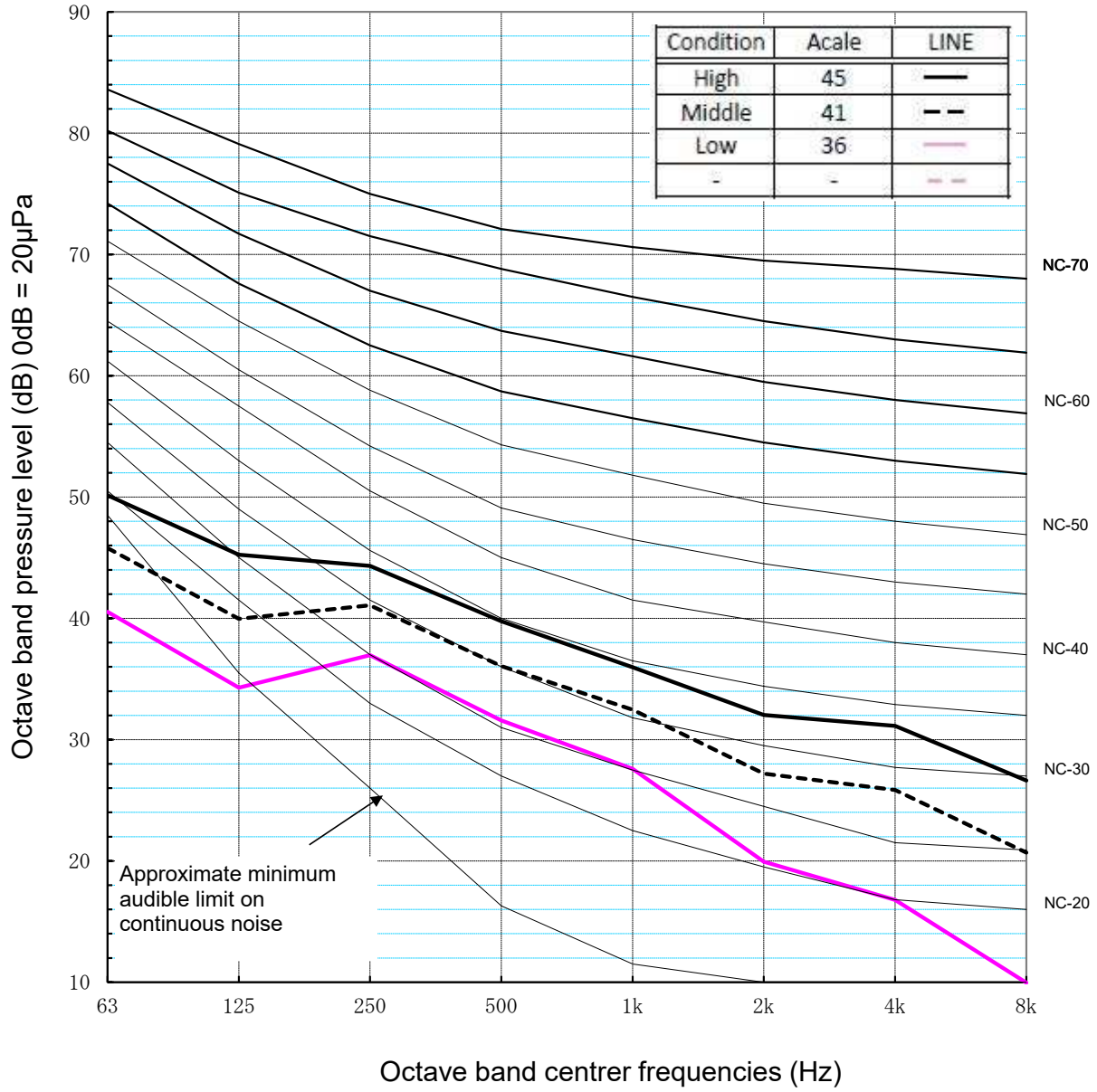
6.2. NC Curves

Table 6. Model code 12, External static pressure 0.30, 0.50, 0.80 in WG (75, 125, 200 Pa).

External static pressure 0.30



External static pressure 0.50



External static pressure 0.80

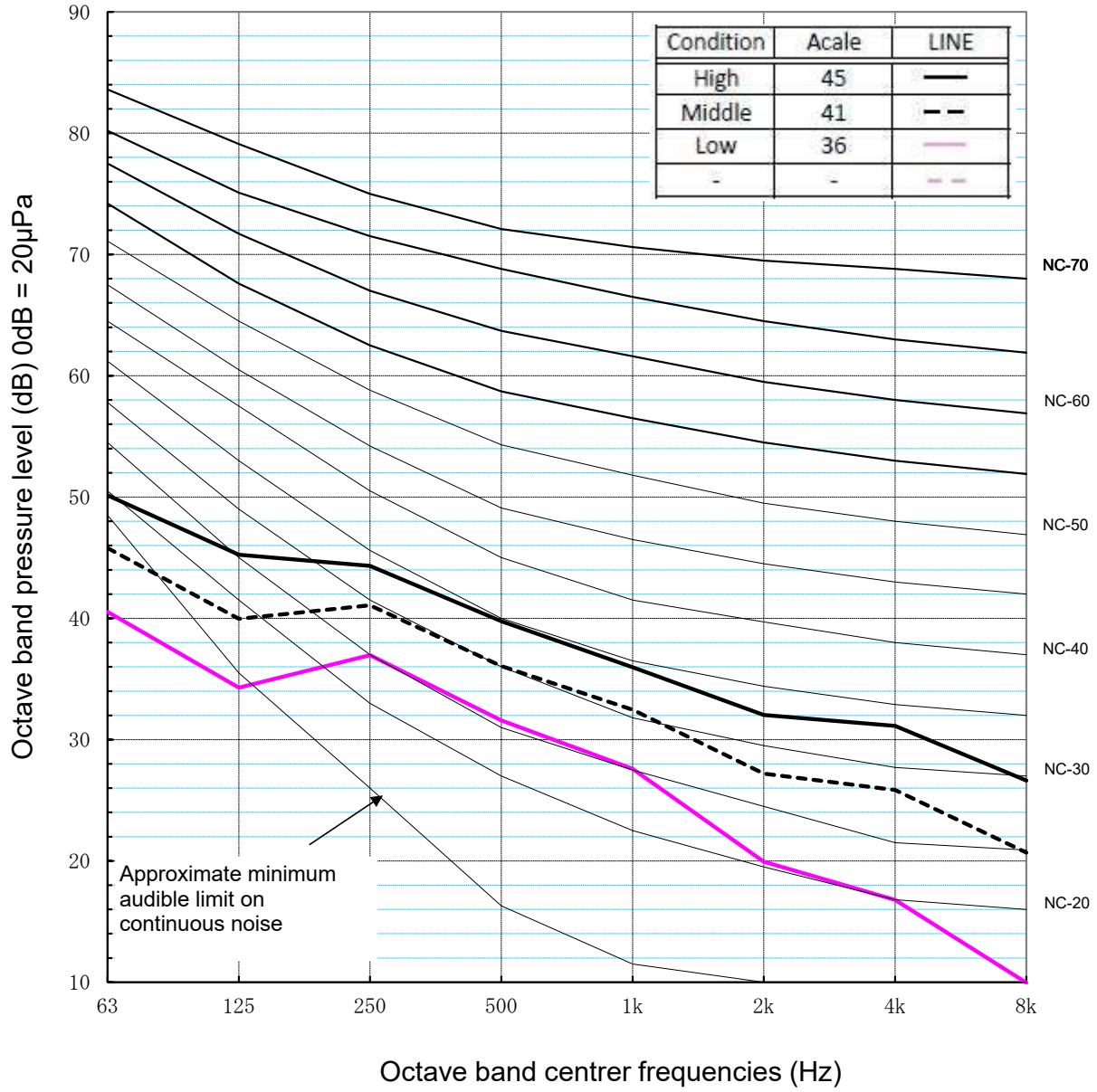
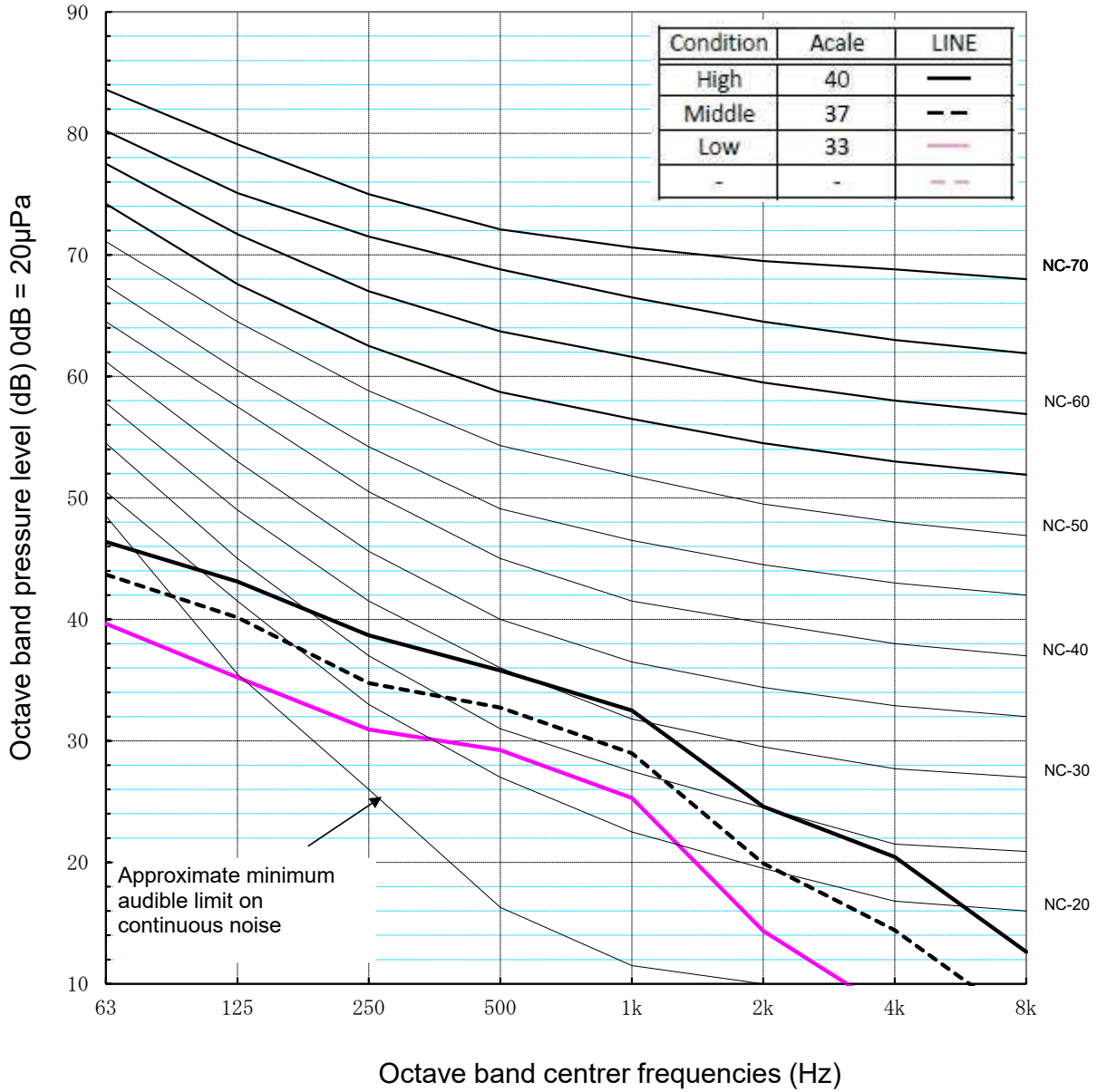
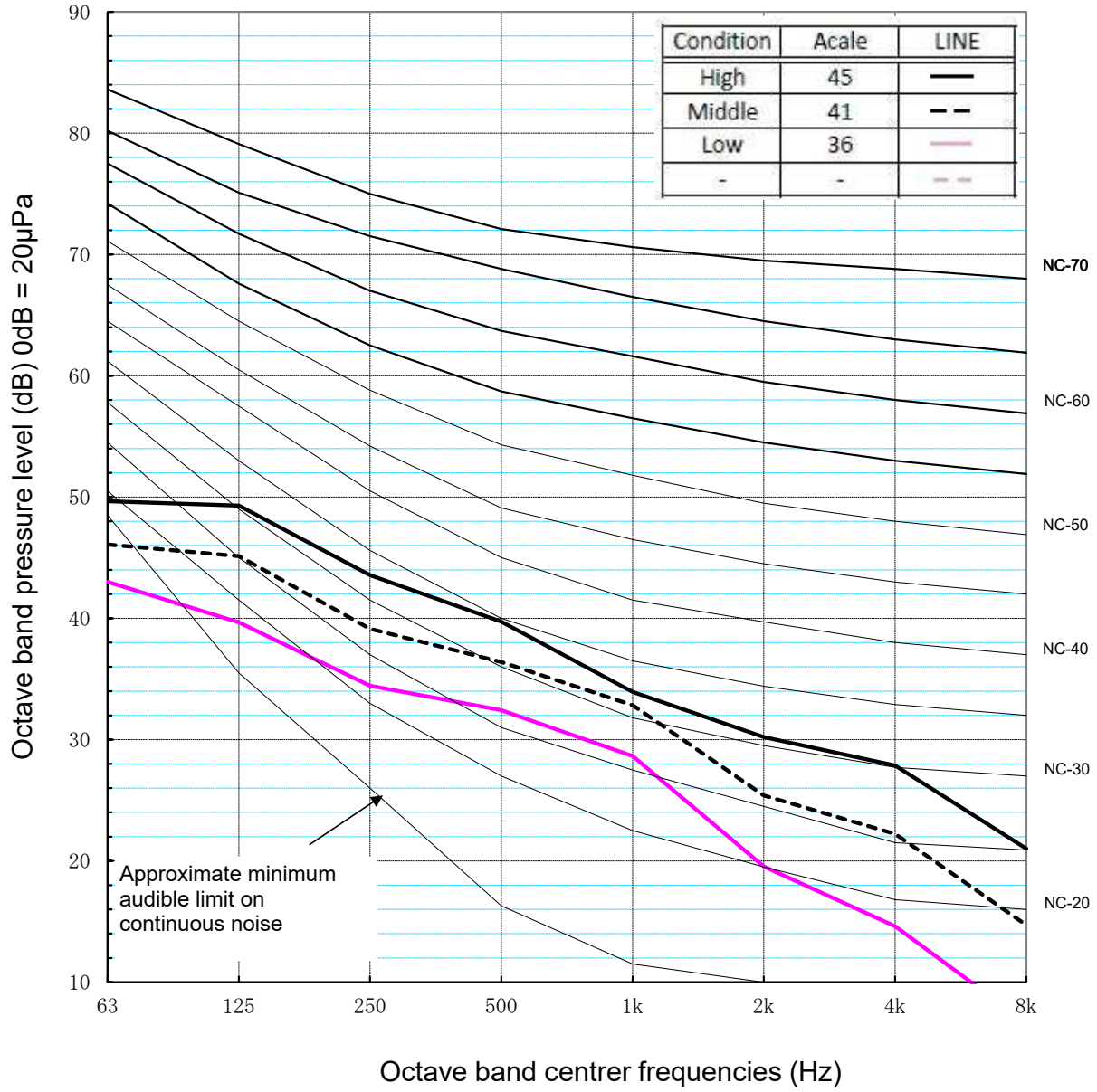


Table 7. Model code 18, External static pressure 0.30, 0.50, 0.80 in WG (75, 125, 200 Pa).

External static pressure 0.30



External static pressure 0.50



External static pressure 0.80

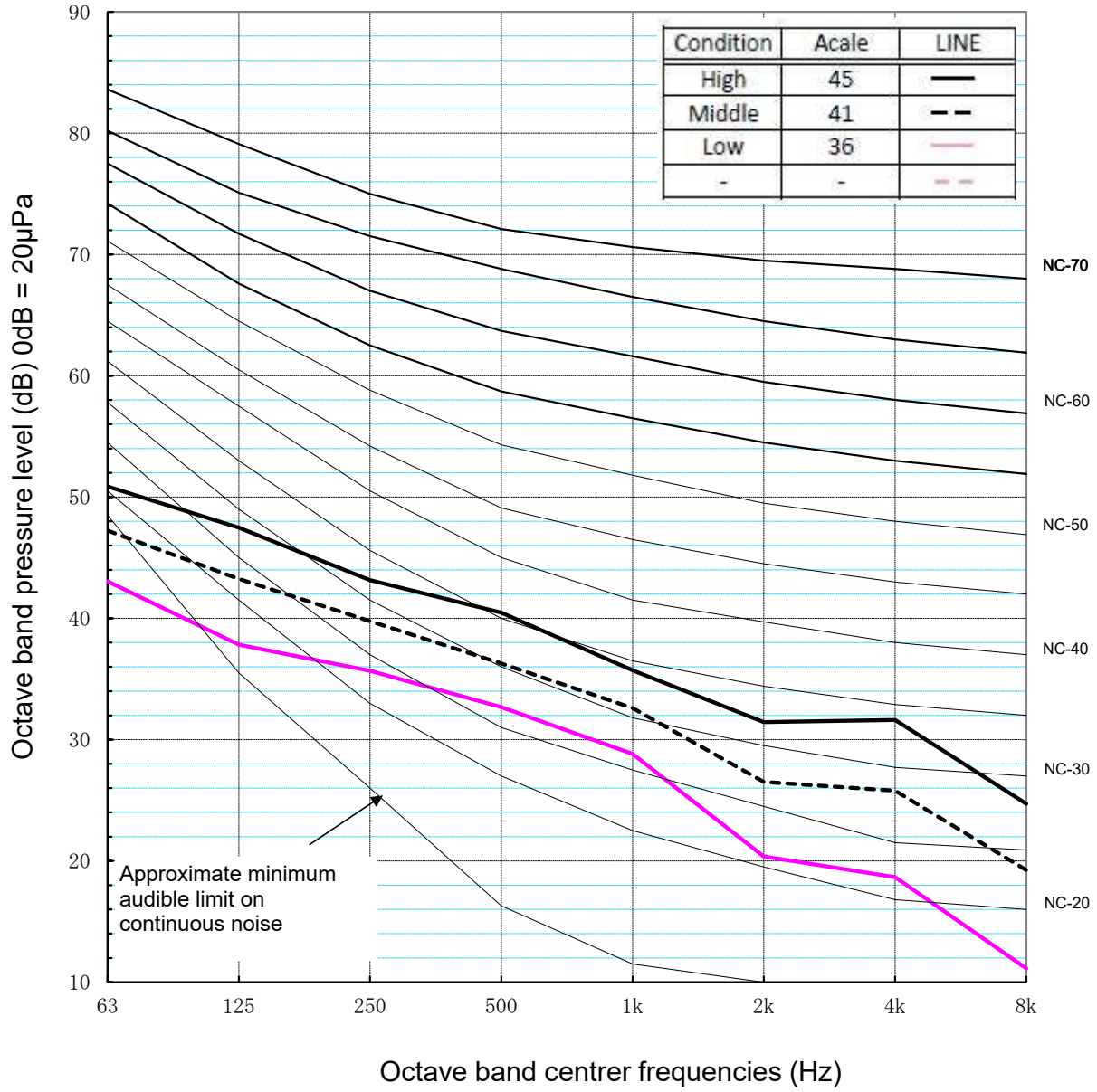
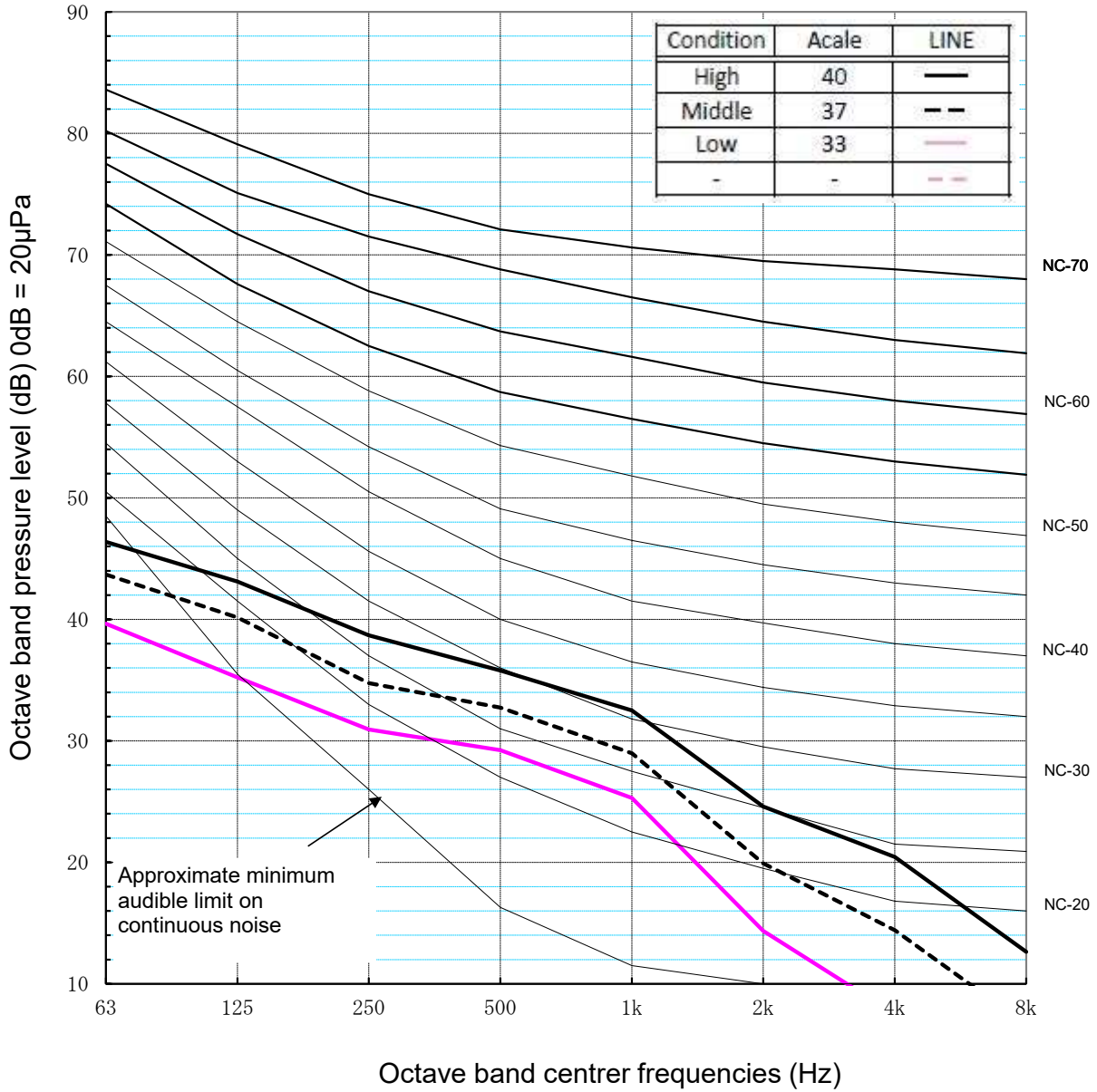
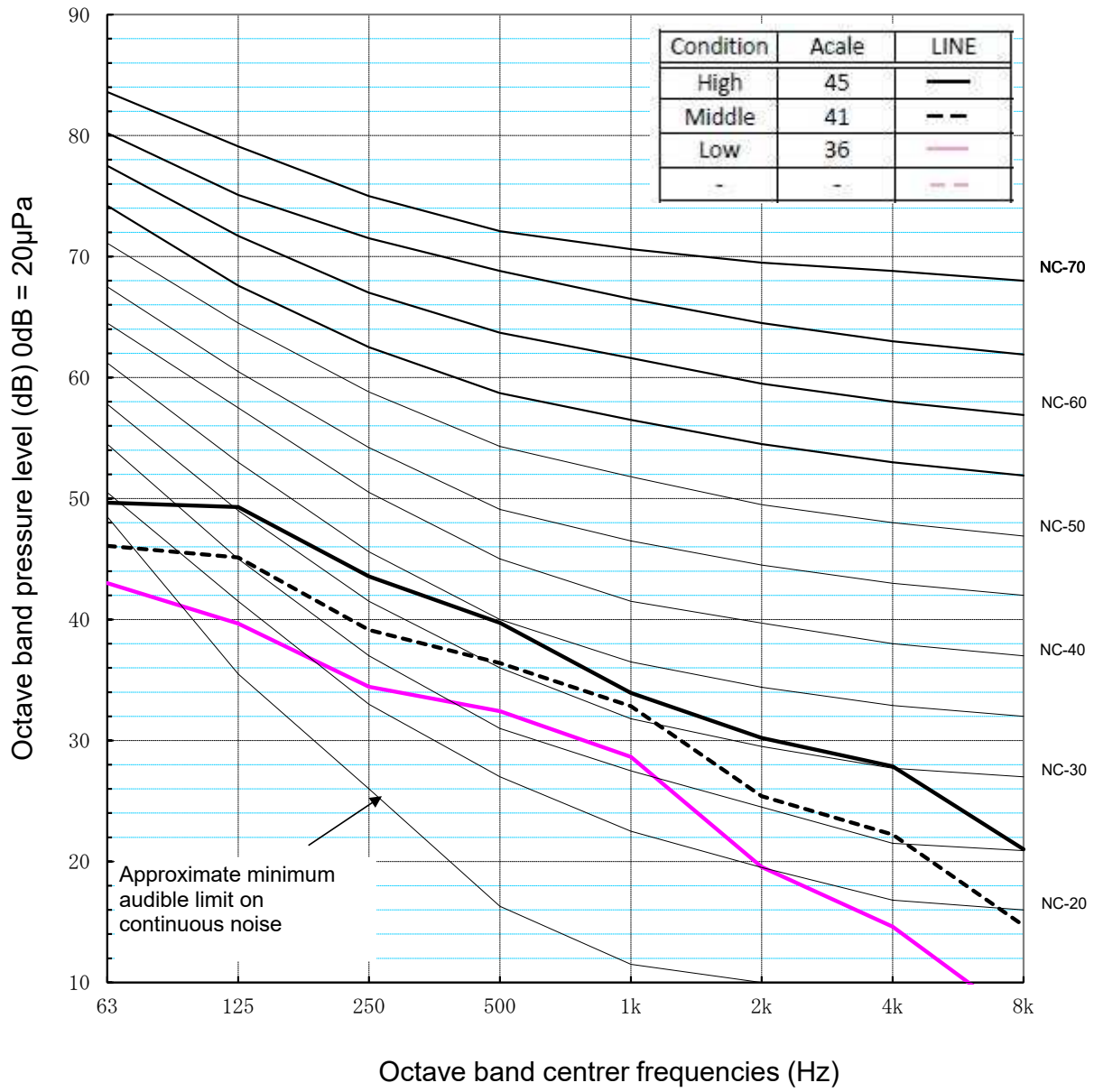


Table 8. Model code 24, External static pressure 0.30, 0.50, 0.80 in WG (75, 125, 200 Pa).

External static pressure 0.30



External static pressure 0.50



External static pressure 0.80

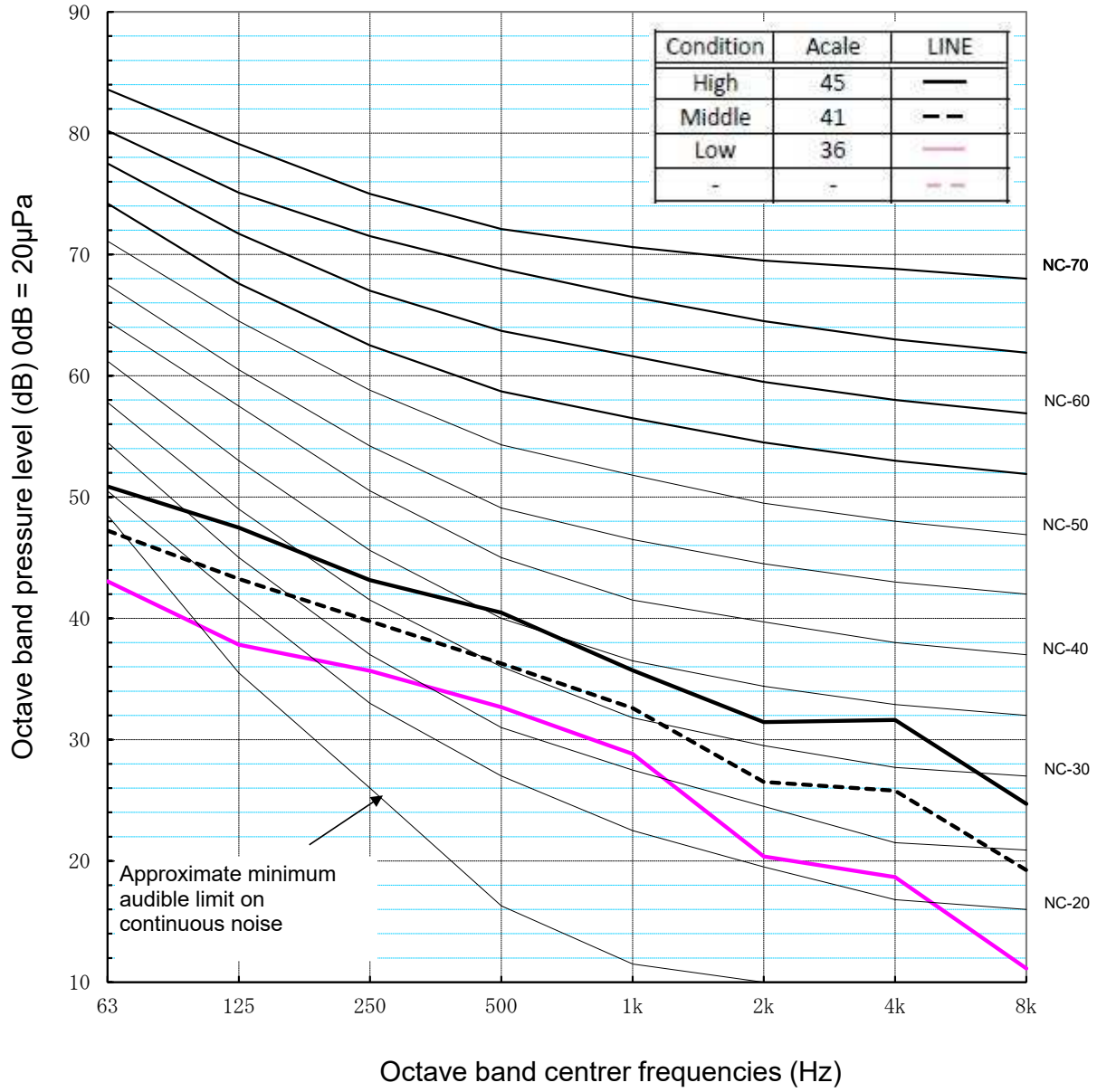
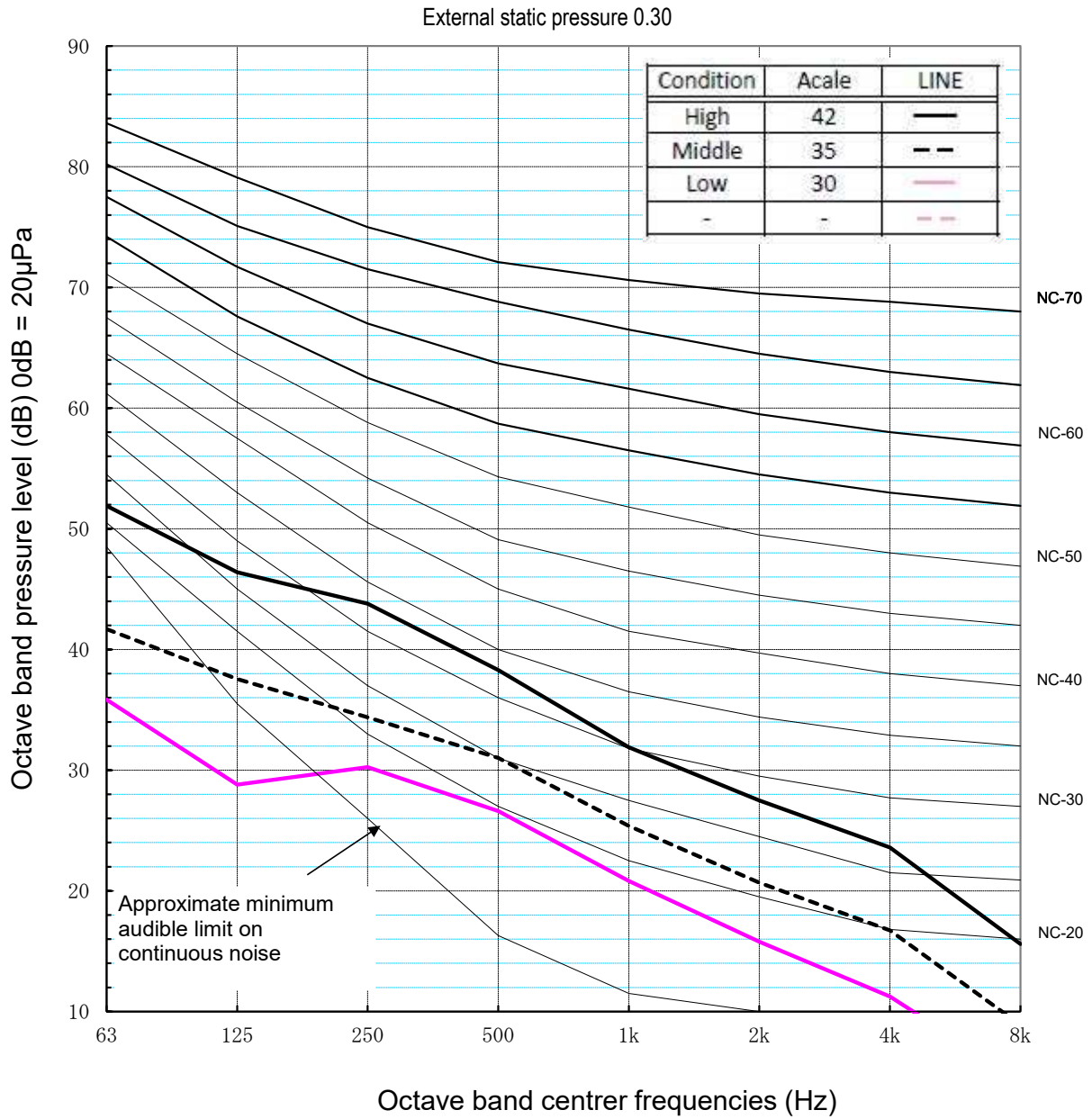
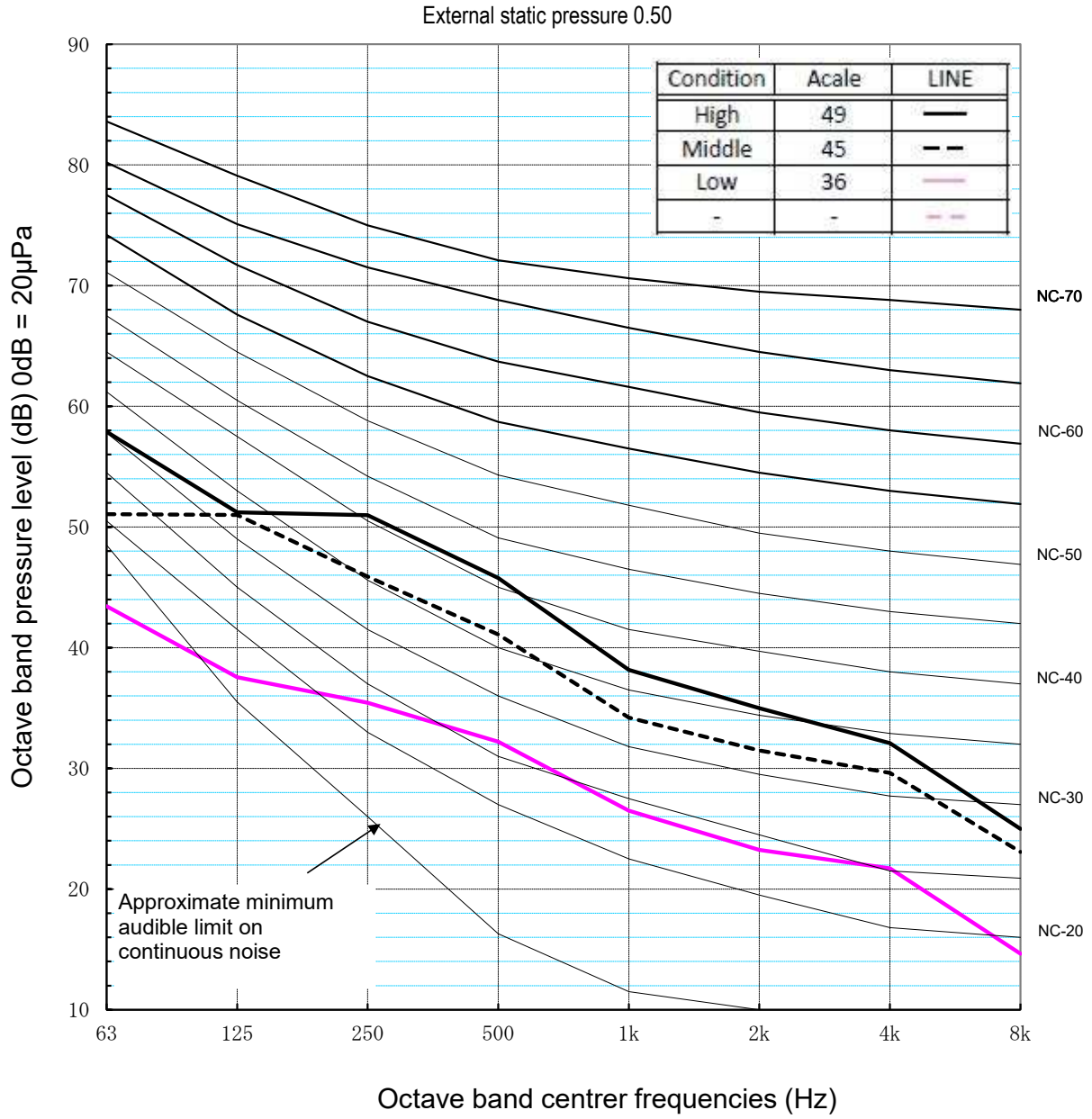


Table 9. Model code 30, External static pressure 0.30, 0.50, 0.80 in WG (75, 125, 200 Pa).





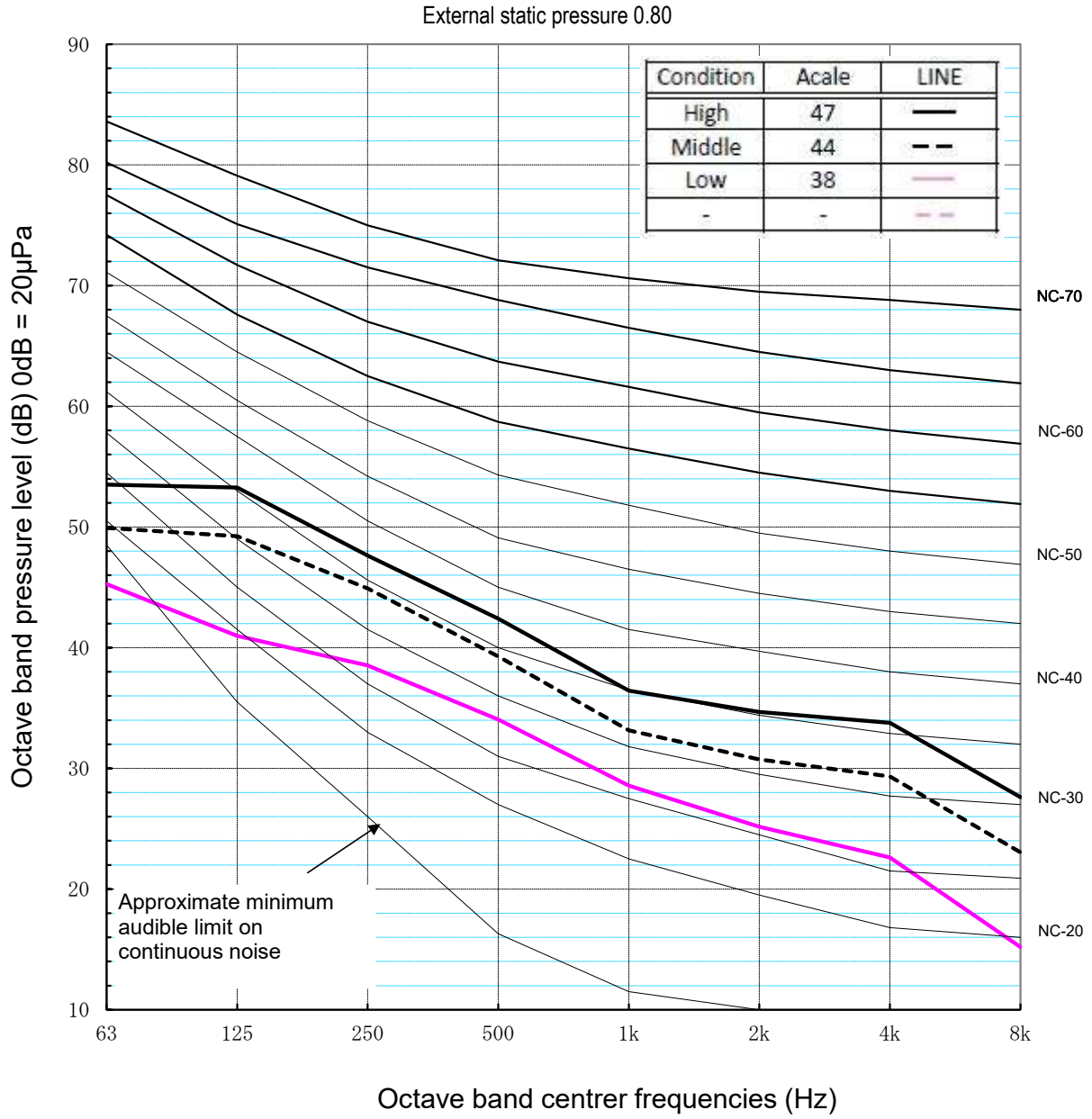
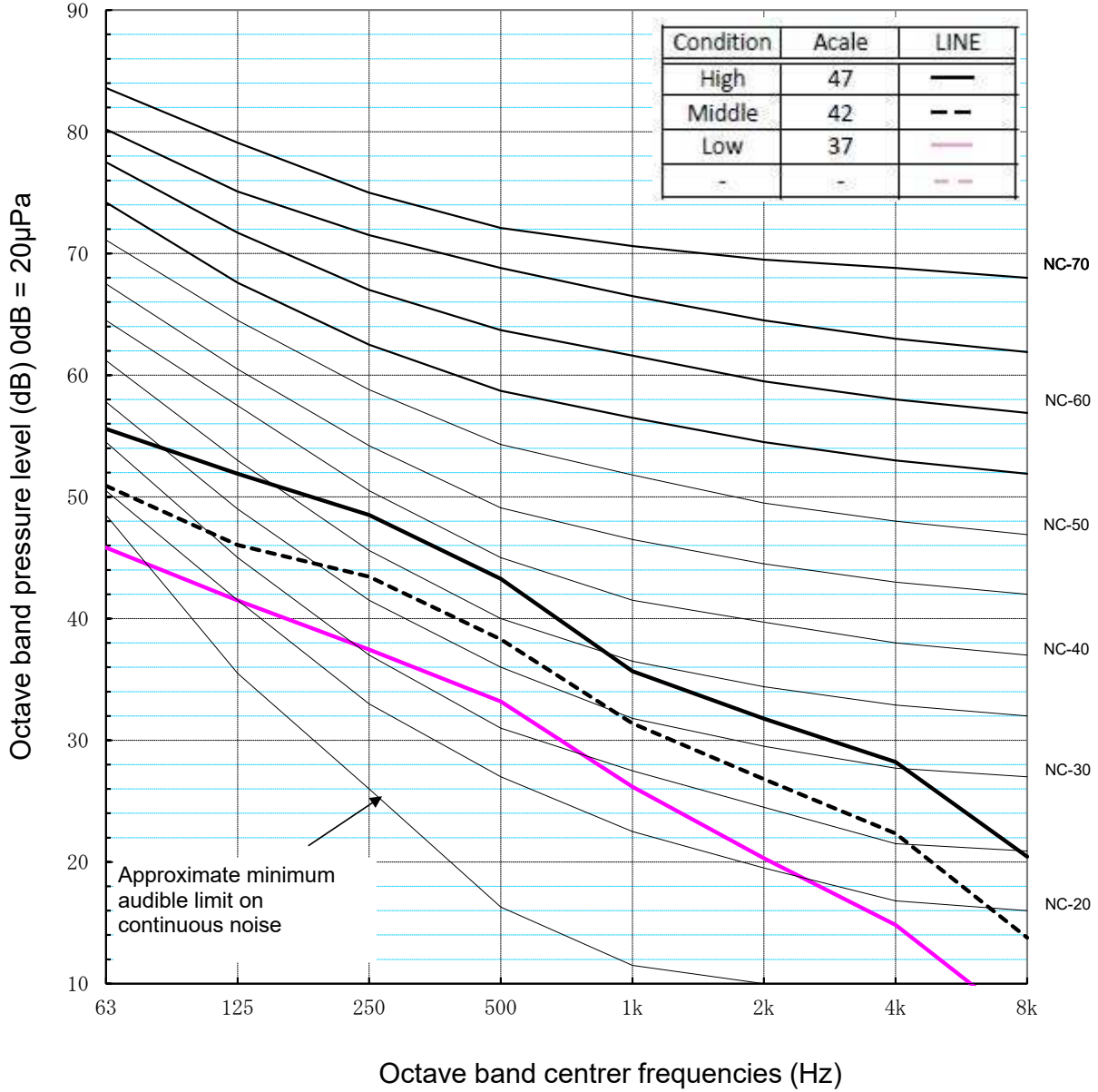
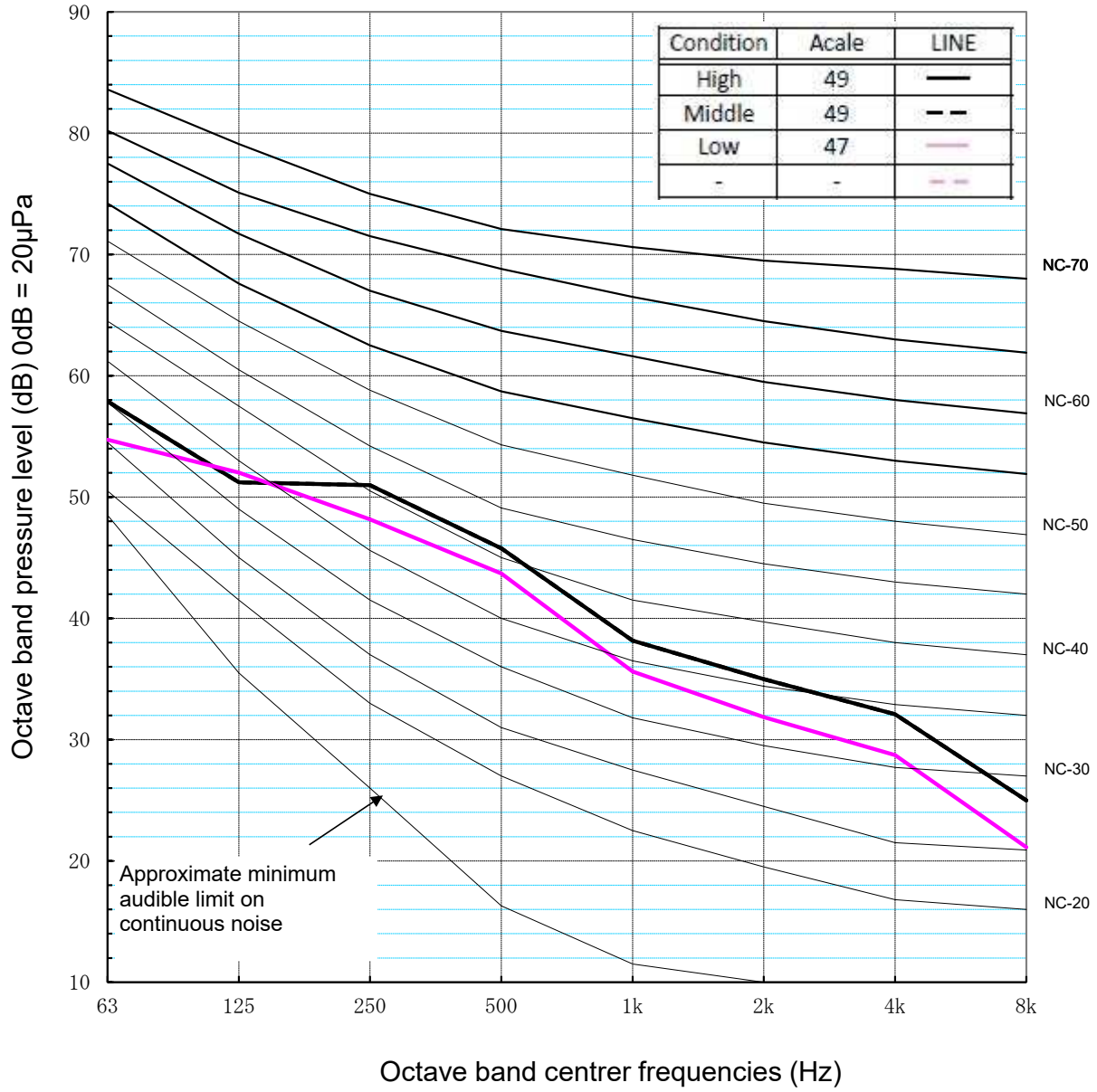


Table 10. Model code 36, External static pressure 0.30, 0.50, 0.80 in WG (75, 125, 200 Pa).

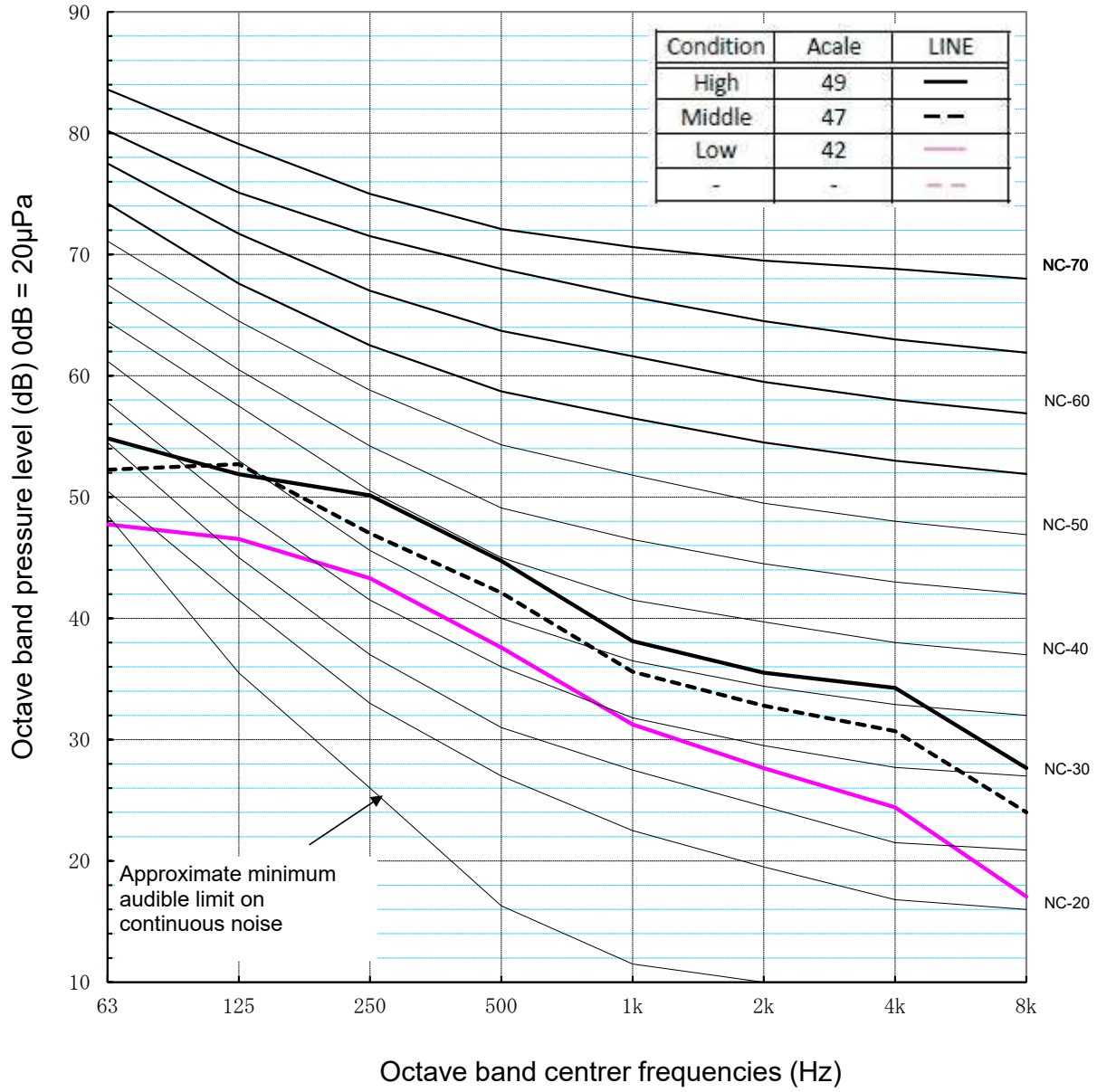
External static pressure 0.30



External static pressure 0.50

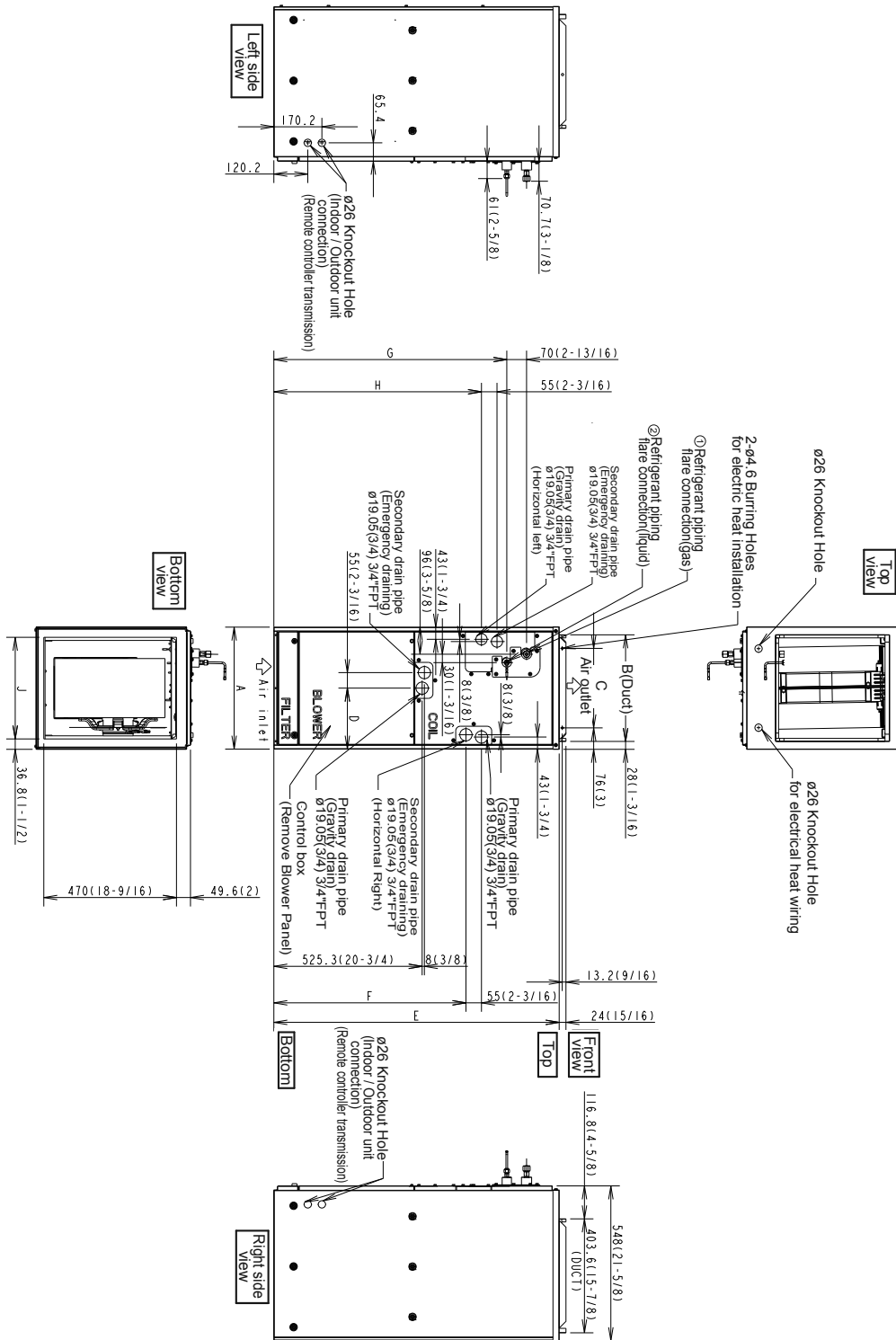


External static pressure 0.80



7. Dimensions

Units: mm (in.)



Provide enough clearance in front of unit for service and maintenance. Electrical entrance for SVZ located on both left and right side of the cabinet. See the right or left side View for Knockout locations.

Units: mm (in.)

Model code	Nominal filter size	Duct connection	② Liquid pipe	① Gas pipe
12	508 x 406.4 x 25.4 (20 x 16 x 1)	376 x 402 (14 -13/16 x 15-7/8)	Ø 6.35 (1/4)	Ø 9.52 (3/8)
18				Ø 12.7 (1/2)
24				Ø 15.88 (5/8)
30	508 x 508 x 25.4 (20 x 20 x 1)	477 x 402 (18-13/16 x 15-7/8)	Ø 9.52 (3/8)	
36				

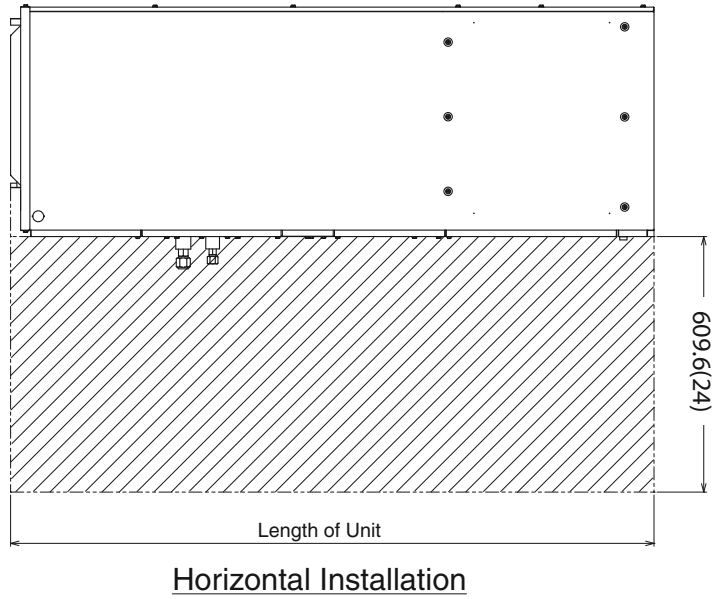
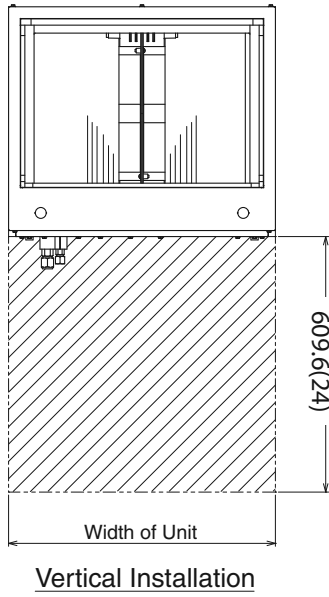
Model code	A	B	C	D
12	432 (17)	376 (14-13/16)	281 (11-1/8)	224 (8-7/8)
18				
24				
30	534 (21)	477 (18-13/16)	382.6 (15-1/8)	266.5 (10-1/2)
36				

Model code	E	F	G	H	J
12	1,010.8 (39-13/16)	680 (26-13/16)	823 (32-7/16)	735.5 (29)	360 (14-3/16)
18					
24					
30	1,113.8 (43-7/8)	737 (19-1/16)	935.5 (37-9/16)	792 (31-3/16)	461 (18-3/16)
36					

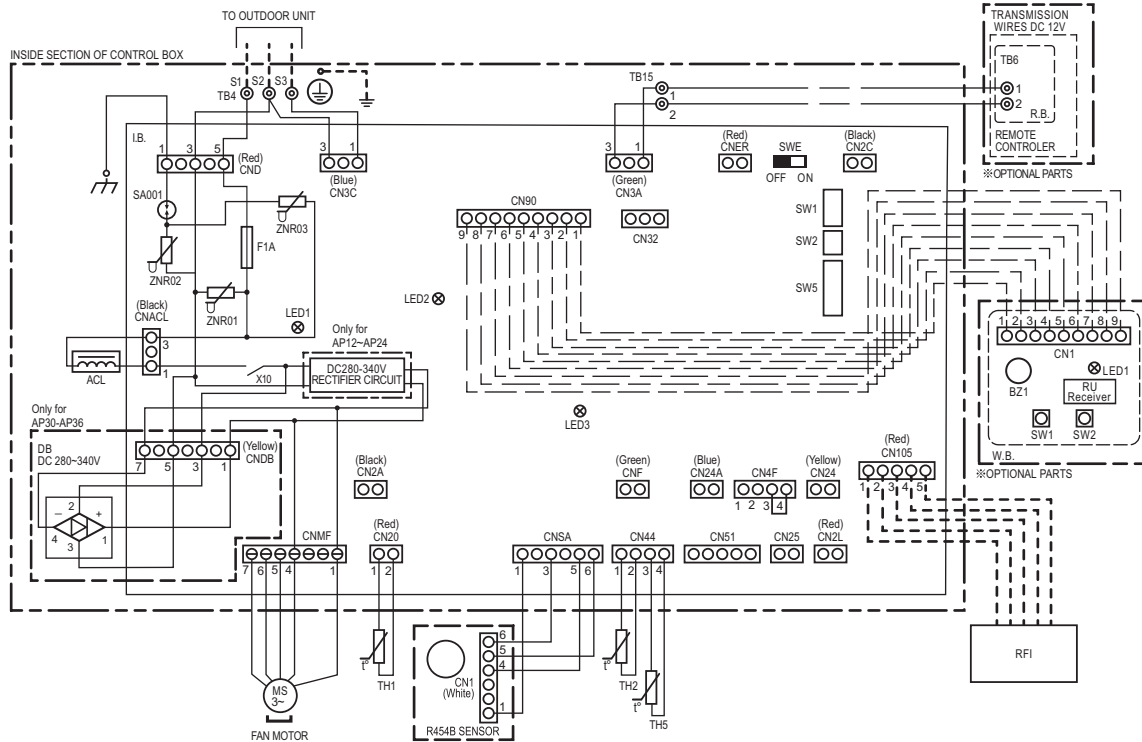
7.1. Outlines

Clearance Area

Unit:mm(in.)



8. Wiring Diagram



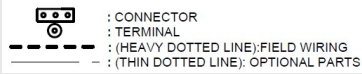
SYMBOL EXPLANATION

SYMBOL	NAME	SYMBOL	NAME	SYMBOL	NAME
I.B.	INDOOR CONTROLLER BOARD	I.B.	INDOOR CONTROLLER BOARD	OPTIONAL PARTS	
CN24	CONNECTOR (HEATER CONTROL 1ST)	SW1	SWITCH (FOR MODEL SELECTION)	W.B.	IR WIRELESS REMOTE CONTROLLER BOARD
CN24A	CONNECTOR (HEATER CONTROL 2ND)	SW2	SWITCH (FOR CAPACITY CODE)	RU	RECEIVING UNIT
CN25	CONNECTOR (HUMIDITY OUTPUT)	SW5	SWITCH (FOR MODE SELECTION)	BZ1	BUZZER
CN2A	CONNECTOR (0-10V ANALOG INPUT)	SWE	CONNECTOR (EMERGENCY OPERATION)	LED1	LED(RUN INDICATOR)
CN2C	CONNECTOR (ERV OUTPUT)	F1A	FUSE AC250V 6.3A	SW1	SWITCH(HEATING ON/OFF)
CN2L	CONNECTOR (LOSSNAY)	ZNR01, 02, 03	VARISTOR	SW2	SWITCH(COOLING ON/OFF)
CN32	CONNECTOR (REMOTE SWITCH)	SA001	ARRESTOR	R.B.	WIRED REMOTE CONTROLLER BOARD
CN51	CONNECTOR (CENTRALLY CONTROL)	X10	AUX. RELAY	TB6	TERMINAL BLOCK (REMOTE CONTROLLER TRANSMISSION LINE)
CN90	CONNECTOR (WIRELESS)	TH1	INTAKE AIR TEMP. THERMISTOR		
CN105	CONNECTOR (RADIO FREQUENCY)	TH2	PIPE TEMP. THERMISTOR/LIQUID		
CNER	CONNECTOR (ERV INPUT)	TH5	COND./EVA. TEMP. THERMISTOR		
CNF	CONNECTOR (HUMIDITY INPUT)	ACL	AC REACTOR (POWER FACTOR IMPROVEMENT)		
CNDB	CONNECTOR (DIODE BRIDGE)	DB	DIODE BRIDGE		
LED1	LED(POWER SUPPLY)	TB4	TERMINAL BLOCK (INDOOR/OUTDOOR CONNECTING LINE)		
LED2	LED(REMOTE CONTROLLER SUPPLY)	TB15	TERMINAL BLOCK (REMOTE CONTROLLER TRANSMISSION LINE)		
LED3	LED(TRANSMISSION INDOOR-OUTDOOR)				
RFI	RADIO FREQUENCY INTERFACE FOR RF THERMOSTAT				



NOTE

1. Since the outdoor side electric wiring may change be sure to check the outdoor unit electric wiring for servicing.
2. Indoor and outdoor connecting wires are made with polarities, make wiring matching terminal numbers (S1, S2, S3).
3. Symbols used in wiring diagram above are as follows:



4. Use copper supply wire. UTILISER DES FILS D'ALIMENTATION EN CUIVRE.

MODEL	SWITCH		
SVZ-AP12NL	SW1 ON 1 2 3 4 5 6	SW2 ON 1 2 3 4 5 6	SW5 ON 1 2 3 4 5 6 7 8
SVZ-AP18NL	SW1 ON 1 2 3 4 5 6	SW2 ON 1 2 3 4 5 6	SW5 ON 1 2 3 4 5 6 7 8
SVZ-AP24NL	SW1 ON 1 2 3 4 5 6	SW2 ON 1 2 3 4 5 6	SW5 ON 1 2 3 4 5 6 7 8
SVZ-AP30NL	SW1 ON 1 2 3 4 5 6	SW2 ON 1 2 3 4 5 6	SW5 ON 1 2 3 4 5 6 7 8
SVZ-AP36NL	SW1 ON 1 2 3 4 5 6	SW2 ON 1 2 3 4 5 6	SW5 ON 1 2 3 4 5 6 7 8

Manipulation Details

To perform a test run for the fan, turn on the SWE on the control board while the indoor unit is being powered.

OPERATION of LED for indoor circuit board service:



IMPORTANT

Be sure to turn off the SWE after completing a test run.

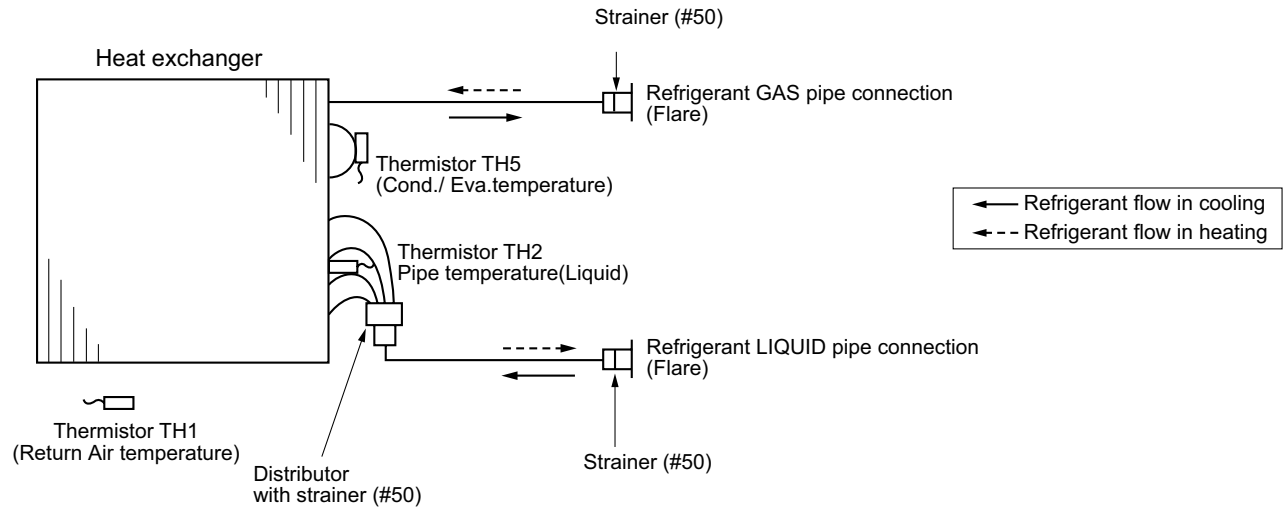


NOTE

The SWE should not be left turned on for longer than 10 hours.

SYMBOL	LED operation under normal state
LED1	At applying main power source → Lighting
LED2	At receiving MA transmission power source → Lighting
LED3	At transmitting indoor-outdoor units → Light- ing

9. Refrigerant System Diagram



10. Heater Control

10.1. Control specifications and function setting

- **Table 11. Function table: shows the mode setting for the field-installed heater.**

Mode (function) no.		Mode	Heater Operation in Error	Heater Operation in defrost	Fan Control when Heater ON ¹
11	23				
1	1	No Heater Present ²			
2	1	Heater Available	OFF	OFF	High
		Disable Heater during Defrost and Error			
2	2	Heater Available	ON	ON	High
		Enable heater and fan during Defrost and Error ³			

¹While the heater is on, the fan will operate at high speed regardless of the fan setting on the remote controller.

²Factory setting

³The heater will not operate if the following errors are active. In these cases, the error must be corrected, and the system restarted in order to recover heater function:

- Remote controller communication error [E4, E5]
- M-NET communication error [A0-A8]
- Air intake sensor error [P1]
- Indoor/outdoor unit communication error (in case of SW5-5. OFF), [E6, E7]



NOTE

Heater on signal can be output in the following cases: FL, FH error

Installers are strongly advised never to physically uninstall a wired controller while the system is running. In addition to the safety concerns, this practice can also trigger a remote controller communication error.



IMPORTANT

If the system detects an error that could potentially create a safety hazard, **the heater will not operate.**



CAUTION

If a heater is installed in a duct, do not use Panel Heater Connector. By doing so, the fan will turn off when the heater is on, which may result in fire.



NOTE

When using the SPTB1 accessory, take special care when restarting power to the system to ensure that both the indoor unit and outdoor unit are powered up at the same time to avoid triggering a communication error.

• **Table 12. Heater control table: shows how the field-installed heater is controlled.**

Mode Change	Condition								
	(To -T _{RA}) > 2.7 ° F [1.5 ° C]	AND	T _{RA} has not increased by 0.9 °F [0.5° C] i X min	EH1 ON for > 7 mi	AND	(To -T _{RA}) > 2.7 ° F [1.5 ° C]	AND	T _{RA} has not increased by 0.9 ° F [0.5° C] in 7 min	(To -T _{RA}) < 0.9 °F [0.5° C]
EH1 ON	o	AND	o						
EH2 ON				o	AND	o	AND	o	
EH1 OFF									o
EH2 OFF									o
KEY • EH1: Electric Heater • EH2: Electric Heater • To: Set point temperature • T _{RA} : Return Air temperature • X: Time delay (Selectable. Default is 20 min. Selectable to 1, 5, 10, 15, or 25 min)									

• **Table 13. Time delay selection table: shows how the time delay is selected**

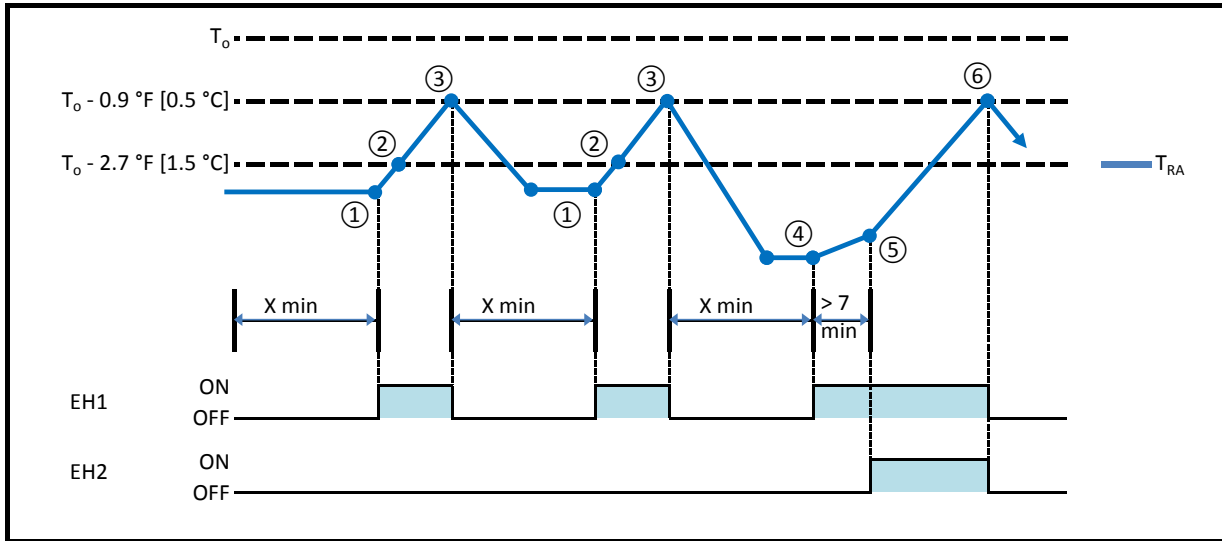
Request Code ¹	Action ²
390	Monitor Time Delay Setting
391	Set Time Delay to <u>10</u> minutes
392	Set Time Delay to <u>15</u> minutes
393	Set Time Delay to <u>20</u> minutes ³
394	Set Time Delay to <u>25</u> minutes
395	Set Time Delay to <u>5</u> minutes
396	Set Time Delay to <u>1</u> minutes

¹Time delay can only be selected with MA controller. If use of a non-MA controller is desired, the time delay must first be selected with the MA controller. Then the non-MA controller can be attached and used.

²All delay times are approximate.

³The default time delay setting is 20 minutes.

• **Table 14. Heater operation example: shows example of heater operation.**



Step	Condition			Result
①	$(T_o - T_{RA}) > 2.7\text{ }^\circ\text{F}$ [1.5 °C]	AND	T_{RA} has not increased by 0.9 °F [0.5°C] in \underline{X} min	EH1 ON
②	$(T_o - T_{RA}) < 2.7\text{ }^\circ\text{F}$ [1.5 °C]	AND	T_{RA} increasing faster than 0.9 °F [0.5°C] in $\underline{7}$ min	EH2 not ON
③	$(T_o - T_{RA}) < 0.9\text{ }^\circ\text{F}$ [0.5°C]			EH1 OFF
④	$(T_o - T_{RA}) > 2.7\text{ }^\circ\text{F}$ [1.5 °C]	AND	T_{RA} has not increased by 0.9 °F [0.5°C] in \underline{X} min	EH1 ON
⑤	$(T_o - T_{RA}) > 2.7\text{ }^\circ\text{F}$ [1.5 °C]	AND	T_{RA} not increasing faster than 0.9 °F [0.5°C] in 7 min	EH2 ON
⑥	$(T_o - T_{RA}) < 0.9\text{ }^\circ\text{F}$ [0.5°C]			EH1 OFF EH2 OFF

10.2. Fan control

By setting Mode No. 23 in the Function Table in section 9-1 and using CN2Y from the CN24RELAY-KIT-CM3 kit, the following patterns of fan control will become possible.

Table 15. Fan Control Patterns When DEFROST and ERROR¹ is displayed

CN2Y for FAN control (CN24RELAY-KIT-CM3)	Mode (function) No. 23	Heater operation	Heater is installed in the duct	No heater installed in the duct
Enabled	1 ²	OFF	During ERROR: Fan ON (Setting) During DEFROST: Fan OFF	Fan OFF
	2	ON	Fan ON High ³	Fan OFF

¹The heater will not operate if the following errors are active. In these cases, the error must be corrected, and the system restarted in order to recover heater function:

- Remote controller communication error [E4, E5]
- M-NET communication error [A0-A8]
- Air intake sensor error [P1]
- Indoor/outdoor unit communication error (in case of SW-5. OFF), [E6, E7]



NOTE

Heater on signal can be output in the following cases: FL, FH error

Installers are strongly advised never to physically uninstall a wired controller while the system is running. In addition to the safety concerns, this practice can also trigger a remote controller communication error.



IMPORTANT

If the system detects an error that could potentially create a safety hazard, **the heater will not operate.**



CAUTION

If a heater is installed in a duct, do not use Panel Heater Connector. By doing so, the fan will turn off when the heater is on, which may result in fire.



NOTE

When using the SPTB1 accessory, take special care when restarting power to the system to ensure that both the indoor unit and outdoor unit are powered up at the same time to avoid triggering a communication error.

²Factory setting

³While the heater is on, the fan will operate at high speed regardless of the fan setting on the remote controller.

Table 16. Fan Speed Setting¹

Mode	Setting		Mode No.	Setting
	Heating Thermo-OFF	DEFROST or ERROR		
Fan Control	Very Low	Very Low	25	1 ²
	STOP	Remote Controller Setting	25	2
	Remote Controller Setting	Remote Controller Setting	25	3

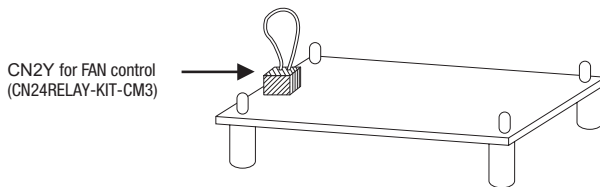
¹Refer to Installation Manual for function settings.

²Factory setting

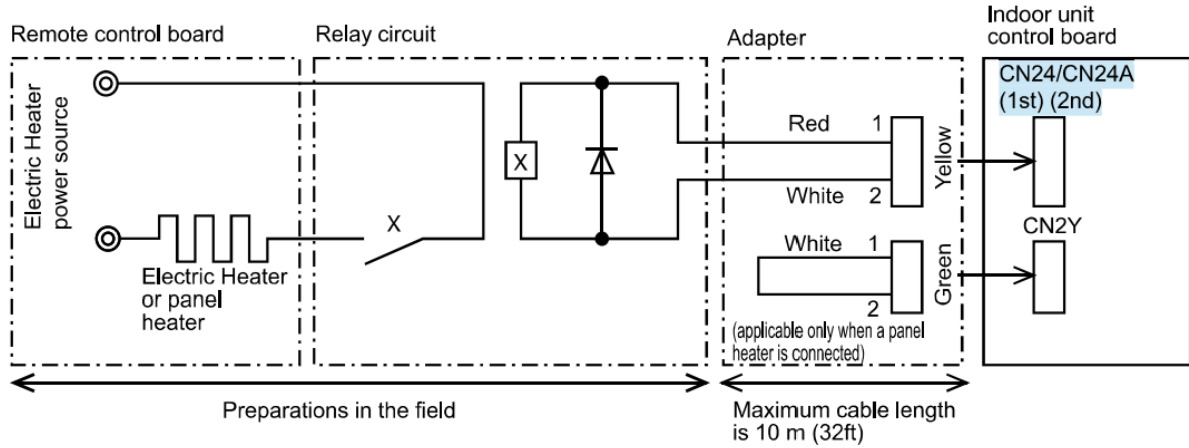
10.3. CN24RELAY-KIT-CM3 (Optional Parts) installation

The following section describes installation of the External Heater Adapter that connects to the appropriate series indoor unit. This products is the special wiring parts to drive an electric heater with the air conditioner.

1. Parts list: Check that the following parts are included in the package.
 - a. External output cable. (Two types of cables with different connectors are included.) 2 in total
 - b. Panel heater connector (White: 3) 3 in total
2. (2) Connection to the indoor unit: Use the cables that fit the connectors on the indoor unit control board.
 - a. External output cable
 - This cable is used to connect a relay circuit for an interlocked operation with either an electric or a panel heater.
 - Select the heater output pattern (1st = CN24 or 2nd = CN24A) to use, and connect the cable to the connector on the indoor unit control board that corresponds to the selection.
 - b. Panel heater connector
 - This connector is used to perform an interlocked operation with a panel heater. Depending on the indoor unit control board specification, connect the cable to CN2Y as appropriate.

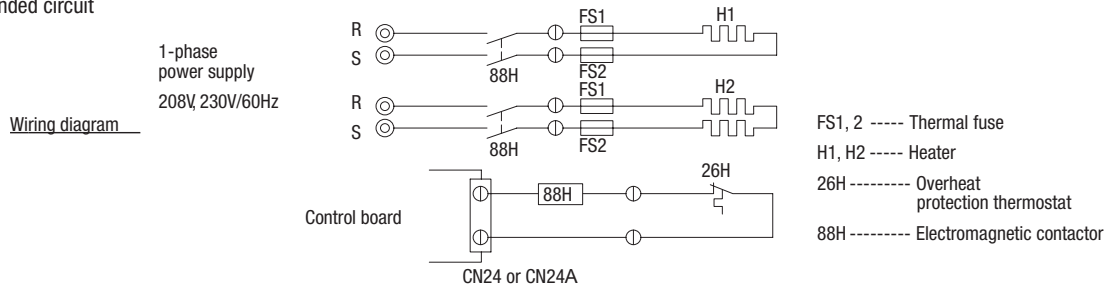


3. Wiring: A basic connection method is shown below.



- The length of the electrical wiring for the CN24RELAY-KIT-CM3 is 2 meters (6-1/2 ft.)
- To extend this length, use sheathed 2-core cable.
 - Control cable type: CVV, CVS, CPEV or equivalent. Cable size: 0.5 mm² ~ 1.25 mm² (16 to 22 AWG)
 - Don't extend the cable more than 10 meters (32ft)

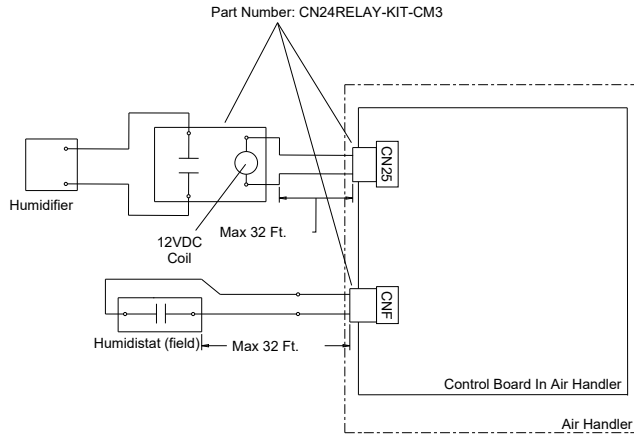
Recommended circuit



4. Wiring restrictions

- Keep the length of the cable connecting to the circuit board of the indoor unit shorter than 10 meters (32 ft).
- Longer than 10 meters (32 ft) could cause improper operation.
- Use a transit relay when extending wiring such as remote wiring.

11. Humidifier



Humidifier Control (CN25 Output is ON)

Sequence of operation:

1. The humidistat closes CNF
2. The fan starts on high
3. CN25 provides 12VDC to turn on the Humidifier (do not exceed 1 Watt draw per relay)
4. When the Humidistat opens, the fan continues to run for 30 seconds to clear the ductwork of moist air
5. If defrost starts during humidifier operation, CN25 de-energizes

Humidistat:

- Non-Voltage a-contact input
- Contact rating voltage ≥ 15 VDC
- Contact Rating Current ≥ 0.1 A
- Minimum Applicable Load ≤ 1 mA at DC

Mode (function) No.		Humidistat Output	Condition	CN25 Output	Fan Speed
13	16	CNF Input	(No Defrost/No Error)		
2	1 ^a .	OFF	Heat operation & Thermo OFF	OFF	RC ^b Setting
			Heat operation & Thermo ON		
		ON	Heat operation & Thermo OFF	OFF	RC Setting
			Heat operation & Thermo ON	ON	High
	2	OFF	Heat operation & Thermo OFF	OFF	RC Setting
			Heat operation & Thermo ON		
ON	Heat operation & Thermo OFF	ON	High		
	Heat operation & Thermo ON				
1 ^a .	-	-	No humidifier operation	OFF	RC Setting

The fan continues to run for 30 seconds after the humidifier stops.



CAUTION

If a heater is installed in a duct, do not use Panel Heater Connector. By doing so, the fan will turn off when the heater is on, which may result in fire.



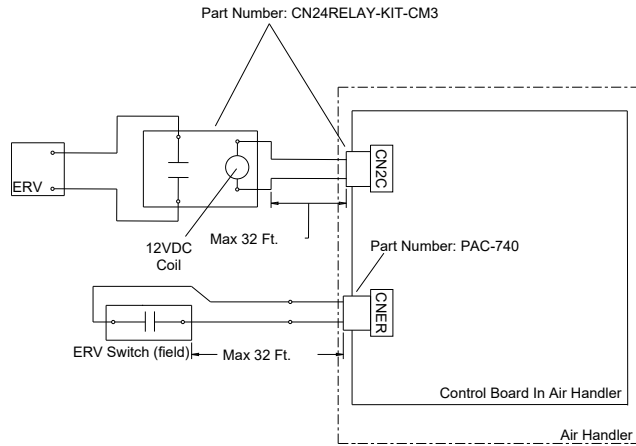
NOTE

When using the SPTB1 accessory, take special care when restarting power to the system to ensure that both the indoor unit and outdoor unit are powered up at the same time to avoid triggering a communication error.

^a Factory setting

^b Remote controller

12. ERV (Energy Recovery Ventilation)



ERV Control

Sequence of operation:

1. The ERV demand switch closes CNER
2. 12 VDC is provided to CN2C to turn on ERV
3. If the unit goes into defrost, CN2C stops 12 VDC output

ERV Switch:

- Non-Voltage a-contact input
- Contact rating voltage ≥ 15 VDC
- Contact rating current ≥ 0.1 A
- Minimum applicable load ≤ 1 mA at DC

ERV output CNER input	Function Mode 26	Condition	Fan speed	CN2C output (=Fan output)
OFF	-	Cool/Heat/Fan operation	RC ^a setting	ON
		Defrost	STOP	OFF
		STOP	STOP	OFF
ON	1 ^b	Cool/Heat/Fan operation	RC setting	ON
		Defrost	STOP	OFF
		STOP	STOP	OFF
	2	Cool/Heat/Fan operation	RC setting	ON
		Defrost	STOP	OFF
		STOP	RC setting ^{c,d}	ON

^aRemote controller

^bFactory setting

^cIf ERV control is effective when STOP, IDU doesn't report fan status or PB error (Fan motor error).

^dWhen fan speed setting by RC is "Auto", Fan speed is fixed to "HIGH".

13. Troubleshooting

13.1. Cautions on troubleshooting



CAUTION

(1) Before troubleshooting, check the following:

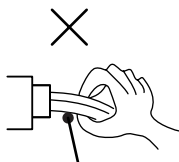
1. Check the power supply voltage.
2. Check the indoor/outdoor connecting wire for miswiring.



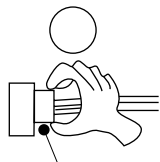
CAUTION

(2) Take care of the following during servicing.

1. Before servicing the air conditioner, be sure to turn off the remote controller first to stop the main unit, and then turn off the breaker.
2. When removing the indoor controller board, hold the edge of the board with care NOT to apply stress on the components.
3. When connecting or disconnecting the connectors, hold the housing of the connector. DO NOT pull the lead wires.



Lead wires



Housing point

13.2. Self-check

Refer to the installation manual that comes with each remote controller for details.

Remote controller	[Output pattern A] Errors detected by indoor unit
Check code on the LCD	Symptom
P1	Intake sensor error
P2 / P9	Pipe (liquid or 2-phase pipe) sensor error
E6 / E7	Indoor / outdoor unit communication error
P4	Float switch connector open error
P5	Drain pump error
P6	Freezing / overheating safeguard operation
EE	Communication error between indoor and outdoor units
P8	Pipe temperature error
E4, E5	Remote controller signal communication error
PB	Fan motor error
Fb	Indoor unit control system error (memory error, etc.)
FL	Refrigerant leak detected
FH	Refrigerant leak sensor error ^a
PL	Refrigerant circuit abnormal
E0, E3	(NO sound) Remote controller transmission error
E1, E2	(NO sound) Remote controller control board error

^aThe refrigerant leak sensor is not properly connected OR replacement of refrigerant leak sensor is required due to end of life or failure. See the sub-section *Service note: servicing and replacing the refrigerant leak sensor* found in chapter *Mount positions* for basic information about the refrigerant leak sensor location and replacement. A complete procedure can be found in the Indoor Unit service manual.

Remote controller	[Output pattern B] Errors detected by unit other than indoor unit (outdoor unit, etc.)
Check code on the LCD	Symptom
E9	Indoor/outdoor unit communication error (transmitting error) (outdoor unit)
UP	Compressor overcurrent interruption
U3 / U4	Open/short of outdoor unit thermistors
UF	Compressor overcurrent interruption (when compressor locked)
U2	Abnormal high discharging temperature / 49C worked / insufficient refrigerant
U1 / Ud	Abnormal high pressure (63H worked) / overheating safeguard operation
U5	Abnormal temperature of heat sink
U8	Outdoor unit fan protection stop
U6	Compressor overcurrent interruption / abnormal of power module
U7	Abnormality of super heat due to low discharge temperature
U9 / UH	Abnormality such as overvoltage, voltage shortage, abnormal and synchronous signal to main circuit / current sensor error
FL	Refrigerant leakage or Refrigerant leak sensor error caused by other rooms
Others	Other errors (refer to the technical manual for the outdoor unit)

If the unit cannot be operated properly after the above test run has been performed, use this table to remove the cause:

Symptom			Cause
Remote controller	LED 1, 2 (PCB in outdoor unit)		
PLEASE WAIT	For about 2 minutes following power-on	After LED 1, 2 are lit → LED 2 is turned off Only LED 1 is lit (correct operation)	<ul style="list-style-type: none"> For about 2 minutes after power-on, operation of the remote controller is not possible due to system start-up. (correct operation)
PLEASE WAIT → Error code	After about 2 minutes has expired following power-on	Only LED 1 is lit → LED 1, 2 blink.	<ul style="list-style-type: none"> Connector for the outdoor unit's protection device is not connected. Reverse or open phase wiring for the outdoor unit's power terminal block (L1, L2, L3)
Display messages do not appear even when operation switch is turned ON (operation lamp does not light up).		Only LED 1 is lit → LED 1, 2 blinks twice LED 2 blinks once	<ul style="list-style-type: none"> Incorrect wiring between indoor and outdoor units (incorrect polarity of S1, S2, S3) Remote controller wire short
Operation is not possible for about 30 seconds after cancellation of function selection. (correct operation)			

Description of LED 1, 2, and 3 on the indoor controller	
LED 1: power for microcomputer	Indicates whether control power is supplied. Make sure that this LED is always lit.
LED 2: power for remote controller	Indicates whether power is supplied to the remote controller. This LED lights only in the case of the indoor unit which is connected to the outdoor unit refrigerant address "0".
LED 3: communication between indoor and outdoor units	Indicates state of communication between the indoor and outdoor units. Make sure that this LED is always blinking.

13.2.1. Auto restart function

Indoor unit control board

This model is equipped with the AUTO RESTART FUNCTION.

When the indoor unit is controlled with the remote controller, the operation mode, set temperature, and the fan speed are memorized by the indoor unit control board.

The AUTO RESTART FUNCTION will restart the unit within a time delay of 5 to 10 minutes after power is restored.

Set the AUTO RESTART FUNCTION using the remote controller. (Mode no. 01)

13.2.2. Function table

Mode	Settings	Mode (function) No.	Setting no.	Default setting
Power failure auto restart	Not available	01	1	1
	Available		2	
Indoor temperature detect	Indoor unit operating average	02	1	1
	Indoor unit's internal sensor		2	

Mode	Settings	Mode (function) No.	Setting no.	Default setting
	Remote controller's internal sensor		3	
LOSSNAY connectivity	Not supported	03	1	1
	Supported (indoor unit is not equipped with outdoor air intake)		2	
	Supported (indoor unit is equipped with outdoor air intake)		3	
Power voltage	240V (230V)	04	1	1
	220V (208V)		2	
Filter sign	100 Hr	07	1	3
	2500 Hr		2	
	No filter sign indicator		3	
External static pressure	See section 14.4 of the installation manual	08	1	2
			2	
			3	
		10	1	1
Humidifier control	Heat mode & Thermo ON	16	1	1
	Heat mode		2	
Humidifier	Humidifier not present	13	1	1
	Humidifier present		2	
Heater control	Heater not present	11	1	1
	Heater present ^a .		2	
Heater control defrost and error	Disable heater during defrost and error	23	1	1
	Enable heater and fan during defrost and error ^b .		2	
Fan speed thermo off (heating)	Extra low	25	1	1
	Stop		2	
	RC Setting		3	
Fan speed thermo off (cooling)	RC setting	27	1	1
	Stop		2	
Coil frost prevention when cooling	Stops operation if indoor coil temp reaches 36° F or less	15	1	1
	Stops operation if indoor coil temp reaches 37° F or less		2	
Room temp offset for high ceilings	Increase temp offset by 7.2° F	24	1	1
	No offset		2	
Abnormal pipe temp detection	Controller will display P8 error when pipe temps are abnormally low or high	28	1	1
	Error will not be displayed until maximum thresholds are reached		2	

^aWhile the heater is on, the fan will operate at high speed regardless of the fan setting on the remote controller.

^bThe heater will not operate if the following errors are active. In these cases, the error must be corrected, and the system restarted in order to recover heater function:

- Remote controller communication error (E4, E5)
- M-NET communication error (A0-A8)
- Air intake sensor error (P1)

Installers are strongly advised never to physically uninstall a wired controller while the system is running. In addition to the safety concerns, this practice can also trigger a remote controller communication error.



IMPORTANT

If the system detects an error that could potentially create a safety hazard, the heater will not operate.



CAUTION

If a heater is installed in a duct, do not use Panel Heater Connector. By doing so, the fan will turn off when the heater is on, which may result in fire.





NOTE

When using the SPTB1 accessory, take special care when restarting power to the system to ensure that both the indoor unit and outdoor unit are powered up at the same time to avoid triggering a communication error.

13.3. Self-diagnosis action table

Error Code	Abnormal point and detection method	Cause	Countermeasure
P1	<p>Room temperature thermistor (TH1)</p> <ol style="list-style-type: none"> The unit is in three-minute resume prevention mode if short/open of thermistor is detected. Abnormal if the unit does not reset normally after three minutes. (The unit returns to normal operation, if it has normally reset.) Constantly detected during cooling, drying and heating operation Short: 90 °C [194 °F] or more Open: -40 °C [-40 °F] or less 	<ol style="list-style-type: none"> Defective thermistor characteristics Contact failure of connector (CN20) on the indoor controller board (Insert failure) Breaking of wire or contact failure of thermistor wiring Defective indoor controller board 	<p>1-3. Check resistance value of thermistor.</p> <p>0 °C [32 °F].....15.0kΩ 10 °C [50 °F].....9.6kΩ 20 °C [68 °F].....6.3kΩ 30 °C [86 °F].....4.3kΩ 40 °C [104 °F]...3.0kΩ</p> <p>If you put force on (draw or bend) the lead wire with measuring resistance value of thermistor breaking of wire or contact failure can be detected.</p> <p>2. Check contact failure of connector (CN20) on the indoor controller board. Refer to 12-5. Turn the power on again and check restart after inserting connector again.</p> <p>4. Check room temperature display on remote controller. Replace indoor controller board if there is abnormal difference with actual room temperature. Turn the power off, and on again to operate after check.</p>

Error Code	Abnormal point and detection method	Cause	Countermeasure
P2	<p>Pipe temperature thermistor/Liquid (TH2)</p> <ol style="list-style-type: none"> The unit is in three-minute resume prevention mode if short/open of thermistor is detected. Abnormal if the unit does not reset normally after three minutes. (The unit returns to normal operation, if it has normally reset.) Constantly detected during cooling, drying, and heating (except defrosting) operation. Short: 90 °C [194 °F] or more Open: -40 °C [-40 °F] or less 	<ol style="list-style-type: none"> Defective thermistor characteristics Contact failure of connector (CN44) on the indoor controller board (Insert failure) Breaking of wire or contact failure of thermistor wiring Defective refrigerant circuit is causing thermistor temperature of 90 °C [194 °F] or more or -40 °C [-40 °F] or less. 5 Defective indoor controller board 	<ol style="list-style-type: none"> Check resistance value of thermistor. For characteristics, refer to (P1) above. Check contact failure of connector (CN44) on the indoor controller board. Refer to 12-5. Turn the power on again and check restart after inserting connector again. Check pipe <liquid> temperature with remote controller in test run mode. If pipe<liquid> temperature is extremely low (in cooling mode) or high (in heating mode), refrigerant circuit may have defective. Check pipe <liquid> temperature with remote controller in test run mode. If there is extreme difference with actual pipe <liquid> temperature, replace indoor controller board. Turn the power off, and on again to operate after check.
P4 (5701)	<p>Contact failure of drain float switch (CN4F)</p> <ol style="list-style-type: none"> Extract when the connector of drain float switch is disconnected. (3 and 4 of connector CN4F is not short-circuited.) Constantly detected during operation. 	<ol style="list-style-type: none"> Contact failure of connector (Insert failure) Defective indoor controller board 	<ol style="list-style-type: none"> Check contact failure of float switch connector. Turn the power on again and check after inserting connector again. Operate with connector (CN4F) short-circuited. Refer to 12-5. Replace indoor controller board if abnormality reappears.
P6	<p>Freezing/overheating protection is working</p> <ol style="list-style-type: none"> Freezing protection (Cooling mode) The unit is in six-minute resume prevention mode if pipe <liquid or condenser/evaporator> temperature stays under -15 °C [5 °F] for three minutes after the compressor started. Abnormal if it stays under -15 °C [5 °F] for three minutes again within 16 minutes after six-minute resume prevention mode. Overheating protection (Heating mode) The units is in six-minute resume prevention mode if pipe <Liquid or condenser / evaporator>temperature is detected as over 70 °C [158 °F] after the compressor started. Abnormal if the temperature of over 70 °C [158 °F] is detected again within 30 minutes after six-minute resume prevention mode. 	<p>(Cooling or drying mode)</p> <ol style="list-style-type: none"> Clogged filter (reduced airflow) Short cycle of air path Low-load (low temperature) operation beyond the tolerance range 4 Defective indoor fan motor <ul style="list-style-type: none"> Fan motor is defective. Indoor controller board is defective. Defective outdoor fan control Overcharge of refrigerant Defective refrigerant circuit (clogs) <p>(Heating mode)</p> <ol style="list-style-type: none"> Clogged filter (reduced airflow) Short cycle of air path Over-load (high temperature) operation beyond the tolerance range Defective indoor fan motor <ul style="list-style-type: none"> Fan motor is defective. Indoor controller board is defective. Defective outdoor fan control Overcharge of refrigerant 7 Defective refrigerant circuit (clogs) Bypass circuit of outdoor unit is defective 	<p>(Cooling or drying mode)</p> <ol style="list-style-type: none"> Check clogging of the filter Remove shields Refer to 12-8. DC Fan motor (FAN MOTOR/ INDOOR CONTROLLER BOARD) Check outdoor fan motor 6~7. Check operating condition of refrigerant circuit. <p>(Heating mode)</p> <ol style="list-style-type: none"> Check clogs of the filter Remove shields Refer to 12-8. DC Fan motor (FAN MOTOR/ INDOOR CONTROLLER BOARD) Check outdoor fan motor 6~8. Check operating condition of refrigerant circuit

Error Code	Abnormal point and detection method	Cause	Countermeasure
P8	<p>Pipe temperature <Cooling mode> Detected as abnormal when the pipe temperature is not in the cooling range 3 minutes after compressor start and 6 minutes after the liquid or condenser/evaporator pipe is out of cooling range.</p> <div data-bbox="269 478 719 674" style="background-color: #e0e0e0; padding: 5px;">  <p>NOTE 1) It takes at least 9 minutes. to detect. 2) Abnormality P8 is not detected in drying mode.</p> </div> <p>Cooling range : -3 °C (-5.4 °F)] (TH-TH1) TH: Lower temperature between: liquid pipe temperature (TH2) and condenser/evaporator temperature (TH5) TH1: Intake temperature <Heating mode> When 10 seconds have passed after the compressor starts operation and the hot adjustment mode has finished, the unit is detected as abnormal when condenser/evaporator pipe temperature is not in heating range within 20 minutes.</p> <div data-bbox="269 1115 719 1388" style="background-color: #e0e0e0; padding: 5px;">  <p>NOTE 3) It takes at least 27 minutes to detect abnormality. 4) It excludes the period of defrosting (Detection restarts when defrosting mode is over)</p> </div> <p>Heating range : 3°C(5.4°F) [(TH5-TH1)</p>	<ol style="list-style-type: none"> 1. Slight temperature difference between indoor room temperature and pipe <liquid or condenser / evaporator> temperature thermistor <ul style="list-style-type: none"> • Shortage of refrigerant • Disconnected holder of pipe <liquid or condenser / evaporator> thermistor • Defective refrigerant circuit 2. Converse connection of extension pipe (on plural units connection) 3. Converse wiring of indoor/outdoor unit connecting wire (on plural units connection) 4. Defective detection of indoor room temperature and pipe <condenser / evaporator> temperature thermistor 5. Stop valve is not opened completely 	<p>1~4. Check pipe <liquid or condenser / evaporator> temperature with room temperature display on remote controller and outdoor controller circuit board.</p> <div data-bbox="1073 835 1429 919" style="border: 1px solid black; padding: 2px;"> <p>Conduct temperature check with outdoor controller circuit board after connecting 'A-Control Service Tool (PAC-SK52ST)'.</p> </div> <p>2~3. Check converse connection of extension pipe or converse wiring of indoor/outdoor unit connecting wire.</p>

Error Code	Abnormal point and detection method	Cause	Countermeasure
P9	<p>Abnormality of pipe temperature thermistor / Condenser-Evaporator (TH5)</p> <ol style="list-style-type: none"> The unit is in three-minute resume protection mode if short/open of thermistor is detected. Abnormal if the unit does not get back to normal within three minutes. (The unit returns to normal operation, if it has normally reset.) Constantly detected during cooling, drying, and heating operation (except defrosting) Short: 90 °C [194 °F] or more Open: -40 °C [-40 °F] or less 	<ol style="list-style-type: none"> Defective thermistor characteristics Contact failure of connector (CN44) on the indoor controller board (Insert failure) Breaking of wire or contact failure of thermistor wiring Temperature of thermistor is 90 °C [194 °F] or more or -40 °C [-40 °F] or less caused by defective refrigerant circuit Defective indoor controller board 	<ol style="list-style-type: none"> Check resistance value of thermistor. For characteristics, refer to (P1) above. Check contact failure of connector (CN44) on the indoor controller board. Refer to 12-5. Turn the power on and check restart after inserting connector again. Operate in test run mode and check pipe <condenser / evaporator>temperature. If pipe <condenser / evaporator> temperature is extremely low (in cooling mode) or high (in heating mode), refrigerant circuit may have defect. When no problems are found in 1–4 above, replace the indoor unit control board.
E0 or E4	<p>Remote controller transmission error(E0)/ signal receiving error(E4)</p> <ol style="list-style-type: none"> Abnormal if main or sub remote controller can not receive normally any transmission from indoor unit of refrigerant address "0" for three minutes. (Error code : E0) Abnormal if sub remote controller could not receive for any signal for two minutes. (Error code: E0) <ol style="list-style-type: none"> Abnormal if indoor controller board can not receive normally any data from remote controller board or from other indoor controller board for three minutes. (Error code: E4) Indoor controller board cannot receive any signal from remote controller for two minutes. (Error code: E4) 	<ol style="list-style-type: none"> Contact failure at transmission wire of remote controller All remote controllers are set as "sub" remote controller. In this case, E0 is displayed on remote controller, and E4 is displayed at LED (LED 1, LED 2) on the outdoor controller circuit board. Mis-wiring of remote controller Defective transmitting receiving circuit of remote controller Defective transmitting receiving circuit of indoor controller board of refrigerant address "0" Noise has entered into the transmission wire of remote controller 	<ol style="list-style-type: none"> Check disconnection or looseness of indoor unit or transmission wire of remote controller. Set one of the remote controllers "main". If there is no problem with the action above. Check wiring of remote controller. • Total wiring length: max 500m (Do not use cable 5 3 or more) • The number of connecting indoor units: max 16 units • The number of connecting remote controller: max 2 units When it is not the above-mentioned problem of 1~3 Diagnose remote controllers. <ol style="list-style-type: none"> When "RC OK" is displayed, Remote controllers have no problem. Turn the power off, and on again to check. If abnormality generates again, replace indoor controller board. When "RC NG" is displayed, Replace remote controller. When "RC E3" is displayed, When "ERC 00-06" is displayed, [c,d)→Noise may be causing abnormality.] <p>* If the unit is not normal after replacing indoor controller board in group control, indoor controller board of address "0" may be abnormal.</p>

Error Code	Abnormal point and detection method	Cause	Countermeasure
E3 or E5	<p>Remote controller transmission error(E3)/ signal receiving error(E5)</p> <p>1. Abnormal if remote controller could not find blank of transmission path for six seconds and could not transmit. (Error code: E3)</p> <p>2. Remote controller receives transmitted data at the same time, compares the data, and when detecting it, judges different data to be abnormal 30 continuous times. (Error code: E3)</p> <p>1. Abnormal if indoor controller board could not find blank of transmission path. (Error code: E5)</p> <p>2. Indoor controller board receives transmitted data at the same time, compares the data, and when detecting it, judges different data to be abnormal 30 continuous times. (Error code: E5)</p>	<p>1. Two remote controller are set as "main." (In case of 2 remote controllers)</p> <p>2. Remote controller is connected with two indoor units or more</p> <p>3. Repetition of refrigerant address</p> <p>4. Defective transmitting receiving circuit of remote controller</p> <p>5. Defective transmitting receiving circuit of indoor controller board</p> <p>6. Noise has entered into transmission wire of remote controller.</p>	<p>1. Set a remote controller to main, and the other to sub</p> <p>2. Remote controller is connected with only one indoor unit</p> <p>3. The address changes to a separate setting</p> <p>4~6. Diagnose remote controller</p> <p>a) When "RC OK" is displayed, remote controllers have no problem. Turn the power off, and on again to check. When becoming abnormal again, replace indoor controller board.</p> <p>b) When "RC NG" is displayed, replace remote controller.</p> <p>c) When "RC E3" or "ERC 00-66" is displayed, noise may be causing abnormality.</p>
E6	<p>Indoor/outdoor unit communication error (Signal receiving error)</p> <p>1. Abnormal if indoor controller board cannot receive any signal normally for six minutes after turning the power on.</p> <p>2. Abnormal if indoor controller board cannot receive any signal normally for three minutes.</p> <p>3. Consider the unit as abnormal under the following condition: When two or more indoor units are connected to an outdoor unit, indoor controller board cannot receive a signal for three minutes from outdoor controller circuit board, a signal which allows outdoor controller circuit board to transmit signals.</p>	<p>1. Contact failure, short circuit or, mis-wiring (converse wiring) of indoor/outdoor unit connecting wire</p> <p>2. Defective transmitting receiving circuit of indoor controller board</p> <p>3. Defective transmitting receiving circuit of indoor controller board</p> <p>4. Noise has entered into indoor/outdoor unit connecting wire</p>	<p>* Check LED display on the outdoor control circuit board. (Connect A-control service tool, PAC-SK52ST.) Refer to EA-EC item if LED displays EA-EC.</p> <p>1. Check disconnection or looseness of indoor/ outdoor unit connecting wire of indoor unit or outdoor unit. Check all the units in case of twin triple indoor unit system.</p> <p>2~4. Turn the power off, and on again to check. If abnormality generates again, replace indoor controller board or outdoor controller circuit board.</p> <p>* Other indoor controller board may have defect in case of twin triple indoor unit system.</p>
E7	<p>Indoor/outdoor unit communication error (Transmitting error)</p> <p>Abnormal if "1" receiving is detected 30 times continuously though indoor controller board has transmitted "0".</p>	<p>1. Defective transmitting receiving circuit of indoor controller board</p> <p>2. Noise has entered into power supply</p> <p>3. Noise has entered into outdoor control wire</p>	<p>1~3. Turn the power off, and on again to check. If abnormality generates again, replace indoor controller board.</p>
Fb	<p>Indoor controller board</p> <p>Abnormal if data cannot be read normally from the nonvolatile memory of the indoor controller board.</p>	<p>1. Defective indoor controller board</p>	<p>1. Replace indoor controller board.</p>
FH	<p>Refrigerant leak sensor error</p> <p>Abnormal if refrigerant sensor cannot detect errors normally.</p>	<p>1. The refrigerant leak sensor mounted on the indoor unit does not work.</p> <p>2. The refrigerant leak sensor is not connected properly or the wire is broken.</p>	<p>1. While the error is being displayed, the indoor unit fan continues operating.</p> <p>2. Ventilate the room well, make sure that there is no ignition source and then turn off the power</p> <ul style="list-style-type: none"> • Check the connection of parts such as connectors and turn the power on again. • If the error does not clear, replace the Refrigerant leak sensor.

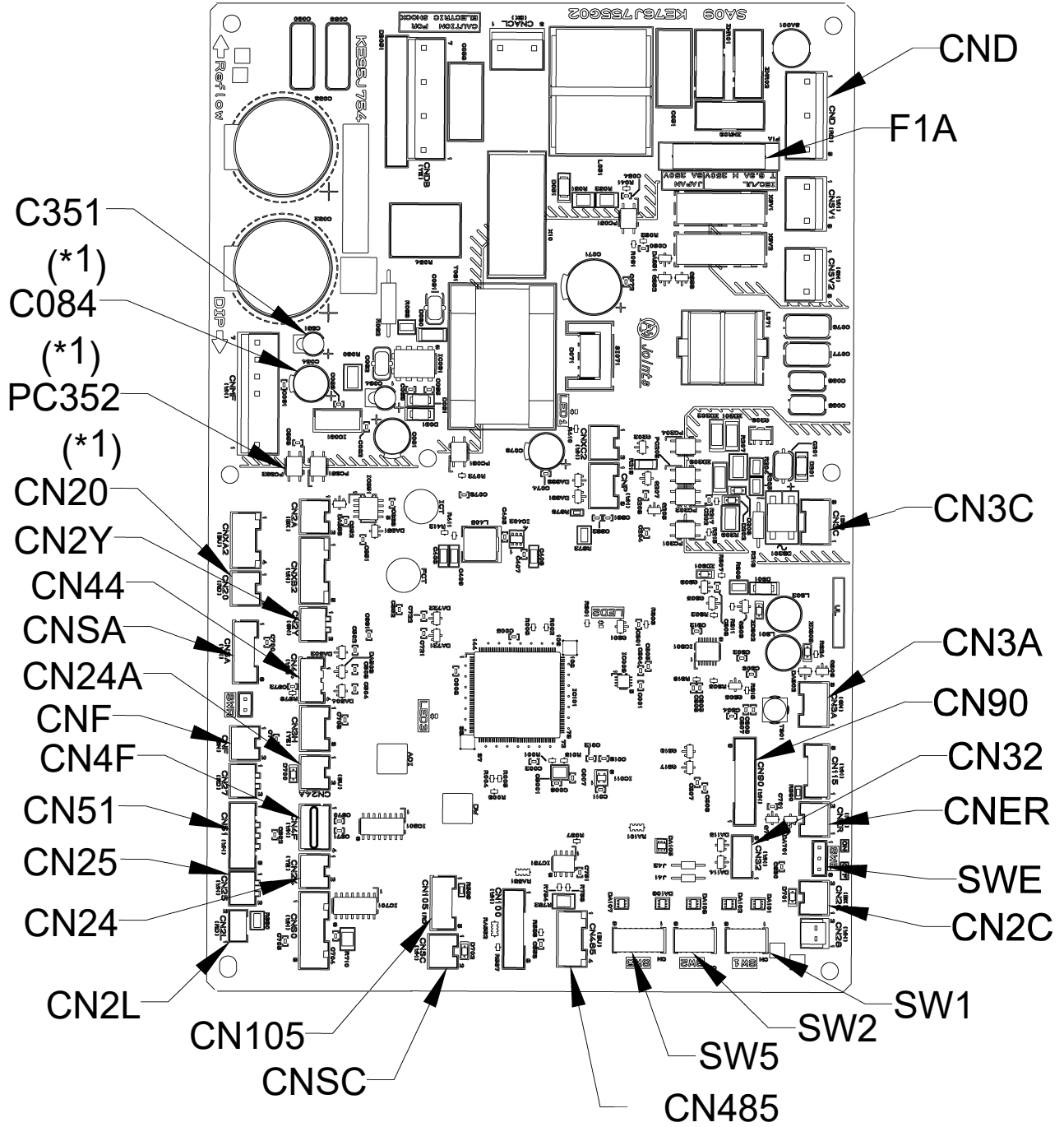
Error Code	Abnormal point and detection method	Cause	Countermeasure
FL	<p>Refrigerant leakage Abnormal if refrigerant leakage detected by a refrigerant leak sensor.</p>	<ol style="list-style-type: none"> 1. The refrigerant leaks from the piping or the heat exchanger in the indoor unit. 2. The following items are used around the indoor unit. <ul style="list-style-type: none"> • Spray (LP gas including FREON, and whose main ingredient is propane and butane). • Aerosol insecticide (including ethanol). • Air spray painting (including dichloromethane). • Charcoal (charcoal fire). • Chemicals (such as ethanol). 3. Refrigerant leaks from piping or heat exchangers, or sensor errors in indoor units in other rooms. 	<ol style="list-style-type: none"> 1. While the error is being displayed, the indoor unit fan continues operating. 2. Ventilate the room well, make sure that there is no ignition source and then turn off the power <ul style="list-style-type: none"> • Check the indoor unit to detect the part where the refrigerant is leaking from. • Repair the part where refrigerant leaks. • Turn on the power again. • If the error does not clear, replace the Refrigerant leak sensor.
E1 or E2	<p>Remote controller control board</p> <ol style="list-style-type: none"> 1. Abnormal if data cannot be read normally from the nonvolatile memory of the remote controller control board. (Error code: E1) 2. Abnormal if the clock function of remote controller cannot be operated normally. (Error code: E2) 	<ol style="list-style-type: none"> 1. Defective remote controller 	<ol style="list-style-type: none"> 1. Replace indoor controller board.
PB	<p>Fan motor error Abnormal if a) or b) is detected during fan motor operation.</p> <p>a) When the number of rotations is detected to be below the lower limit for 30 seconds.</p> <p>b) When the number of rotations is detected to be above the upper limit for 30 seconds.</p>	<ol style="list-style-type: none"> 1. Motor or fan cannot rotate because of foreign object, etc. 2. Motor wire disconnection or connector disconnection or looseness 3. Motor failure 	<ol style="list-style-type: none"> 1. Remove the foreign object causing the problem. 2. Check disconnection of the motor wiring or connector disconnection. 3. Replace the failed motor.

13.4. Troubleshooting by inferior phenomena

Phenomena	Cause	Countermeasure
(1) LED 2 on indoor controller board is off.	<p>When LED 1 on indoor controller board is also off.</p> <ol style="list-style-type: none"> Power supply of rated voltage is not supplied to outdoor unit Defective outdoor controller circuit board Power supply of 208~230V is not supplied to indoor unit Defective indoor controller board 	<ol style="list-style-type: none"> Check the voltage of outdoor power supply terminal block (L, N) or (L3, N). <ul style="list-style-type: none"> When AC 208~230V is not detected. Check the power wiring to outdoor unit and the breaker. When AC 208~230V is detected. <ul style="list-style-type: none"> Check 2 (below) Check the voltage between outdoor terminal block S1 and S2. <ul style="list-style-type: none"> When AC 208~230V is not detected. Check the fuse on outdoor controller circuit board. Check the wiring connection. When AC 208~230V is detected. <ul style="list-style-type: none"> Check 3 (below) Check the voltage between indoor terminal block S1 and S2. <ul style="list-style-type: none"> When AC 208~230V is not detected. Check indoor/outdoor unit connecting wire for miswiring. When AC 208~230V is detected. <ul style="list-style-type: none"> Check 4 (below) Check the fuse on indoor controller board. <ul style="list-style-type: none"> Check the wiring connection. If no problem are found, indoor controller board is defective.
(2) LED 2 on indoor controller board is blinking.	<ol style="list-style-type: none"> When LED 1 on indoor controller board is also blinking. Connection failure of indoor/outdoor unit connecting wire. When LED 1 is lit. <ol style="list-style-type: none"> Miswiring of remote controller wires Under twin triple indoor unit system, 2 or more indoor units are wired together. Refrigerant address for outdoor unit is wrong or not set. Under grouping control system, there are some units whose refrigerant address is 0. Short-cut of remote controller wires Defective remote controller 	<p>Check indoor/outdoor unit connecting wire for connection failure.</p> <ol style="list-style-type: none"> Check the connection of remote controller wires in case of twin triple indoor unit system. When 2 or more indoor units are wired in one refrigerant system, connect remote controller wires to one of those units. Check the setting of refrigerant address in case of grouping control system. If there are some units whose refrigerant addresses are 0 in one group, set one of the units to 0 using SW1 (3-6) on outdoor controller circuit board. 3~4. Remove remote controller wires and check LED 2 on indoor controller board. <ul style="list-style-type: none"> When LED 2 is blinking, check the short-cut of remote controller wires. When LED 2 is lit, connect remote controller wires again and: if LED 2 is blinking, remote controller is defective; if LED 2 is lit, connection failure of remote controller terminal block etc. has returned to normal.

13.5. Test point diagram

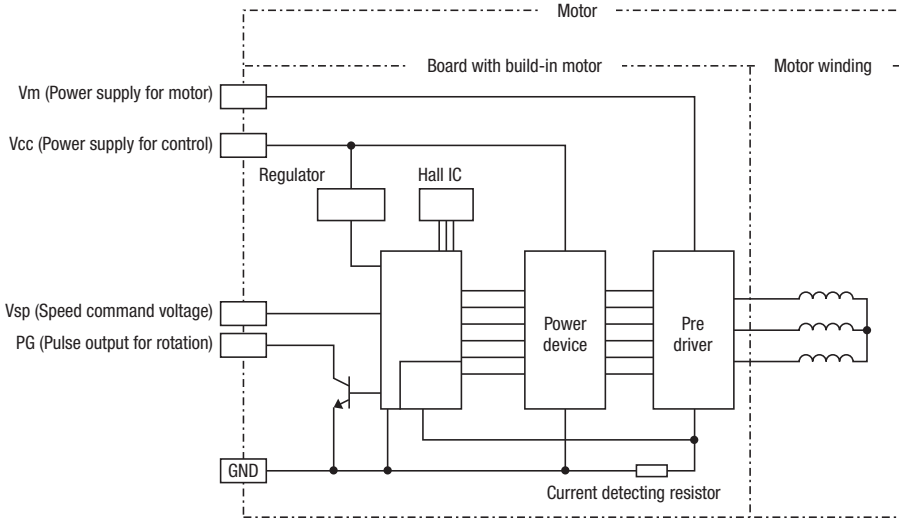
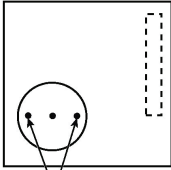
Indoor controller board



- (1*)
 - V_{FG} : Voltage on the (-) side of PC352 and C084
 - (same with the voltage between 7 (+) and 4 (-) of CNMF)
 - V_{CC} : Voltage between the C084 pins 15 VDC
 - (same with the voltage between 5 (+) and 4 (-) of CNMF)
 - V_{sp} : Voltage between the C351 pins
 - 0 VDC (with the fan stopped)
 - 1 - 6.5 VDC (with fan operating)
 - (same with the voltage between 6 (+) and 4 (-) of CNMF)
- CND: Power supply voltage (208-230VAC)
- CNMF: Fan motor output
 - 1 - 4: 310 - 340 VDC
 - 5 - 4: 15 VDC
 - 6 - 4: 0 - 6.5 VDC
 - 7 - 4: Stop 0 to 15 VDC, Run 7.5 VDC (0 - 15 pulse)
- CN32: Remote start/stop adapter
- CN22: For MA remote controller cable connection (10 - 13 VDC)
- CN105: Radio frequency interface
- CN51: Centralized control
- CN41: JAMA standard HA terminal A
- CN44: Thermistor (liquid/condenser/evaporator temperature)
- CN4F: Float sensor
- CN20: Thermistor (inlet temperature)
- CN24: 1st heater control (12 VDC)
- CN24a: 2nd heater control
- CN2Y: For fan control
- CN3C: Indoor - outdoor transmission (0 - 24 VDC)
- CN90: Wireless remote controller
- CNSA: Refrigerant leak sensor
- CNER: ERV control
- CN2C: ERV input
- CN25: Humidity control
- CNF: Humidity input
- SWE: Emergency operation
- SW1: Model selection
- SW2: Capacity setting

13.6. Trouble criterion of main parts

Part name	Check method and criterion	
Room temperature thermistor (TH1)	Measure the resistance with a tester. (Part temperature 10C (50F) ~ 30C (86F))	
Pipe temperature thermistor / liquid (TH2)		
Condenser / evaporator temperature thermistor (TH5)	Normal	Abnormal
	4.3k~9.6k	Opened or short-circuited

Part name	Check method and criterion				
<p>Wiring diagram</p>					
<p>Refrigerant leak sensor</p>	<p>Measure the resistance between the terminals with a multimeter.</p> <table border="1" data-bbox="441 835 756 926"> <thead> <tr> <th>Normal</th> <th>Abnormal</th> </tr> </thead> <tbody> <tr> <td>Below 10</td> <td>Open (10 or more)</td> </tr> </tbody> </table> <p>After turning off the indoor unit breaker and leaving it for 5 minutes, measure the resistance value between the sensor terminals.</p> <p>Back side of the sensor</p>  <p>Measure the both sides of the sensor pin.</p>	Normal	Abnormal	Below 10	Open (10 or more)
Normal	Abnormal				
Below 10	Open (10 or more)				

13.7. Thermistor

<Thermistor Characteristic graph>

Thermistor for lower temperature

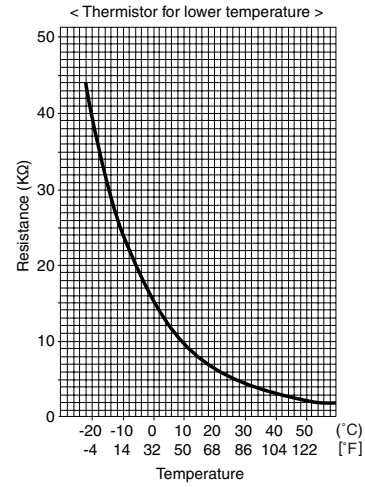
Room temperature thermistor (TH1)
 Pipe temperature thermistor (TH2)
 Condenser/evaporator temperature thermistor (TH5)

Thermistor $R_0 = 15 \text{ k}\Omega \pm 3\%$

Fixed number of $B = 3480 \text{ k}\Omega \pm 2\%$

$$R_t = 15 \exp \left\{ 3480 \left(\frac{1}{273+t} - \frac{1}{273} \right) \right\}$$

0°C (32°F)	15 kΩ
10°C (50°F)	9.6 kΩ
20°C (68°F)	6.3 kΩ
25°C (77°F)	5.2 kΩ
30°C (86°F)	4.3 kΩ
40°C (104°F)	3.0 kΩ



13.8. DC Fan motor (fan motor/indoor controller board)

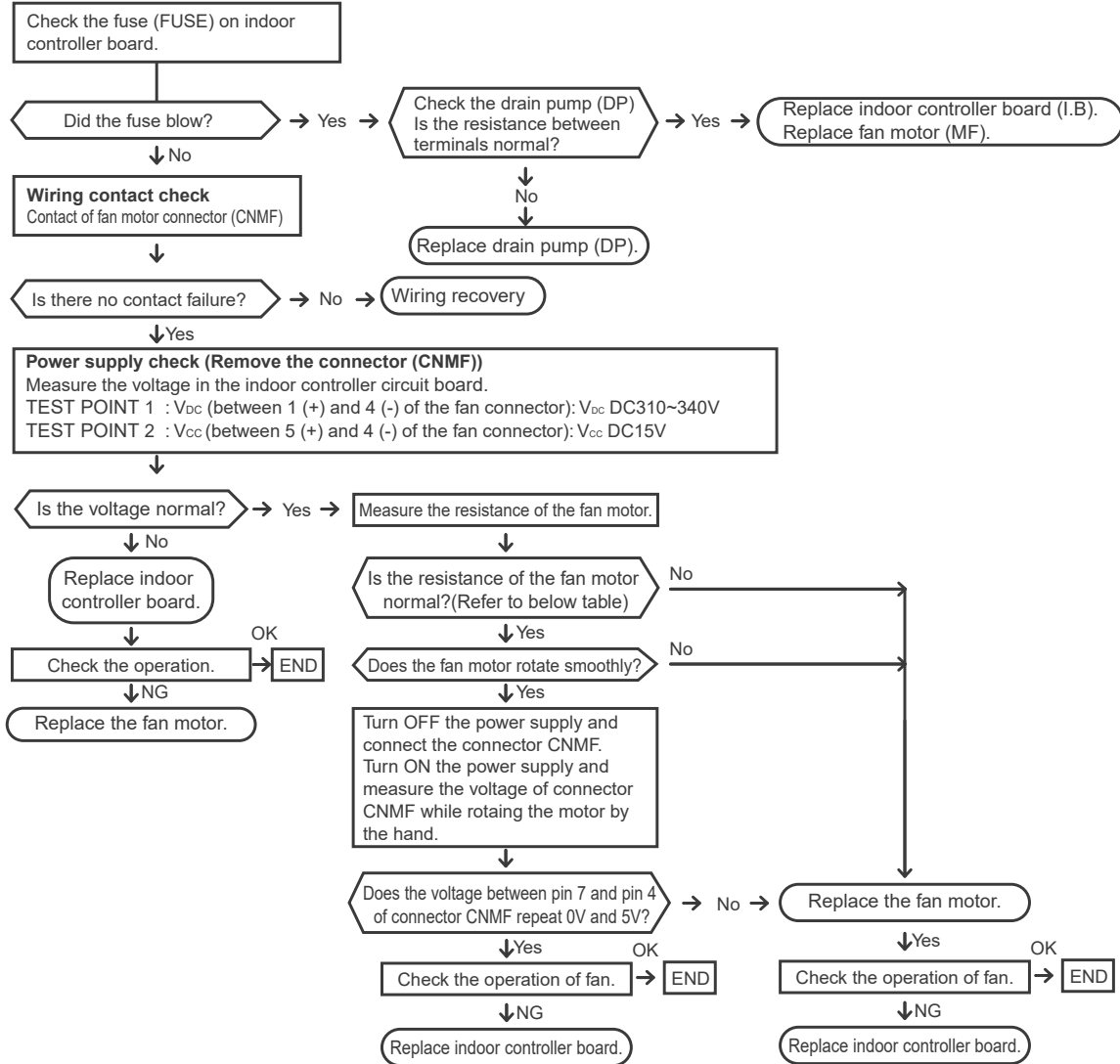
Check method of DC fan motor (fan motor/indoor controller circuit board)

1 Notes

- High voltage is applied to the connector (CNMF) for the fan motor. Give attention to the service.
- Do not pull out the connector (CNMF) for the motor with the power supply on.
(It causes trouble of the indoor controller circuit board and fan motor.)

2 Self check

Symptom : The indoor fan cannot turn around.



13.8.1. DC Fan motor measuring points

Measuring points	Resistance
pin 1 - pin 4	O.L.
pin 5 - pin 4	50kΩ
pin 6 - pin 4	150kΩ
pin 7 - pin 4	O.L.



NOTE

* To measure the resistance, connect the negative (-) end of the tester to pin 4.

13.9. Functions of DIP switch and jumper wire

Each function is controlled by the dip switch and the jumper wire on control p.c. board. SW1 and SW2 are equipped only for service parts.

Model setting and capacity setting are memorized in the nonvolatile memory of the control p.c. board of the unit.

Jumper wire	Functions	Setting by the dip switch and jumper wire	Remarks												
SW1	Model settings	for service board 													
SW2	Capacity settings	<table border="1"> <thead> <tr> <th>Model code</th> <th>Service Board</th> </tr> </thead> <tbody> <tr> <td>12</td> <td> </td> </tr> <tr> <td>18</td> <td> </td> </tr> <tr> <td>24</td> <td> </td> </tr> <tr> <td>30</td> <td> </td> </tr> <tr> <td>36</td> <td> </td> </tr> </tbody> </table>	Model code	Service Board	12		18		24		30		36		
Model code	Service Board														
12															
18															
24															
30															
36															

Jumper wire	Functions	Setting by the dip switch and jumper wire			Remarks
J41 J42	Pair number setting with wireless remote controller	Wireless remote controller setting	Control PCB setting		<Settings at time of factory shipment> Wireless remote controller: 0 Control PCB: ○ (for both J41 and J42) Four pair number settings are supported. The pair number settings of the wireless remote controller and indoor controller PCB (J41/J42) are given in the table on the left. × in the table indicates the jumper line is disconnected.
		0	○ ¹	○	
		1	× ²	○	
		2	○	×	
		3 ~ 9	×	×	
		¹ ○ : Short ² × : Open			

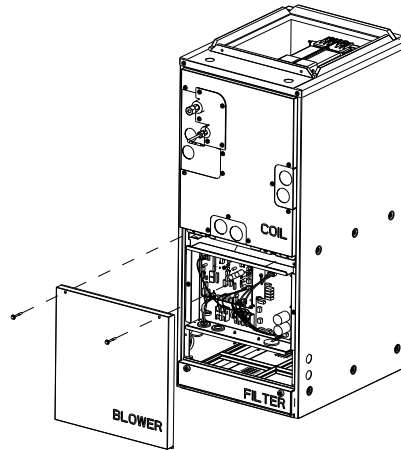
¹ ○ : Short

² × : Open

14. Disassembly Procedure

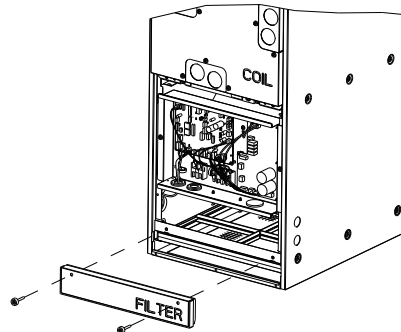
14.1. Control box

1. Remove blower panel.

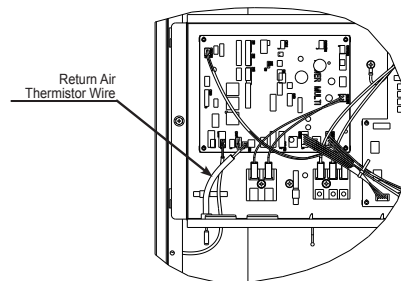


14.2. Thermistor (Return Air)

1. Remove the Filter panel

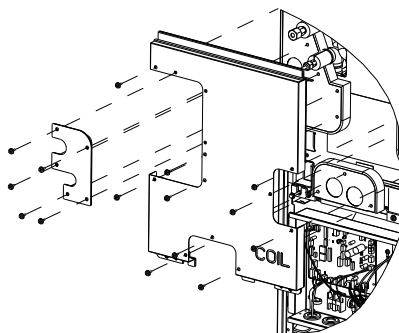


2. Return air thermistor is located as shown in the image inside the control box and is connected to the control board on CN20.

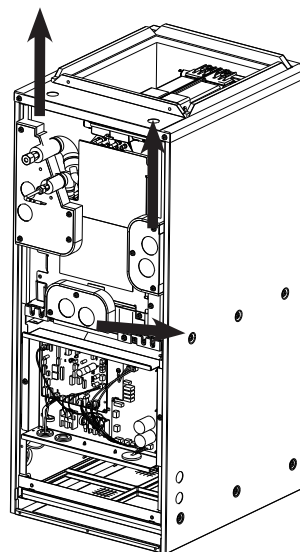


14.3. Coil assembly

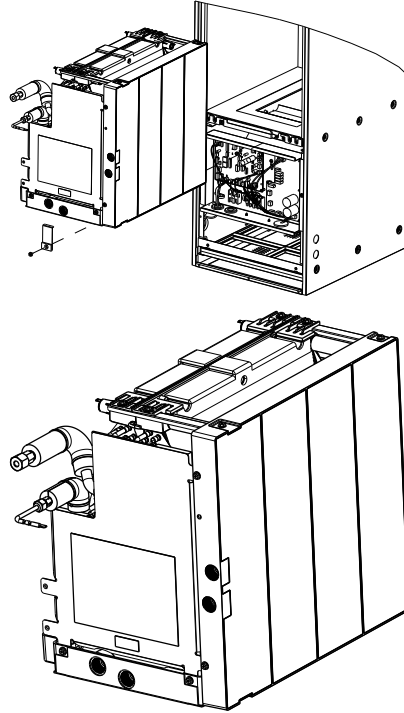
1. Remove the Blower and Filter panel indicated in sections 1 and 2.
2. Remove the Coil panel by removing all of the screws securing it to the (3) smaller panels for refrigerant and drain lines.



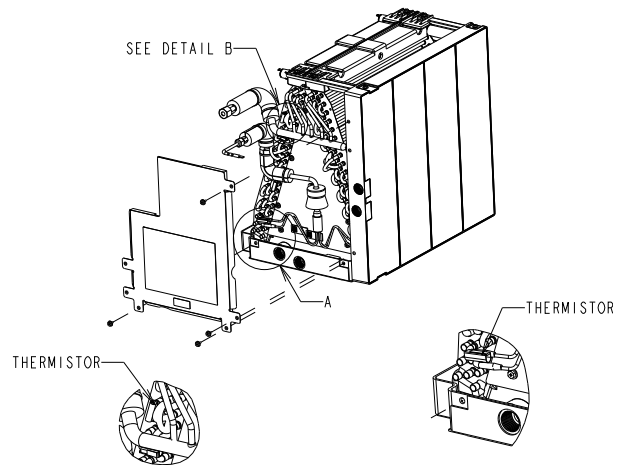
3. Slide the smaller panels in the directions indicated and remove.



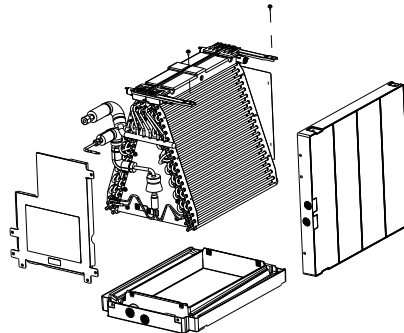
4. Remove the (1 or 2) brackets that secure the coil, unplug the thermistors and Refrigerant leak sensor by separating the waterproof connectors in the coil area. Next, slide the coil from the frame.



5. Remove the plate covering the coil assembly to access the thermistors and Refrigerant leak sensor.

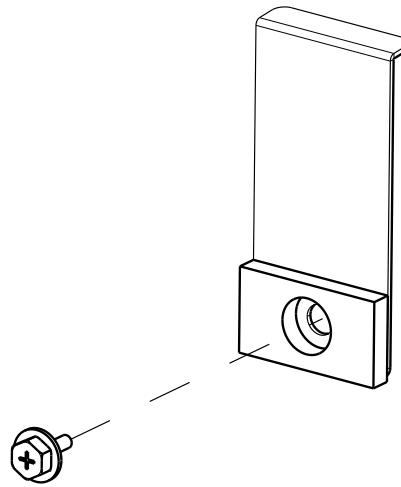


6. Remove lower and side drain pan.

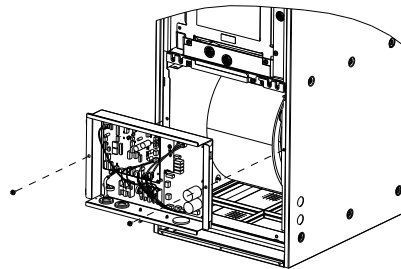


14.4. Blower/fan assembly

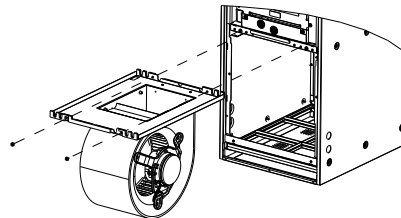
1. Remove the Blower and Filter panel (along with filter if installed) indicated in section 2.
2. Remove the (1 or 2) brackets that secure the coil assembly.



3. Unplug CN44, motor plug (CNMF), and refrigerant leak sensor (CNSA) from control box.
4. Remove the (2) screws that secure the control box and then remove the control box.



5. Remove coil panel and smaller drain panel.
6. Remove the (2) screws that secure the fan assembly and slide out.



14.5. Refrigerant leak sensor

Table 17. Refrigerant leak sensor instructions



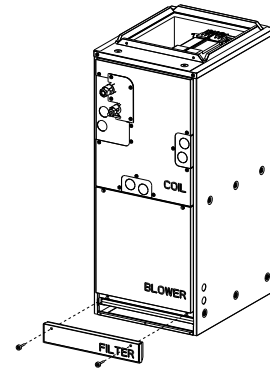
NOTE

The steps and figures on the preceding pages can be used to locate, service, and replace the refrigerant leak sensor.

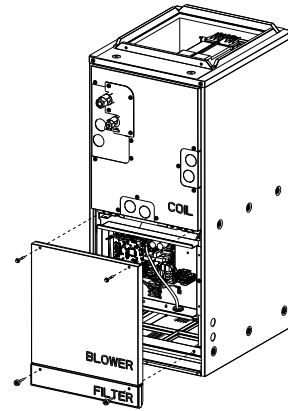
For vertical installations, follow Step. 1 - 5.

For horizontal installations, follow Step. 1 - 4 and 6.

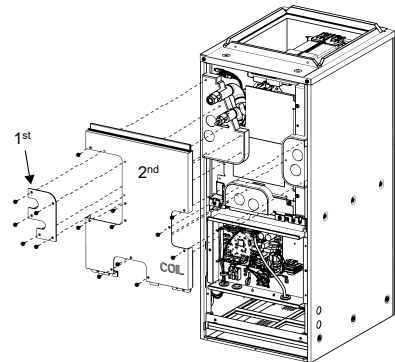
Step. 1 Remove the panel marked "FILTER".



Step. 2 Remove the panel marked "BLOWER".



Step. 3a Remove the screws securing the (3) panels to the COIL panel shown in the image above. Remove the "1st" panel and "2nd" panel marked "COIL".





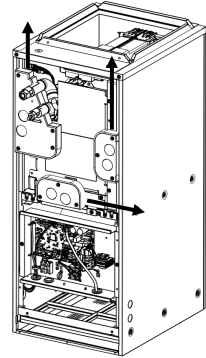
NOTE

The steps and figures on the preceding pages can be used to locate, service, and replace the refrigerant leak sensor.

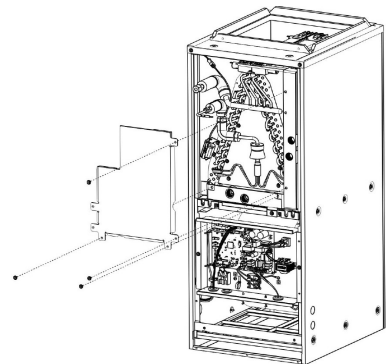
For vertical installations, follow Step. 1 - 5.

For horizontal installations, follow Step. 1 - 4 and 6.

Step. 3b Next, remove the smaller panels covering the drain holes and refrigerant lines by first sliding in the directions indicated above.

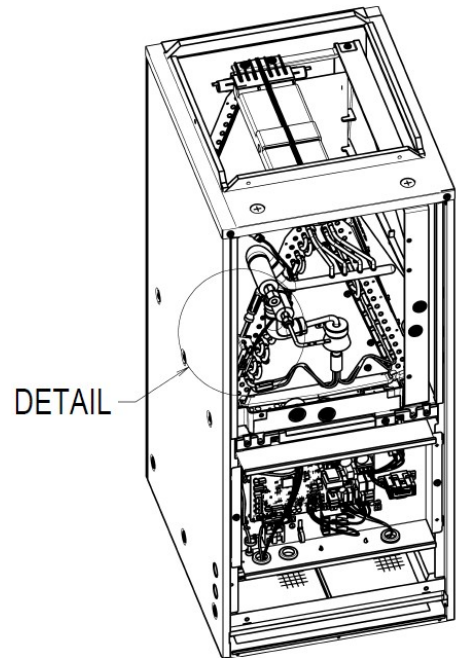


Step. 4 Remove the screws (4) and front plate from the coil assembly.



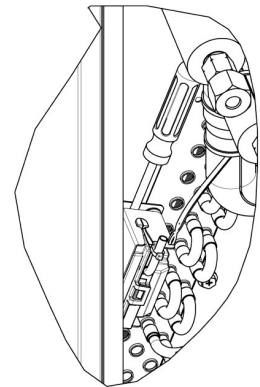
VERTICAL INSTALLATION ONLY DETAILS

Step. 5 Locate the refrigerant leak sensor attached to the coil as shown. Separate the sensor housing from the vertical flow sensor bracket. Once the refrigerant leak sensor housing assembly is removed from the bracket, open the housing and unplug the cable from the sensor PCB. The refrigerant leak sensor PCB is then replaced, and the cable is reused. The same steps can be followed in reverse to reassemble the indoor unit after service is completed.



TIP

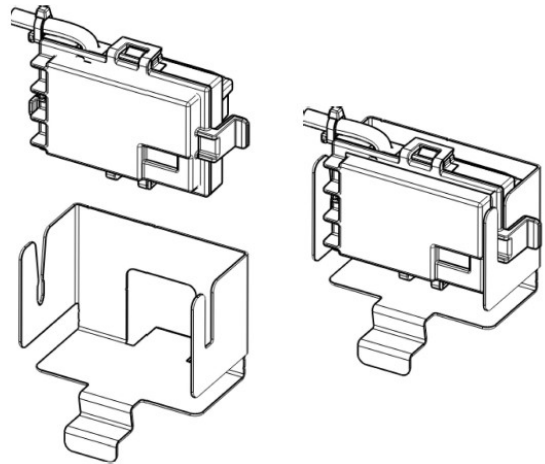
- If there is difficulty removing the refrigerant leak sensor / housing assembly from the vertical flow bracket, insert a screwdriver between the sensor housing assembly and the bracket as shown in the detailed area above.
- Gently apply pressure against the back of the sensor housing assembly to release it from the bracket.
- Once it has released, remove the bracket by hand.



DETAIL ↑

HORIZONTAL INSTALLATION ONLY DETAILS

Step. 6 Locate the refrigerant leak sensor attached to the side drain pan as shown. Separate the sensor housing from the side flow sensor bracket. Once the refrigerant leak sensor housing assembly is removed from the bracket, open the housing and unplug the cable from the sensor PCB. The refrigerant leak sensor PCB is then replaced, and the cable is reused. The same steps can be followed in reverse to reassemble the indoor unit after service is completed.

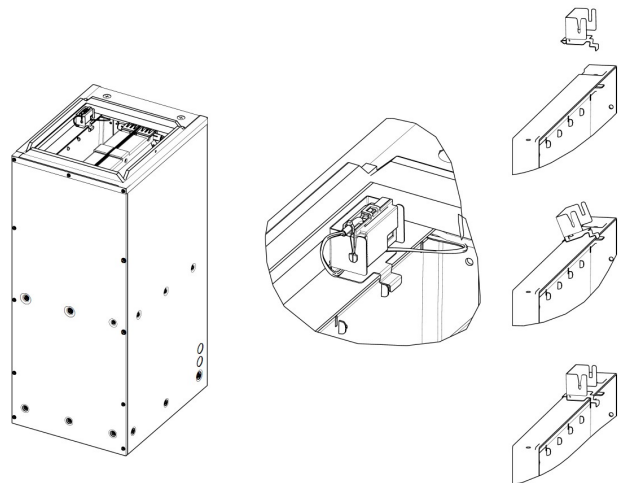


*REFRIGERANT LEAK SENSOR REMOVED FOR BRACKET INSTALLATION CLARITY



NOTE

Route the refrigerant leak sensor wire between the sensor bracket and the refrigerant leak sensor housing (as shown in the image above).



15. Appendix A: Quick reference worksheet (minimum room area requirement)



IMPORTANT

This quick reference worksheet must be used in conjunction with Installation manual instructions regarding minimum room area calculation. All safety precautions and instructions must be followed as stated in the Installation manual.

1. What is the factory refrigerant pre-charge of the outdoor unit (ODU)?



TIP

The factory refrigerant pre-charge of the ODU can be found on it's nameplate.

- **Factory pre-charge** = _____ **lb or kg** (circle one)
2. Will there be an additional refrigerant line set beyond the limit of the factory refrigerant pre-charge?
 - **Additional charge** = _____ **lb or kg** (circle one)
 3. Take the values from **Step. 1** and **Step. 2** and use the following equation to find the Total planned system charge.
 - **Total planned system charge (m_c)** = **Factory (Step. 1) + Additional (Step. 2)** = _____ **lb or kg** (circle one)
 4. Is the installation space a conditioned space as defined in the installation manual? **YES** or **NO** (circle one)
 - If **Yes** – **Use Case D**. This is the easiest and least restrictive case.
 - Then, **Skip to step 6**. In this case only: **$TA_{min} = A_{min}$**
 - If **No** – Continue to the next step.
 5. What is the planned installation height of the indoor unit (IDU), measure from floor to lowest downward facing surface of the IDU?
 - **Installation height (h_0)** = _____ **ft or m** (circle one)

h_0 - (ft, in.)	h_0 - (m)	Use Case:	Mark correct Case with an 'X'
Lower than 3 ft. 3 3/8 in.	Lower than 1 m	C	
3 ft. 3 3/8 in. to 7 ft 2 5/8 in.	1 m to 2.2 m	B	
Higher than 7ft. 2 5/8 in.	Higher than 2.2 m	A	

6. Use the **Minimum area requirement table**, on the following pages, to determine the correct values for A_{min} and TA_{min} .
 - a. In the left most column, find the correct or nearest value for m_c (calculated Step. 2), mark this row with an *.
 - b. In the top row, find the column that describes the correct Case (chosen in Step. 4) and the ODU installed, mark this column with an *.

- c. Find the intersection of the marked row and column. Circle the correct values for A_{min} and TA_{min} .
- d. Write the required minimum room area below:
 - Minimum room area for installation room
 $A_{min} = \underline{\hspace{2cm}} \text{ft}^2 \text{ or } \text{m}^2$ (circle one)
 - Minimum conditioned space area
 $TA_{min} = \underline{\hspace{2cm}} \text{ft}^2 \text{ or } \text{m}^2$ (circle one)

7. Now, find the total areas of each Zone (as defined in the installation manual) and add the room areas together to find the total TA_{min} for each zone.

Zone 1		Zone 2		Zone 3		Zone 4	
Room	Area	Room	Area	Room	Area	Room	Area
Zone 1 TA_{min} total		Zone 2 TA_{min} total		Zone 3 TA_{min} total		Zone 4 TA_{min} total	

- 8. Answer questions a. - d. below to verify that room requirements are met.
 - a. Does the combined area of each Zone meet or exceed TA_{min} as defined in Step. 6d?
 - **Yes** or **No** (circle one)
 - b. Does the combined area of the installation room and adjacent connected rooms meet or exceed A_{min} ?
 - **Yes** or **No** (circle one)
 - c. If **A** and **B** are **YES**, then proceed with installation.
 - d. If **A** and/or **B** are **NO**, then additional area, ventilation, or installation height required.

Table 18. Minimum room area requirement

Total planned system charge	Case A				Case B			
	Outdoor unit (ODU)				Outdoor unit (ODU)			
	SUZ/PUZ/MXZ-D		MXZ-SM		SUZ/PUZ/MXZ-D		MXZ-SM	
m_c kg (lbs)	Amin m ² [ft ²]	TAmin m ² [ft ²]	Amin m ² [ft ²]	TAmin m ² [ft ²]	Amin m ² [ft ²]	TAmin m ² [ft ²]	Amin m ² [ft ²]	TAmin m ² [ft ²]
0.9 [1.9]	2.8 [30.2]	9 [96.9]	x	x	6.1 [65.7]	9 [96.9]	x	x
1 [2.2]	3.1 [33.4]	9 [96.9]	x	x	6.8 [73.2]	9 [96.9]	x	x
1.5 [3.3]	4.7 [50.6]	9 [96.9]	x	x	10.2 [109.8]	9 [96.9]	x	x
2 [4.4]	6.2 [66.8]	9 [96.9]	x	x	13.6 [146.4]	9 [96.9]	x	x
2.5 [5.5]	7.7 [82.9]	9 [96.9]	x	x	16.9 [182]	9 [96.9]	x	x
3 [6.6]	9.3 [100.2]	9.3 [100.2]	x	x	20.3 [218.6]	9.3 [100.2]	x	x
3.5 [7.7]	10.8 [116.3]	10.8 [116.3]	x	x	23.7 [255.2]	10.8 [116.3]	x	x
4 [8.8]	12.3 [132.4]	12.3 [132.4]	4.2 [45.3]	9 [96.9]	27.1 [291.8]	12.3 [132.4]	9.2 [99.1]	9 [96.9]
4.5 [9.9]	13.9 [149.7]	13.9 [149.7]	4.5 [48.5]	9 [96.9]	30.5 [328.3]	13.9 [149.7]	9.9 [106.6]	9 [96.9]
5 [11]	15.4 [165.8]	15.4 [165.8]	4.9 [52.8]	9 [96.9]	33.8 [363.9]	15.4 [165.8]	10.6 [114.1]	9 [96.9]
5.5 [12.1]	16.9 [182]	16.9 [182]	5.2 [56]	9 [96.9]	37.2 [400.5]	16.9 [182]	11.3 [121.7]	9 [96.9]
6 [13.4]	18.5 [199.2]	18.5 [199.2]	5.5 [59.3]	9 [96.9]	40.6 [437.1]	18.5 [199.2]	12 [129.2]	9 [96.9]
6.5 [14.5]	20 [215.3]	20 [215.3]	5.8 [62.5]	9 [96.9]	44 [473.7]	20 [215.3]	12.7 [136.8]	9 [96.9]
7 [15.6]	21.5 [231.5]	21.5 [231.5]	6.1 [65.7]	9 [96.9]	47.3 [509.2]	21.5 [231.5]	13.4 [144.3]	9 [96.9]
7.5 [16.7]	23.1 [248.7]	23.1 [248.7]	6.4 [68.9]	9 [96.9]	50.7 [545.8]	23.1 [248.7]	14 [150.7]	9 [96.9]
8 [17.8]	24.6 [264.8]	24.6 [264.8]	6.7 [72.2]	9 [96.9]	54.1 [582.4]	24.6 [264.8]	14.7 [158.3]	9 [96.9]
8.5 [18.9]	26.2 [282.1]	26.2 [282.1]	7 [75.4]	9 [96.9]	57.5 [619]	26.2 [282.1]	15.4 [165.8]	9 [96.9]
9 [20]	27.7 [298.2]	27.7 [298.2]	7.3 [78.6]	9 [96.9]	60.9 [655.6]	27.7 [298.2]	16.1 [173.3]	9 [96.9]
9.5 [21.1]	29.2 [314.4]	29.2 [314.4]	7.7 [82.9]	9 [96.9]	64.2 [691.1]	29.2 [314.4]	16.8 [180.9]	9 [96.9]
10 [22.1]	30.8 [331.6]	30.8 [331.6]	8 [86.2]	9 [96.9]	67.6 [727.7]	30.8 [331.6]	17.5 [188.4]	9 [96.9]
10.5 [23.1]	32.3 [347.7]	32.3 [347.7]	8.3 [89.4]	9 [96.9]	71 [764.3]	32.3 [347.7]	18.2 [196]	9 [96.9]
11 [24.2]	33.8 [363.9]	33.8 [363.9]	8.6 [92.6]	9 [96.9]	74.4 [800.9]	33.8 [363.9]	18.8 [202.4]	9 [96.9]
11.5 [25.3]	35.4 [381.1]	35.4 [381.1]	8.9 [95.8]	9 [96.9]	77.8 [837.5]	35.4 [381.1]	19.5 [209.9]	9 [96.9]
12 [26.4]	36.9 [397.2]	36.9 [397.2]	9.2 [99.1]	9.2 [99.1]	81.1 [873]	36.9 [397.2]	20.2 [217.5]	9.2 [99.1]
12.5 [27.5]	38.4 [413.4]	38.4 [413.4]	9.5 [102.3]	9.5 [102.3]	84.5 [909.6]	38.4 [413.4]	20.9 [225]	9.5 [102.3]
13 [28.6]	40 [430.6]	40 [430.6]	9.8 [105.5]	9.8 [105.5]	87.9 [946.2]	40 [430.6]	21.6 [232.6]	9.8 [105.5]
13.5 [29.7]	41.5 [446.8]	41.5 [446.8]	10.1 [108.8]	10.1 [108.8]	91.3 [982.8]	41.5 [446.8]	22.3 [240.1]	10.1 [108.8]
14 [30.8]	43 [462.9]	43 [462.9]	10.5 [113.1]	10.5 [113.1]	94.6 [1018.3]	43 [462.9]	22.9 [246.5]	10.5 [113.1]
14.4 [31.7]	44.3 [476.9]	44.3 [476.9]	10.7 [115.2]	10.7 [115.2]	97.3 [1047.4]	44.3 [476.9]	23.5 [253]	10.7 [115.2]

SVZ-AP12,18, 24, 30, 36NL *

Total planned system charge	Case C				Case D			
	Outdoor unit (ODU)				Outdoor unit (ODU)			
m _c kg (lbs)	SUZ/PUZ/MXZ-D		MXZ-SM		SUZ/PUZ/MXZ-D		MXZ-SM	
	Amin m2 [ft2]	TAmin m2 [ft2]	Amin m2 [ft2]	TAmin m2 [ft2]	Amin m2 [ft2]	TAmin m2 [ft2]	Amin m2 [ft2]	TAmin m2 [ft2]
0.9 [1.9]	10.2 [109.8]	9 [96.9]	x	x	9 [96.9]	9 [96.9]	x	x
1 [2.2]	11.3 [121.7]	9 [96.9]	x	x	9 [96.9]	9 [96.9]	x	x
1.5 [3.3]	16.9 [182]	9 [96.9]	x	x	9 [96.9]	9 [96.9]	x	x
2 [4.4]	22.6 [243.3]	9 [96.9]	x	x	9 [96.9]	9 [96.9]	x	x
2.5 [5.5]	28.2 [303.6]	9 [96.9]	x	x	9 [96.9]	9 [96.9]	x	x
3 [6.6]	33.8 [363.9]	9.3 [100.2]	x	x	9.3 [100.2]	9.3 [100.2]	x	x
3.5 [7.7]	39.5 [425.2]	10.8 [116.3]	x	x	10.8 [116.3]	10.8 [116.3]	x	x
4 [8.8]	45.1 [485.5]	12.3 [132.4]	15.4 [165.8]	9 [96.9]	12.3 [132.4]	12.3 [132.4]	9 [96.9]	9 [96.9]
4.5 [9.9]	50.7 [545.8]	13.9 [149.7]	16.5 [177.7]	9 [96.9]	13.9 [149.7]	13.9 [149.7]	9 [96.9]	9 [96.9]
5 [11]	56.4 [607.1]	15.4 [165.8]	17.7 [190.6]	9 [96.9]	15.4 [165.8]	15.4 [165.8]	9 [96.9]	9 [96.9]
5.5 [12.1]	62 [667.4]	16.9 [182]	18.8 [202.4]	9 [96.9]	16.9 [182]	16.9 [182]	9 [96.9]	9 [96.9]
6 [13.4]	67.6 [727.7]	18.5 [199.2]	19.9 [214.3]	9 [96.9]	18.5 [199.2]	18.5 [199.2]	9 [96.9]	9 [96.9]
6.5 [14.5]	73.2 [788]	20 [215.3]	21.1 [227.2]	9 [96.9]	20 [215.3]	20 [215.3]	9 [96.9]	9 [96.9]
7 [15.6]	78.9 [849.3]	21.5 [231.5]	22.2 [239]	9 [96.9]	21.5 [231.5]	21.5 [231.5]	9 [96.9]	9 [96.9]
7.5 [16.7]	84.5 [909.6]	23.1 [248.7]	23.4 [251.9]	9 [96.9]	23.1 [248.7]	23.1 [248.7]	9 [96.9]	9 [96.9]
8 [17.8]	90.1 [969.9]	24.6 [264.8]	24.5 [263.8]	9 [96.9]	24.6 [264.8]	24.6 [264.8]	9 [96.9]	9 [96.9]
8.5 [18.9]	95.8 [1031.2]	26.2 [282.1]	25.7 [276.7]	9 [96.9]	26.2 [282.1]	26.2 [282.1]	9 [96.9]	9 [96.9]
9 [20]	101.4 [1091.5]	27.7 [298.2]	26.8 [288.5]	9 [96.9]	27.7 [298.2]	27.7 [298.2]	9 [96.9]	9 [96.9]
9.5 [21.1]	107 [1151.8]	29.2 [314.4]	27.9 [300.4]	9 [96.9]	29.2 [314.4]	29.2 [314.4]	9 [96.9]	9 [96.9]
10 [22.1]	112.7 [1213.1]	30.8 [331.6]	29.1 [313.3]	9 [96.9]	30.8 [331.6]	30.8 [331.6]	9 [96.9]	9 [96.9]
10.5 [23.1]	118.3 [1273.4]	32.3 [347.7]	30.2 [325.1]	9 [96.9]	32.3 [347.7]	32.3 [347.7]	9 [96.9]	9 [96.9]
11 [24.2]	123.9 [1333.7]	33.8 [363.9]	31.4 [338]	9 [96.9]	33.8 [363.9]	33.8 [363.9]	9 [96.9]	9 [96.9]
11.5 [25.3]	129.6 [1395.1]	35.4 [381.1]	32.5 [349.9]	9 [96.9]	35.4 [381.1]	35.4 [381.1]	9 [96.9]	9 [96.9]
12 [26.4]	135.2 [1455.3]	36.9 [397.2]	33.6 [361.7]	9.2 [99.1]	36.9 [397.2]	36.9 [397.2]	9.2 [99.1]	9.2 [99.1]
12.5 [27.5]	140.8 [1515.6]	38.4 [413.4]	34.8 [374.6]	9.5 [102.3]	38.4 [413.4]	38.4 [413.4]	9.5 [102.3]	9.5 [102.3]
13 [28.6]	146.4 [1575.9]	40 [430.6]	35.9 [386.5]	9.8 [105.5]	40 [430.6]	40 [430.6]	9.8 [105.5]	9.8 [105.5]
13.5 [29.7]	152.1 [1637.2]	41.5 [446.8]	37.1 [399.4]	10.1 [108.8]	41.5 [446.8]	41.5 [446.8]	10.1 [108.8]	10.1 [108.8]
14 [30.8]	157.7 [1697.5]	43 [462.9]	38.2 [411.2]	10.5 [113.1]	43 [462.9]	43 [462.9]	10.5 [113.1]	10.5 [113.1]
14.4 [31.7]	162.2 [1746]	44.3 [476.9]	39.1 [420.9]	10.7 [115.2]	44.3 [476.9]	44.3 [476.9]	10.7 [115.2]	10.7 [115.2]

16. Appendix B - High altitude applications - capacity reduction factors

Capacity reduction

When air conditioners and heat pumps are installed in areas above sea level, operating capacity is reduced due to decreased air density. Because of this, equipment size may need to be increased to meet the load requirements. The following correction factors apply to M & P Series air conditioners and heat pumps for both heating and cooling operation. The indoor and outdoor units need to be sized based on the capacity reduction due to the increased air density.

Altitude ft (m)	Indoor unit correction factor	Outdoor unit correction factor
0	1.00	1.00
1,000	0.96	0.99
2,000	0.93	0.98
3,000	0.90	0.98
4,000	0.86	0.97
5,000	0.83	0.96
6,000	0.80	0.95
7,000	0.77	0.94
8,000	0.74	0.94
9,000	0.71	0.93
10,000	0.69	0.92

This product is designed and intended for use in the residential, commercial and light-industrial environment.

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