



# Vertiv™ Coolphase Condensing Unit

## **Installer/User Guide**

3.5 kW, 7.0 kW and 11 kW

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Refer to local regulations and building codes relating to the application, installation, and operation of this product. The consulting engineer, installer, and/or end user is responsible for compliance with all applicable laws and regulations relation to the application, installation, and operation of this product.

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### **Technical Support Site**

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit <https://www.vertiv.com/en-us/support/> for additional assistance.

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# 1 Important Safety Instructions

This manual contains important safety instructions that should be followed during the installation and maintenance of the Vertiv™ Coolphase Condensing Unit. Read this manual thoroughly before attempting to install or operate this unit. Only qualified personnel should move, install, or service this equipment.

Adhere to all warnings, cautions, notices, installation, operating, and safety instructions on the unit and in this manual. Follow all installation, operation, and maintenance instructions and all applicable national and local building, electrical, and plumbing codes.

Any operation that requires the removal of equipment panels must be carried out only by adequately trained and qualified personnel.

For assistance or spare parts, look for the model and serial number on the nameplate located on the service access panel.

Warning labels on the Vertiv™ Coolphase Condensing Unit remind users that:

- The unit restarts automatically in case of a blackout.
- All power sources must be disconnected before accessing the internal compartment for any operation.

The following safety guidelines are intended to prevent unforeseen risks or damage from unsafe or incorrect operation.

Vertiv™ CoolPhase Condensing Units must be paired only with Vertiv™ CoolPhase products.

This appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities or lack of experience and knowledge unless they have been given supervision or instruction concerning its use by a person responsible for their safety.

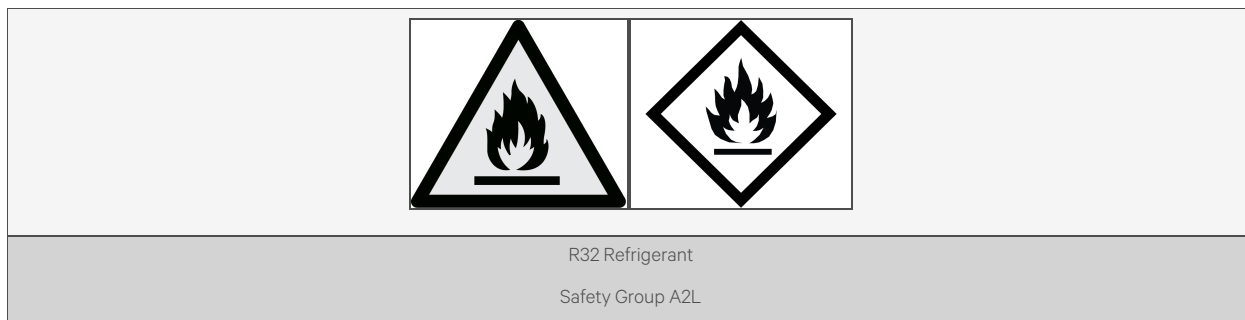
This appliance is designed to be installed in areas with a maximum altitude of 6561.68 ft (2000 m).

**NOTE: If the altitude exceeds 3280.8 ft (1000 m), contact Vertiv™ Technical Support.**

This is for installation only in locations not accessible to the general public.

The appliance shall be installed according to national wiring regulations. For USA and Canada follow NFPA 70 National Electrical code and Canadian Electrical Code for the proper electrical installation.

Decommissioned equipment shall be labeled, stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed, stating that the equipment contains flammable refrigerant.





**WARNING!** Air outlet of the appliance must be clear of obstructions at all times.



**WARNING!** An unventilated area where the appliance using flammable refrigerant is installed shall be so constructed that any refrigerant leak will not stagnate so as to create a fire or explosion hazard.



**WARNING!** Arc flash and electric shock hazard. Disconnect all electric power supplies, verify with a voltmeter that the power is Off, and wear approved personal protective equipment (PPE) before working within the electric control enclosure. Failure to comply can cause severe injury or death. The customer must provide earth ground to the unit, per national and local codes. Before proceeding with installation, read all instructions, verify that all the parts are included, and check the nameplate to be sure the voltage matches the available utility power. The Vertiv™ Coolphase Condensing Unit controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components require and receive power even during the “Unit Off” mode of the controller. The only way to ensure NO voltage inside the unit is to install and disconnect all power-supply sources. Refer to the unit electrical schematic. Follow all national and local codes.



**WARNING!** Risk of electric shock. Power down the unit for 10 minutes before removing any cover.



**WARNING!** Risk of over-pressurization of the refrigeration system. It can cause explosive discharge of high-pressure refrigerant, loss of refrigerant, environmental pollution, equipment damage, injury, or death. This unit contains fluids and gases under high pressure. Use extreme caution when charging the refrigerant system. Do not pressurize the system higher than the maximum allowable pressure marked on the unit's nameplate.



**WARNING!** Risk of contact with high-speed rotating fan blades. It can cause severe injury or death. Disconnect all electric power supply sources, verify with a voltmeter that the power is off, and confirm that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. Fan motor and compressor controls can maintain an electric charge for 10 minutes after disconnecting the power. If the control voltage is applied, the fan motor can restart without warning after a power failure.



**WARNING!** Risk of hair, clothing, and jewelry entanglement with high-speed rotating fan blades. It can cause equipment damage, serious injury, or death. Keep hair, jewelry, and loose clothing secure and away from rotating fan blades during unit operation.



**WARNING!** Risk of heavy unit falling over. Improper handling can cause equipment damage, injury, or death. Read all the following instructions and verify that all lifting and moving equipment is rated for the unit's weight before attempting to move, lift, remove packaging from, or prepare the unit for installation. Unit weights are specified in [section 2.5, “Dimensions and Weights”](#).





**WARNING!** Risk of contact with extremely hot and/or cold surfaces. It can cause injury. Verify that all components have reached a safe temperature for human contact or wear appropriate PPE before working within the electric connection enclosures or unit cabinet. Perform maintenance only when the system is de-energized, and component temperatures have become safe for human contact.



**WARNING!** Risk of improper wiring, piping, moving, lifting, and handling. It can cause equipment damage, serious injury, or death. Installation and service of this equipment should be done only by qualified personnel who have been specially trained in the installation of air conditioning equipment and are wearing appropriate PPE.



**WARNING!** Risk of improper wire sizing/rating and loose electrical connections. It can cause overheated wire and electrical connection terminals, resulting in smoke, fire, equipment, building damage, injury, or death. Use correctly sized copper wire only and verify that all electrical connections are tight before turning the power On. Check all electrical connections periodically and tighten them as necessary.



**CAUTION:** In order to avoid a hazard due to inadvertent resetting of the thermal cut-off, this appliance must not be supplied through an external switching device, such as a timer, or connected to a circuit that is regularly switched on and off by the utility.



**CAUTION:** Risk of improper moving, lifting, and handling. It can cause equipment damage or injury. Only properly trained and qualified personnel should work on this equipment. Condenser fan modules are heavy objects. Use proper lifting techniques and wear appropriate PPE to avoid injury and dropping the fan module during removal. Equipment used in handling/lifting and/or installing the fan assembly must meet Health and Safety national and local requirements. Handling/lifting equipment should be rated for the weight of the fan assembly. Use ladders rated for the weight of the fan assembly and technicians if used during installation. Refer to the operating manual for handling/lifting and/or installing equipment for the manufacturer's safety requirements and operating procedures.



**CAUTION:** Risk of exposure to harmful noise levels. It can cause hearing injury or loss. A sound pressure level greater than 70 dB(A) may arise depending on the installation and operating conditions. Take appropriate technical safety measures. Operating personnel must wear proper PPE and observe all appropriate hearing protection safety requirements.



**CAUTION:** Risk of excessive refrigerant line pressure. It can cause tubing and component rupture, damage to equipment, and personal injury. Do not close off the refrigerant line isolation valve for repairs unless a pressure relief valve is installed in the field between the isolation valve and the check valve. The pressure relief valve must be rated 5% to 10% higher than the system's maximum allowable pressure. An increase in ambient temperature can cause the pressure of the isolated refrigerant to rise and exceed the system's maximum allowable pressure rating marked on the unit nameplate.



**CAUTION: A high-touch current and earth connection is essential before connecting the supply.**



**CAUTION: This unit is equipped with electrically powered safety measures. To be effective, it must be electrically powered at all times after installation, except when servicing.**

#### **NOTICE**

Servicing must be performed only as recommended by this manual.

#### **NOTICE**

Risk of improper power supply connection. It can cause equipment damage and loss of warranty coverage. Before connecting any equipment to a main or alternate power source (for example, backup generator systems) for startup, commissioning, testing, or regular operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. Power source voltages should generally be stabilized and regulated to within  $\pm 10\%$  of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phase at any time.

#### **NOTICE**

Risk of oil contamination with water. It can cause equipment damage.

Vertiv™ Coolphase Condensing Unit systems require polyvinyl ether (FW68S) oil. Oil absorbs water much faster when exposed to air than previously used oils. Because water is the enemy of a reliable refrigeration system, extreme care must be used when opening systems during installation or service. If water is absorbed into the oil, it will not be easily removed and will not be removed through the normal evacuation process. If the oil is too wet, an oil change may be required. Oils also have a property that makes them act as a solvent in a refrigeration system. Maintaining system cleanliness is extremely important because the oil will return any foreign matter to the compressor.

#### **NOTICE**

Risk of improper refrigerant charging. It can cause equipment damage.

Refrigerant charges must be weighed into air-cooled compressorized systems before they are started. Starting rotary and scroll compressors without proper refrigerant charging can cause the compressors to operate at less than 5°F (-15°C) evaporator temperature and at less than 20 psig (138 kPa). Operation for extended periods at less than 20 psig (138 kPa) can cause premature compressor failure.

#### **NOTICE**

Risk of doorway/hallway interference. It can cause unit and/or structure damage. The unit may be too large to fit through a doorway or hallway while on the skid. Measure the unit and passageway dimensions and refer to the installation plans before moving the unit to verify clearances.

#### **NOTICE**

Risk of damage from the forklift. It can cause unit damage. Keep tines of the forklift level at a height suitable to fit below the skid and/or unit to prevent exterior and/or underside damage.

**NOTICE**

Risk of improper storage can cause unit damage. Keep the unit upright and indoors, protecting it from dampness, freezing temperatures, and contact damage.

**NOTICE**

Risk of release of hazardous substances into the environment. It can cause environmental pollution and violation of environmental regulations.

The Vertiv™ Coolphase Condensing Unit contains substances and components hazardous to the environment (electronic components, refrigerating gases, and oils). At the end of its useful life, specialized refrigerating technicians must dismantle it. The unit must then be delivered to suitable centers specializing in collecting and disposing of equipment containing hazardous substances.

## 1.1 Pipe Work

Pipework shall be kept to a minimum.

Pipework shall be protected from physical damage and shall not be installed in an unventilated space.

Compliance with national gas regulations shall be observed.

Mechanical connections shall be accessible for maintenance purposes.

Pipe-work, including piping material, pipe routing, and installation, shall include protection from physical damage in operation and service and comply with national and local codes and standards, such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection before being covered or enclosed.

After completion of field piping for split systems, the field pipework shall be pressure tested with an inert gas and then vacuum tested prior to refrigerant charging.

Field-made refrigerant joints indoors shall be tightness tested. The test method shall have a sensitivity of 5 grams per year of refrigerant or better under a pressure of at least 0.25 times the maximum allowable pressure. No leak shall be detected.

## 1.2 Qualification of workers

Every working procedure that affects safety means shall only be carried out by competent personnel.

Information on procedures additional to the usual information for refrigerating appliance installation, repair, maintenance, and decommission procedures is required when an appliance with flammable refrigerants is affected.

The training of these procedures is carried out by national training organizations or manufacturers that are accredited to teach the relevant national competency standards that may be set in legislation. The achieved competence should be documented by a certificate.

### 1.2.1 Safety concepts

**Unventilated enclosure.** The safety of the appliance does not depend on ventilation of the housing. Switching off the appliance or opening of the housing has no significant effect on safety. Nevertheless, it is possible that leaking refrigerant may accumulate inside the enclosure, and a flammable atmosphere will be released when the enclosure is opened.

**Ventilated enclosure.** The safety of the appliance depends on the ventilation of the housing. Switching off the appliance or opening of the enclosure has a significant effect on safety. Care should be taken to ensure sufficient ventilation before switching off the unit.

**Ventilated room.** The safety of the appliance depends on the ventilation of the room. Switching off the appliance or opening of the housing has no significant effect on safety. The ventilation of the room shall not be switched off during repair procedures.

### 1.2.2 Correct working procedures

#### 1.2.2.1 Commissioning

Ensure that the floor area is sufficient for the refrigerant charge or that the ventilation duct is assembled correctly.

Connect the pipes and carry out a leak test before charging with refrigerant.

Check safety equipment before putting it into service.

### 1.2.2.2 Maintenance

Ensure sufficient ventilation at the repair place.

Be aware that equipment malfunction may be caused by refrigerant loss, and a refrigerant leak is possible.

Discharge capacitors in a way that won't cause any sparks. Should turn down the unit for 10 minutes to wait for the capacitors to discharge.

Reassemble sealed enclosures accurately. If seals are worn, replace them.

Check safety equipment before putting it into service.

### 1.2.2.3 Repair

Ensure sufficient ventilation at the repair place.

Be aware that equipment malfunction may be caused by refrigerant loss, and a refrigerant leak is possible.

Discharge capacitors in a way that won't cause any sparks. Should turn down the unit for 10 minutes to wait for the capacitors to discharge.

When brazing is required, the following procedures shall be carried out in the correct order:

- Safely remove the refrigerant following local and national regulations. If national regulations do not require the recovery, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should be assigned to guard the outlet. Take special care that the drained refrigerant will not float back into the building.
- Evacuate the refrigerant circuit.
- Purge the refrigerant circuit with nitrogen for 5 minutes.
- Evacuate again.
- Remove parts to be replaced by cutting, not by flame.
- Purge the braze point with nitrogen during the brazing procedure.
- Carry out a leak test before charging with refrigerant.

Reassemble sealed enclosures accurately. If seals are worn, replace them.

Check safety equipment before putting it into service.

### 1.2.2.4 Decommissioning

If the safety is affected when the equipment is put out of service, the refrigerant charge shall be removed before decommissioning.

Ensure sufficient ventilation at the equipment location.

Be aware that equipment malfunction may be caused by refrigerant loss, and a refrigerant leak is possible.

Discharge capacitors in a way that won't cause any sparks. Should turn down the unit for 10 minutes to wait for the capacitors to discharge.

Remove the refrigerant. If national regulations do not require the recovery, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should be assigned to guard the outlet. Take special care that the drained refrigerant will not float back into the building.

When the refrigerant charge is removed, the following procedures shall be carried out in the following order:

- Evacuate the refrigerant circuit.
- Purge the refrigerant circuit with nitrogen for 5 minutes.
- Evacuate again.
- Fill with nitrogen up to atmospheric pressure.
- Put a label on the equipment that the refrigerant has been removed.

### **1.2.2.5 Disposal**

Ensure sufficient ventilation at the place where the unit is operating.

Remove the refrigerant. If national regulations do not require the recovery, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should be assigned to guard the outlet. Take special care that the drained refrigerant will not float back into the building.

When flammable refrigerants are used:

- Evacuate the refrigerant circuit.
- Purge the refrigerant circuit with oxygen-free nitrogen for 5 minutes.
- Evacuate again.
- Cut out the compressor and drain the oil.

## **1.3 Installation, Maintenance, Repair and Decommissioning**

### **1.3.1 Checks to the area**

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized. For repair to the refrigerating system, servicing procedures shall be completed prior to conducting work on the system.

### **1.3.2 Work procedure**

Work shall be undertaken under a controlled procedure so as to minimize the risk of flammable gas or vapor being present while the work is being performed.

### **1.3.3 General work area**

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

### **1.3.4 Checking for the presence of refrigerant**

The area shall be checked with an appropriate refrigerant detector prior to and during work to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e., non-sparking, adequately sealed, or intrinsically safe.

### **1.3.5 Presence of fire extinguisher**

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available at hand. Have a dry powder or CO<sub>2</sub> fire extinguisher adjacent to the charging area.

### 1.3.6 No ignition sources

No person carrying out work in relation to a refrigerant system that involves exposing any pipework shall use any ignition sources in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the installation site, repair, removal, and disposal, during which refrigerant can possibly be released into the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to ensure there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.

### 1.3.7 Ventilated area

Ensure the area is open or adequately ventilated before breaking into the system or conducting hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

### 1.3.8 Checks to the refrigerant equipment

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times, the Vertiv™ maintenance and service guidelines shall be followed. If in doubt, consult the technical department for assistance.

The following checks shall be applied to installations using flammable refrigerants:

- The actual refrigerant charge is in accordance with the room size within which the refrigerant-containing parts are installed.
- The ventilation machinery and outlets are operating adequately and are not obstructed.
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.
- Markings on the equipment continue to be visible and legible. Markings and signs that are illegible shall be corrected.
- Refrigerating pipes or components are installed in a position where they are unlikely to be exposed to any substance that may corrode refrigerant-containing components unless the components are constructed of materials that are inherently resistant to being corroded or are suitably protected against being so corroded.

### 1.3.9 Checks to electrical devices

Repair and maintenance of electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment, so all parties are advised.

Initial safety checks shall include:

- That capacitors are discharged: this shall be done safely to avoid sparking.
- That no live electrical components and wiring are exposed while charging, recovering or purging the system.
- That there is continuity of earth bonding.

#### 1.3.9.1 Repair to sealed components and intrinsically safe components.

- Sealed electrical components shall be replaced.
- Intrinsically safe components must be replaced.

### 1.3.10 Cabling

Check that cabling is not subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

### 1.3.11 Detection of flammable refrigerants

Under no circumstances shall potential ignition sources be used to search for or detect refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

Electronic leak detectors may be used to detect refrigerant leaks; in the case of flammable refrigerants, the sensitivity may not be adequate or may need recalibration. Detection equipment shall be calibrated in a refrigerant-free area. Ensure that the detector is not a potential ignition source and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the refrigerant's Lower Flammable Limit (LFL). It shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.

Leak-detection fluids are also suitable for use with most refrigerants. Still, chlorine-containing detergents shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipework. Examples of leak detection fluids are the bubble method and fluorescent method agents.

All naked flames shall be removed/extinguished if a leak is suspected.

If refrigerant leakage requires brazing, all of the refrigerant shall be recovered from the system or isolated (by means of shut-off valves) in a part of the system remote from the leak. Refrigerant removal shall be done according to the removal and evacuation procedures.

### 1.3.12 Removal and evacuation

Conventional procedures shall be used when breaking into the refrigerant circuit to make repairs – or for any other purpose. However, for flammable refrigerants, best practices must be followed since flammability is a consideration. The following procedure shall be adhered to:

- Safely remove refrigerant following local and national regulations.
- Evacuate.
- Purge the circuit with inert gas
- Evacuate.
- Continuously flush or purge with an inert gas when using a flame to open the circuit.
- Open the circuit

The refrigerant charge shall be recovered into the correct recovery cylinders. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the maximum allowable pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is absolutely vital if brazing operations on the pipe-work are to take place.

The outlet for the vacuum pump is not close to any potential ignition sources and ventilation shall be available.



### 1.3.13 Charging procedures

In addition to conventional charging procedures, the following requirements shall be followed:

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow-up leak test shall be carried out before leaving the site.

### 1.3.14 Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its details. It is recommended that all refrigerants be recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required before re-using the recovered refrigerant. Electrical power must be available before the task is commenced.

- a. Become familiar with the equipment and its operation.
- b. Isolate system electrically.
- c. Before attempting the procedure, ensure that:
  - Mechanical handling equipment is available, if required, for handling refrigerant cylinders.
  - All personal protective equipment is available and being used correctly.
  - The recovery process is supervised at all times by a competent person.
  - Recovery equipment and cylinders conform to the appropriate standards.
- d. Pump down the refrigerant system, if possible.
- e. If a vacuum is not possible, make a manifold so refrigerant can be removed from various system parts.
- f. Make sure the cylinder is situated on the scales before recovery occurs.
- g. Start the recovery machine and operate in accordance with instructions.
- h. Do not overfill cylinders (no more than 80 % volume liquid charge).
- i. Do not exceed the maximum working pressure of the cylinder, even temporarily.
- j. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- k. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

### 1.3.15 Labeling

Equipment shall be labeled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing flammable refrigerants, ensure that there are labels on the equipment stating that it contains flammable refrigerant.

### 1.3.16 Recovery

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (i.e. Special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants, including, when applicable, flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.

The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

**USA and Canada.** The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.






If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

**USA and Canada.** If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

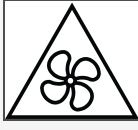


## 1.4 Symbol Description

The unit is marked with various symbols for different purposes; read the part with the symbol(s) carefully and follow the instructions to avoid any risk.

**Table 1.1 Symbol Description**

Symbology	Description
	This symbol is displayed to indicate matters and operations that can cause risk.
	<b>WARNING</b> This symbol means that if the warning is not heeded, it can cause death or severe injury.
	<b>WARNING</b> This symbol means that if the precaution is not taken, it may cause minor or moderate injury.
	This symbol is displayed to indicate protective earthing. Permanent earthing shall always remain connected other than for small periods of maintenance.
	These symbols are displayed to indicate matters related to the appliance's operation.
	This symbol is displayed to indicate matters related to the servicing of the appliance. The information in the manual is intended for use by a qualified service technician familiar with the safety procedures and equipped with the proper tools and test instruments.
	These symbols are displayed to indicate matters related to flammable refrigerants.
	

**Table 1.1 Symbol Description (continued)**

Symbology	Description
	<p>This symbol is displayed to indicate moving fan blades during regular operation.</p>
	<p>This symbol is displayed to indicate hazardous voltage involved or risk of electric shock. This symbol might be followed by 'CAUTION' or 'WARNING' wording to indicate the level of risk.</p>
	<p>This symbol is displayed to indicate potential hot surfaces.</p>

## 2 Product Introduction

### 2.1 Product Overview

#### 2.1.1 Condensing Unit Overview

The Vertiv™ Coolphase Condensing Unit is an air-cooled condenser with a compressor that rejects the heat removed from the IT space into ambient air and uses low GWP R32. This unit is always used with an Evaporator unit and is controlled and operated from it. These units can be installed outdoors or indoors in plenums; overcurrent protective devices, overvoltage protective devices, and main connections must be provided by the end-user following the installation instructions.

### 2.2 Model Nomenclature

The Vertiv™ Coolphase Condensing Unit is available in two versions: Standard Ambient and Low Ambient. The standard ambient version shall operate with ambient temperatures between -4~118°F (-20~48°C), and the Low Ambient version shall work between -31~118°F (-35~48°C).

#### 2.2.1 Model Number Nomenclature Detail

The following tables describe each digit of the model number Nomenclature displayed:

**Table 2.1 Model Number Nomenclature**

1	2	3	4	5	6	-	7	8	9	10	11
C	U	D	1	1	1	-	E	0	0	0	A

**Table 2.2 Condensing Unit Model-number Digit Description**

Digit	Description
Digits 1 - 2	Unit Family: CU - Vertiv™ Coolphase Condensing Unit
Digit 3	Version: D - Air-Cooled Standard Ambient L - Air-Cooled Low Ambient
Digit 4 - 5	Nominal Capacity 03 – 3.5 kW 07 – 7.0 kW 11 – 11.0 kW
Digit 6	Power Supply: 0 - 208/230V, 1 PH, 50/60 Hz (GLOBAL) 1 - 208/230V, 3 PH, 50/60 Hz (NAM) 5 - 400V, 3 PH, 50/60 Hz (EMEA)
7	Protection:

**Table 2.2 Condensing Unit Model-number Digit Description (continued)**

Digit	Description
	E - E-coating (Aggressive environments)
8	Free
9	Free
10	Free
11	Revision: A - Revision A

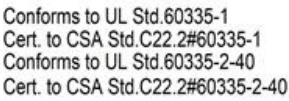


## 2.2.2 Technical Description

**Table 2.3 Vertiv™ Coolphase Condensing Unit Technical Description.**

	CUD030 CUL030	CUD070 CUL070	CUD111 CUL111	CUD115 CUL115
Region	Global		NAM	EMEA
Certification Marks	cETLus, CE & UKCA		cETLus	CE & UKCA
Piping Connections	Flare Connection			
Operating Temperature range (Condensing Unit Only)	Standard ambient condensing Unit: -4°F (-20°C) ~118°F (48°C) Low ambient condensing unit: -31°F (-35°C) ~118°F (48°C)			
Operating Temperature range (Condensing Unit with accessories installed)	Standard ambient condensing Unit with wind baffle: -4°F (-20°C) ~118°F (48°C) Standard ambient condensing unit without wind baffle 23°F (-5°C) ~118°F (48°C)			
Compressor	Variable speed rotary compressor			
Condenser Fan	EC Motor			
External Static Pressure	0.20 inH2O (50pa)	0.12 inH2O (30pa)		
Noise Data	68 dB	68 dB	71 dB	
Noise Data of night mode	58 dB	58 dB	56 dB	
Power Supply	208/230V, 1ph, 50/60Hz (-10%/+10%)		208/230V, 3Ph, 50/60 Hz (-10%/+10%)	400V, 3PH+N 50/60 Hz (-10%/+10%)
Refrigerant	R32			
Max Equivalent Length of Pipe between Indoor Unit and Condensing Unit	196.85 ft (60m)			
Height between Indoor and Condensing Unit	Condensing unit placed higher than indoor unit	98.43 ft (30m)		
	Condensing unit placed lower than indoor unit	-26.25 ft (-8m)		

**NOTE: The Low ambient version of the Condensing Unit can not be installed in plenum areas, only the standard version is plenum rated.**

Figure 2.1 Vertiv™ Coolphase Condensing Unit Name Plate Information

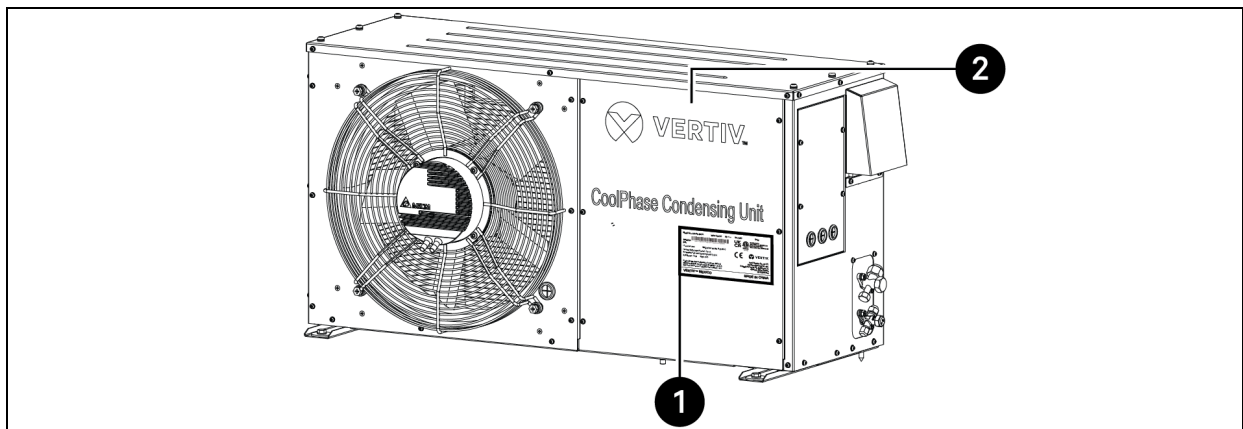
Model No.: CUD030-E000A	Volts: 208/230	Ph: 1~	Hz: 50/60	Date: XXX 20XX
Serial No.:				
IP Number: IPX4	Weight Net: 50.0 kg. (110.23 lb.)			
Full Load Current (FLA): 17 A				
 Refrigerant: R32___ GWP: 675 CO2 : ___				
<b>Inverter Rated Input Current: 14 A</b> <b>EC Fan Maximum Operating Current (MOC): 3 A</b> <b>High-side Maximum Allowable Pressure: 650 PSI</b> <b>Low-side Maximum Allowable Pressure: 300 PSI</b> <b>Branch Circuit Selection Current (BCSC): 7 A</b> <b>Maximum Overcurrent Protective Device (MOP): 35 A</b> <b>Minimum Supply Circuit Ampacity (MCA): 21 A</b>				 Vertiv Corporation 505 N. Cleveland Ave., Westerville, Ohio, 43082, USA. <a href="http://www.vertiv.com">www.vertiv.com</a>
<i>For installation only in locations not accessible to the general public</i>				
<b>VERTIV™</b>			<b>MADE IN CHINA</b>	

Name Plate Information	Description
Power Supply	
Model	Model defined by 11 digits
Serial Number	Serial number defined by 20 digits

**NOTE:** The values may vary for different SKUs. Please refer to the nameplate on the unit.

**NOTE:** The certification label changes for different regions; please refer to the nameplate on the unit.

Figure 2.2 Name Plate Location

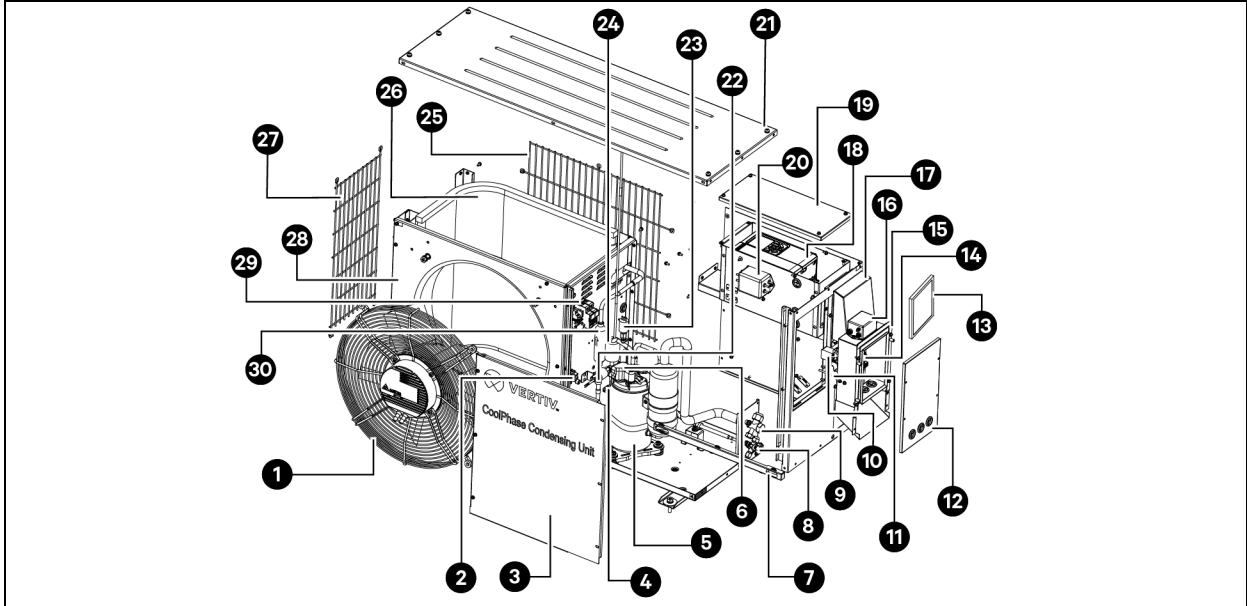


Item	Description
1	Nameplate
2	Service Access Panel/Front of Unit

## 2.3 Components

### 2.3.1 Component Location

Figure 2.3 Vertiv™ Coolphase Condensing Unit Standard Ambient Version Component Location

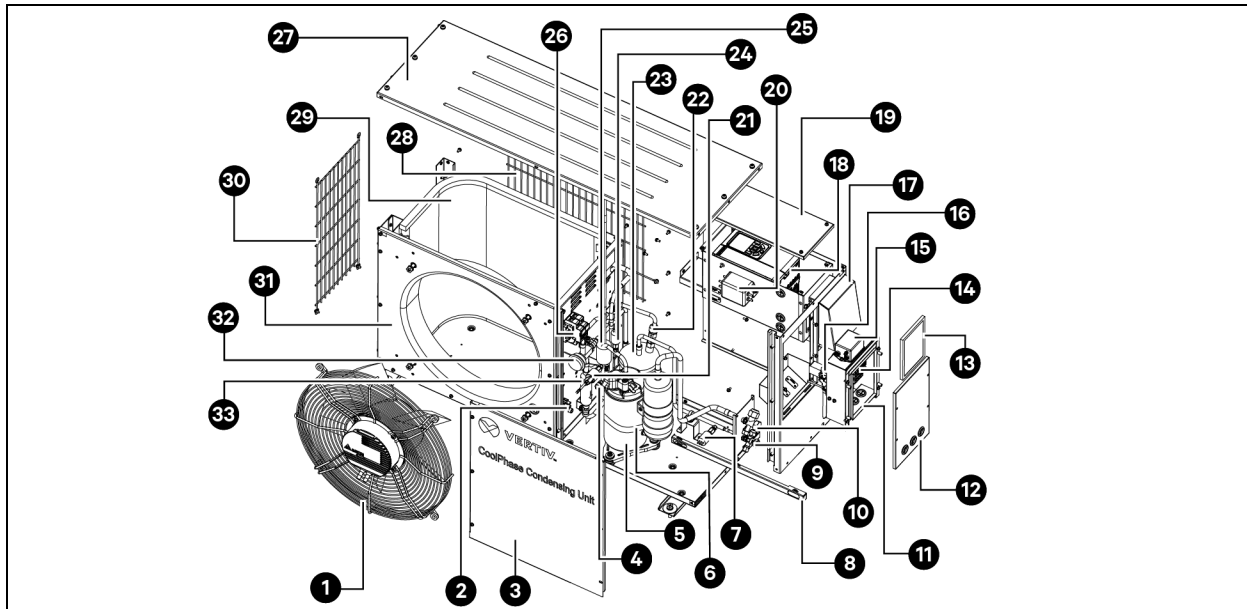


Item	Description	Item	Description
1	Condenser Fan	16	EMI Filter 2
2	Terminal Block 1	17	VFD Air Filter Box Panel
3	Service Access Panel	18	Variable Frequency Driver
4	Schrader Valve	19	VFD Access Panel
5	Compressor	20	EMI Filter 1
6	Compressor Cable	21	Top Cover
7	Cable Routing Plate	22	High Pressure Transducer
8	Liquid Valve	23	High Pressure Switch
9	Suction Valve	24	Discharge Temperature Sensor
10	Relay	25	Back Guard Mesh
11	COMM Port	26	Condenser Coil
12	Electrical Box Panel	27	Side Guard Mesh
13	VFD Air Filter	28	Fan Panel
14	Terminal Block	29	Terminal Block 2
15	Electrical Box	30	Check Valve

**NOTE:** Condensing unit CUD111-E000A model does not have Item 16 (EMI Filter).



Figure 2.4 Vertiv™ Coolphase Condensing Unit Low Ambient Version Component Location



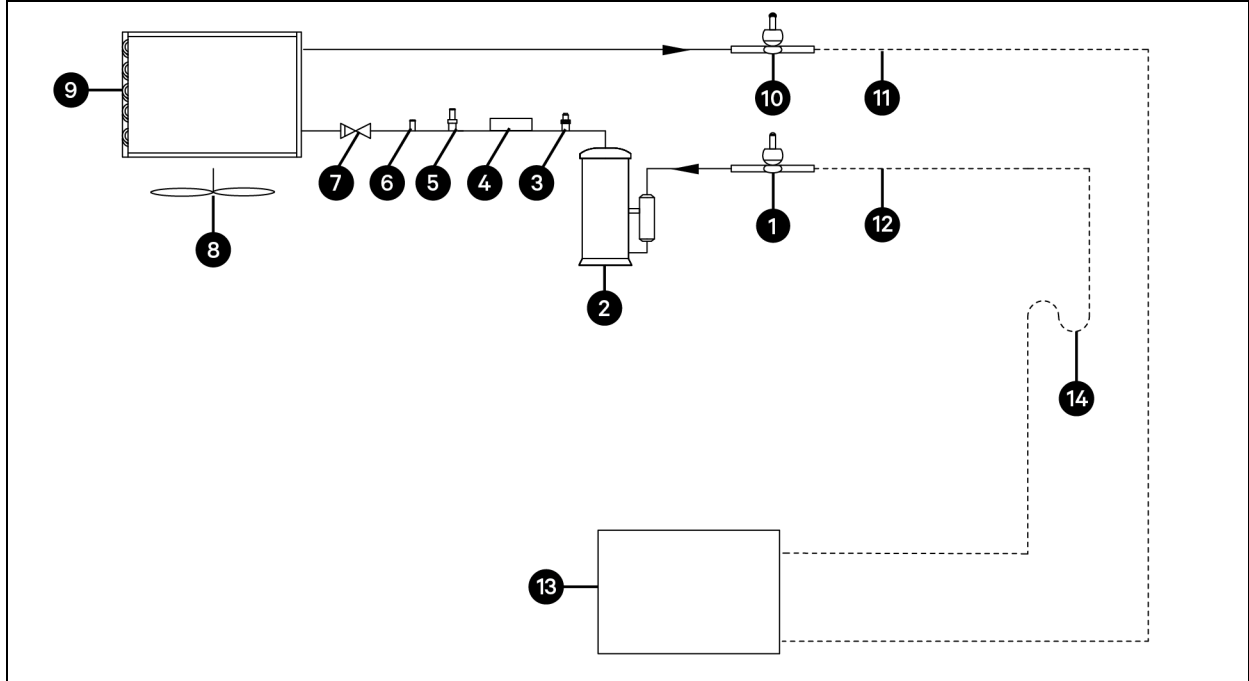
Item	Description	Item	Description
1	Condenser Fan	18	Variable Frequency Driver
2	Terminal Block	19	VFD Access Panel
3	Service Access Panel	20	EMI Filter 1
4	Schrader Valve	21	High Pressure Transducer
5	Compressor	22	Relief Valve
6	Electrical Heating Belt	23	Liquid Receiver
7	Low Pressure Switch	24	High Pressure Switch
8	Cable Routing Plate	25	Discharge Temperature Sensor
9	Liquid Valve	26	Terminal Block 2
10	Suction Valve	27	Top Cover
11	Electrical Box	28	Back Guard Mesh
12	Electrical Box Panel	29	Condenser Coil
13	VFD Air Filter	30	Side Guard Mesh
14	Terminal Block	31	Fan Panel
15	EMI Filter 2	32	Head Pressure Valve
16	Relay	33	Check Valve
17	VFD Air Filter Box Panel		

**NOTE:** Condensing unit CUL11-E000A model does not have Item 16 (EMI Filter).

### 2.3.2 Main Components (Standard version)

The standard version of the unit mainly consists of a compressor, fan, and heat exchanger, and it is designed to maintain proper operating pressure in outdoor temperatures of -4~118°F (-20~+48 °C). The Main components of the Condensing Unit are described below:

Figure 2.5 Condensing Unit Standard Ambient Components Diagram.



Item	Description	Item	Description
1	Suction Valve	2	Compressor
3	High-pressure switch	4	Discharge temperature sensor
5	High-pressure transducer	6	Scharder valve
7	Check valve	8	Condenser fan
9	Condenser Coil	10	Liquid valve
11	Liquid line	12	Suction line
13	Indoor unit	14	Oil trap

#### Compressor

The variable speed rotary compressor can adapt to different operating conditions.

#### Fan

The EC axial fan uses low-noise fan blades and a high-performance motor.

#### Heat Exchanger

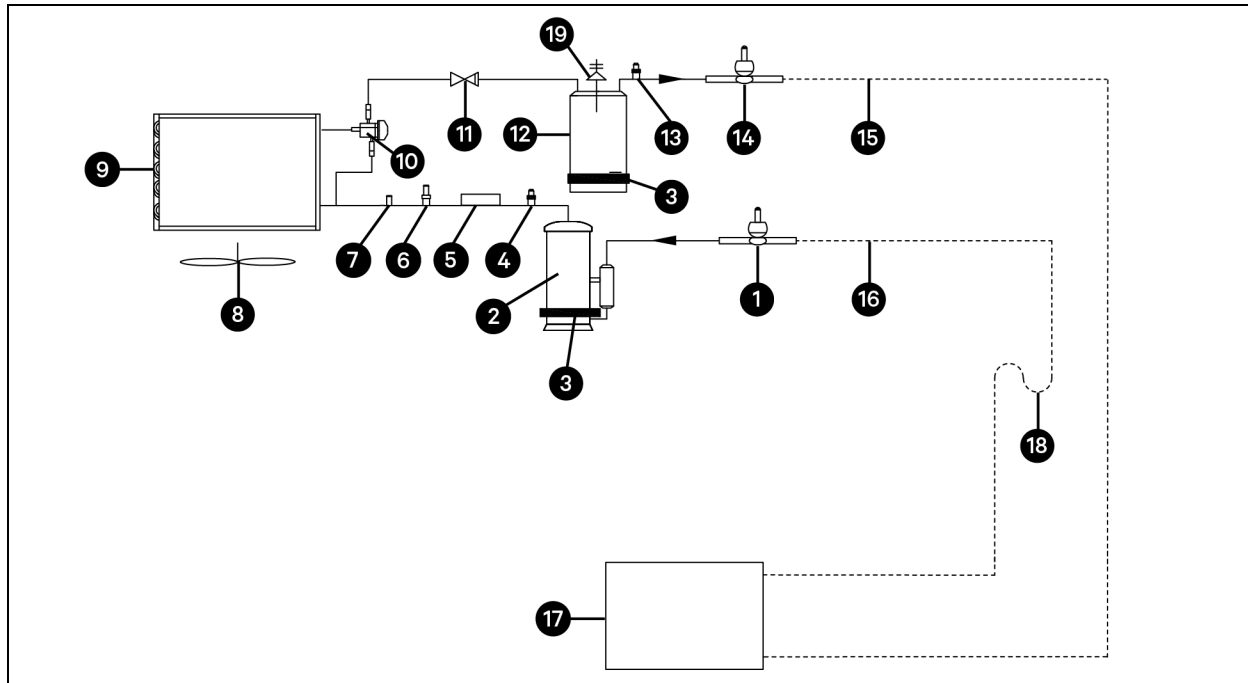
The microchannel heat exchanger provides high heat-dissipating efficiency and is convenient for maintenance.

### 2.3.3 Main Components (Low Ambient Version)

The low ambient version of the unit has additional components for its system, such as a receiver with a heater belt, a head pressure valve, a safety valve, a check valve, and a pressure switch. This version is designed to maintain proper operating pressure in outdoor temperatures lower than the standard version; the lowest operating temperature for these models is -31°F (-35 °C).

The low ambient version is a factory-made installed option selected at the time of the purchase.

**Figure 2.6 Diagram of Low Ambient Version Components.**



Item	Description	Item	Description
1	Suction Valve	2	Compressor
3	Electric heating belt	4	High pressure switch
5	Discharge temperature sensor	6	High pressure transducer
7	Schrader valve	8	Condenser fan
9	Condenser Coil	10	Head pressure valve
11	Check valve	12	Liquid receiver
13	Low pressure switch	14	Liquid valve
15	Liquid line	16	Suction line
17	Indoor unit	18	Oil trap
19	Relief Valve		

**Main Components of this version:**

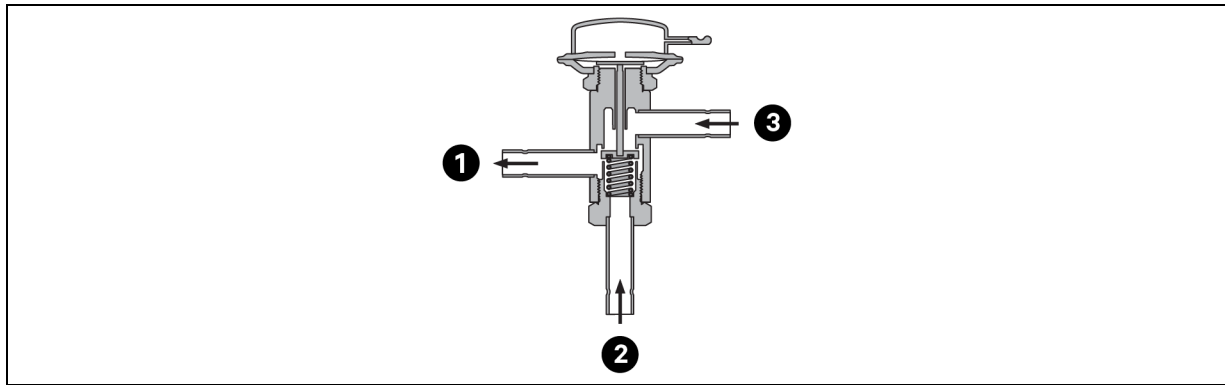
**Liquid Receiver**

The receiver stores refrigerant to help fulfill the needs for low-temperature loads in winter and high-temperature loads in summer. The receiver has three connection ports to connect the refrigerant inlet pipe, refrigerant outlet pipe, and safety valve.

**Head Pressure Valve**

The head pressure valve is a three-way modulating valve that responds to discharge pressure. When the system head pressure falls below the setting of the Head pressure valve, flow from the condenser coil outlet is reduced by mixing both valve inlets (Discharge Gas, Liquid from Condenser coil) to the valve outlet (Receiver Inlet), causing the liquid refrigerant to stack within the condenser coil reducing its heat of rejection capacity. Steady system pressure is achieved when enough refrigerant has flooded the condenser coil to reduce the heat exchange capacity, maintaining the minimum system head pressure. The receiver size is based on the liquid refrigerant holding capacity of the condenser coil while maintaining a liquid column of refrigerant to the expansion valve. See Figure 2.7 below for reference.

**Figure 2.7 Structure Diagram of Head Pressure Valve**



Item	Description
1	Connected with Receiver
2	Connected with Condenser
3	Connected with Discharge pipe

**Electric heating belt**

The unit is equipped with two electric heating belts: one for the liquid receiver and the other for the compressor. The belts will heat when the pressure is lower than 1.4 MPa (203 psi) and stop heating when the pressure exceeds 1.9 MPa (276 psi).

**Check Valve**

The check valve is installed after the compressor on the discharge line to prevent the refrigerant from flowing back to the condenser. The arrow on the valve indicates the direction of the flow, and it should point toward the receiver.

## 2.4 Accessories

The accessories for the Vertiv™ Coolphase Condensing Unit are listed below. These items are sold separately. For further mounting information, refer to each accessory’s Quick Installation Guide.

### 2.4.1 Hail Guard

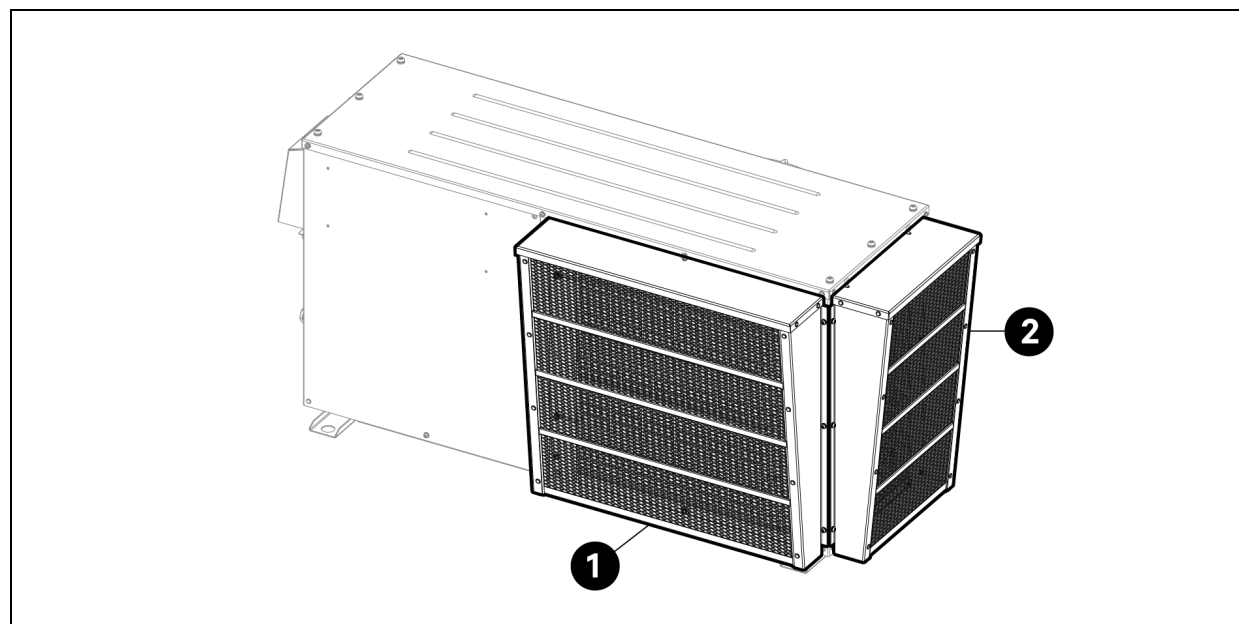
Hail Guards protect the condenser coil against hail produced during storms. It is recommended to add this accessory when the unit is in a location with extreme weather conditions.

**NOTE:** With the Hail Guard kit installed, the maximum ambient air temperature is 118.4°F (48°C), but cooling capacity will be reduced by approximately 2% in high ambient temperatures.

**Table 2.4 Hail Guard SKUs**

SKU	Item Description	Applicable Models
CUHAILGRD-03	Hail Guard for 3.5 kW Units	CUD03, CUL03
CUHAILGRD-07	Hail Guard for 7 kW Units	CUD07, CUL07
CUHAILGRD-11	Hail Guard for 11 kW Units	CUD11, CUL11

**Figure 2.8 Hail Guards mounted on the unit.**



Item	Description
1	Back Guard Mesh Hail Guard
2	Side Guard Mesh Hail Guard

## 2.4.2 Wind Baffle

The wind baffle allows cooling-mode operation at lower outdoor ambient temperatures.

**NOTE:** The Wind Baffle should be installed when the standard condensing unit is installed outdoors, and the temperature is 23°F (-5 °C) or below. The Wind Baffle can help ensure the stability and reliability of the standard condensing unit running in a low-temperature environment.

**NOTE:** When equipped with the wind baffle kit, the maximum ambient air temperature is 118.4°F(48°C), but cooling capacity will be reduced by approximately 1.5% in high ambient temperatures. If both the hail guard and wind baffle kit are installed, the maximum ambient air temperature is 118.4°F(48°C), but cooling capacity will decrease by approximately 2.0% in high ambient temperatures.

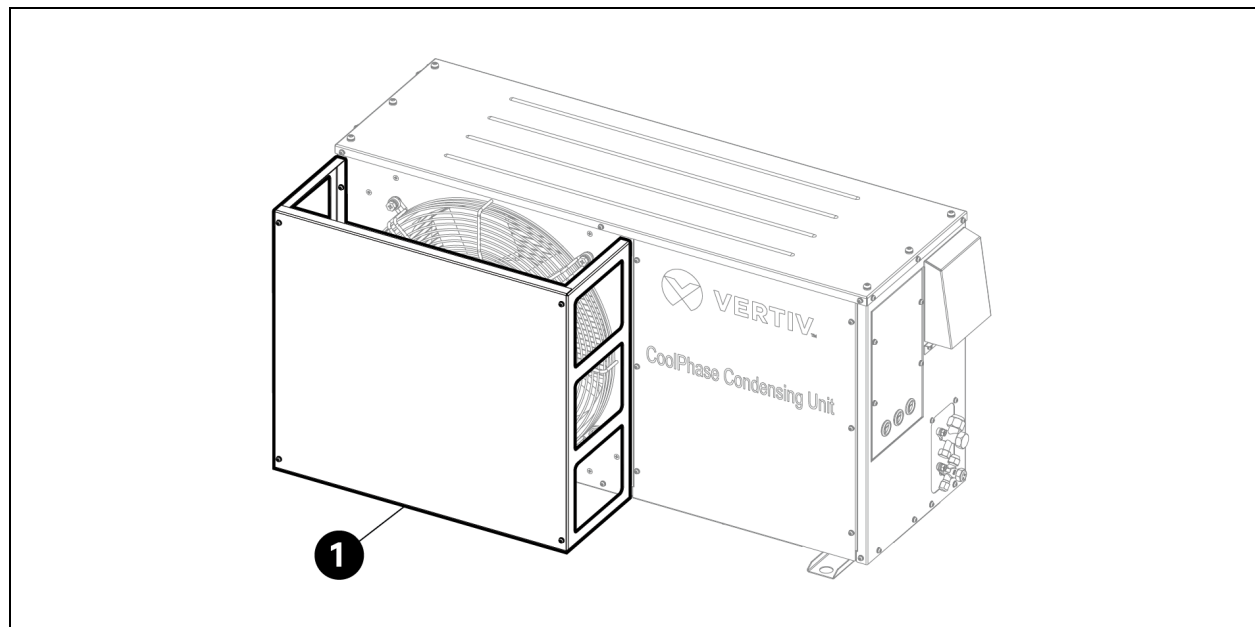
**NOTE:** When the ambient temperature is lower than -4°F (-20 °C) up to -31°F (-35°C), the low ambient version of the Condensing Unit must be used.

**NOTE:** Low Ambient version units do not require a Wind Baffle accessory.

Table 2.5 Wind Baffle SKUs.

SKU	Item Description	Applicable Models
CUWINDKIT-03	Wind Baffle for 3.5 kW Standard Ambient Condensing Units	CUD03
CUWINDKIT-07	Wind Baffle for 7 kW Standard Ambient Condensing Units	CUD07
CUWINDKIT-11	Wind Baffle for 11 kW Standard Ambient Condensing Units	CUD11, CUD11

Figure 2.9 Wind Baffle mounted on the unit.



Item	Description
1	Wind Baffle for Condensing Unit

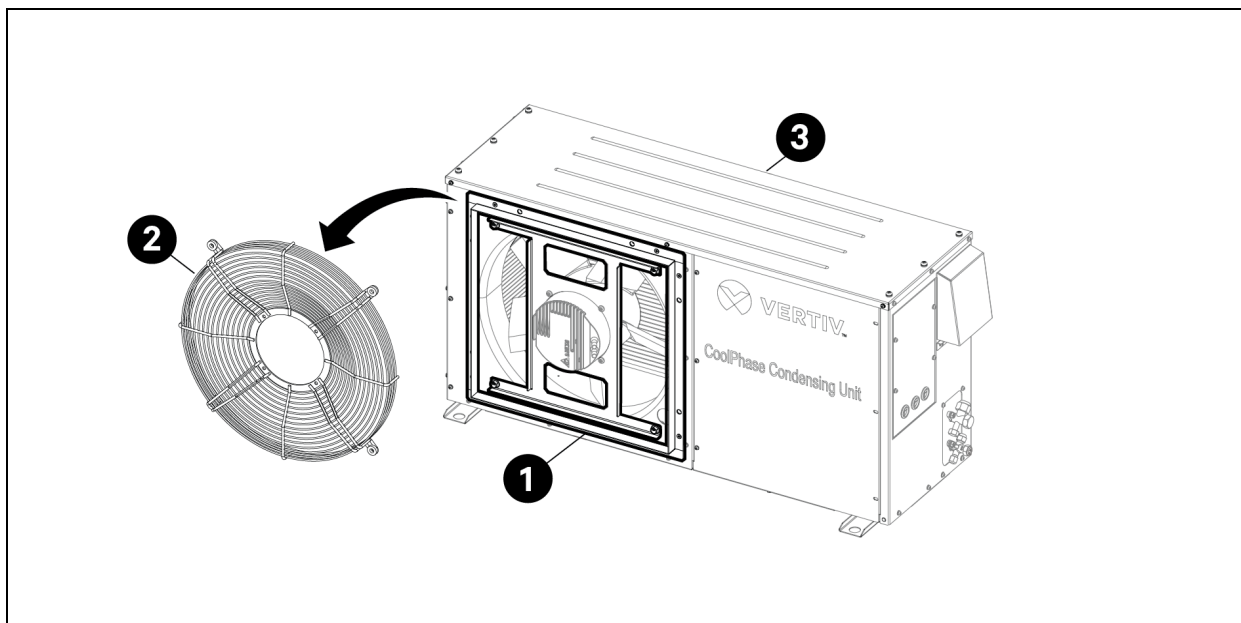
### 2.4.3 Duct Kit

The Duct kit is needed when the unit is required to be adapted to a duct system. This kit must be attached before mounting the unit to the ceiling for proper component access and installation. For further details of the kit's components, please refer to the accessory Quick Installation Guide.

**Table 2.6 Duct Kit SKUs.**

SKU	Item Description	Applicable Models
CUDUCTKIT-07	Duct Kit for 3.5 and 7 kW Units	CUD03, CUL03 CUD07, CUL07
CUDUCTKIT-11	Duct Kit for 11 kW Units	CUD11, CUL11

**Figure 2.10 Duct Kit mounted on the unit.**



Item	Description	Item	Description
1	Duct Kit	3	Condensing Unit
2	Fan cover		

## 2.5 Dimensions and weights

Figure 2.11 Condensing Unit Dimensions.

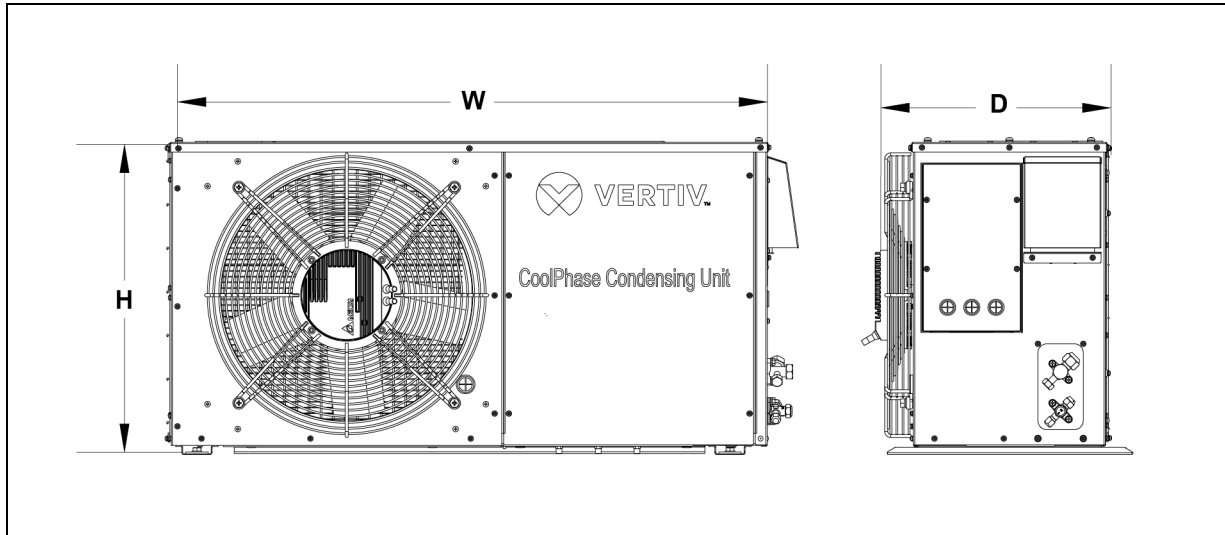


Table 2.7 Dimensions and Weights

Model	Unit Dimensions	Shipping Dimensions (Width x Depth x Height)	Net Weight	Shipping Weight
	(Width x Depth x Height) in (mm)	in (mm)	lb (kg)	lb (kg)
CUD03	38.77 x 12.55 x 20.31	45.24 x 22.01 x 28.82	110.23 (50)	169.76 (77)
CUL03	(985 x 319 x 516)	(1149 x 559 x 732)	116.85 (53)	176.37 (80)
CUD07	44.40 x 16.49 x 20.31	50.75 x 25.94 x 28.82	117.95 (53.5)	188.5 (85.5)
CUL07	(1128 x 419 x 516)	(1289 x 659 x 732)	130.07 (59)	200.62 (91)
CUD111	51.29 x 20.47 x 22.83 (1303 x 520 x 580)	57.64 x 30.08 x 31.30 (1464 x 764 x 795)	175.27 (79.5)	259.04 (117.5)
CUL111			184.09 (83.5)	272.27 (123.5)
CUD115			174.17 (79)	257.94 (117)
CUL115			182.98 (83)	271.17 (123)



## 2.6 Storage Environment

Table 2.8 Storage Environment

Item	Requirements
Storage environment	Store the unit in its original factory packaging in a clean indoor environment with good ventilation and no dust.
Ambient temperature	-40~+158°F (-40°C ~+70°C)
Ambient humidity	Less than 95%RH @ 86°F (30°C)

## 2.7 Electrical Data

Table 2.9 Condensing Unit Electrical Data

Models	Nom. Tons	Volts / Phases	Compressor Qty.	Compressor Inverter (A)	Fan Qty.	Fan (A)	FLA (A)	MCA (A)	MOP (A)
CUD030 CUL030	1	208/230 1PH	1	14	1	3	17	21	35
CUD070 CUL070	2	208/230 1PH	1	20	1	3	23	28	50
CUD111 CUL111	3	208/230 3PH	1	16.7	1	4	21	25	40
CUD115 CUL115	3	400 3PH+N	1	11.4	1	4	15	18	30

Table 2.10 Compatible Evaporator Unit Electrical Data

Condensing Unit Model	Compatible Evaporator Unit Model	FLA (A)	MCA (A)	MOP (A)
CUD030 CUL030	WLM030A	19	50	24
CUD070 CUL070	WLM070A	26	65	32
CUD111 CUL111	WLM110A	25	55	30
CUD115 CUL115		19	45	23

**NOTE:** The FLA, MOP and MCA values of this table are the total of the condenser + evaporator system when the Evaporator Unit is powered from the Condensing Unit.

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### 3 Pre-Installation Preparation



**WARNING!** Competent persons shall only carry out every working procedure that affects safety means.



**WARNING!** Risk of top-heavy unit falling over. Improper handling can cause equipment damage, injury, or death. Read all the following instructions and verify that all lifting and moving equipment is rated for the unit's weight before attempting to move, lift, remove packaging from, or prepare the unit for installation.



**WARNING!** Before breaking into the system or conducting any hot work, ensure the working area is open or adequately ventilated. Ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.



**WARNING!** Under no circumstances should potential ignition sources be used to search for or detect refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.



**WARNING!** If a refrigerant leakage requires brazing, all the refrigerant shall be recovered from the system or isolated (by means of shut-off valves) in a part of the system remote from the leak. Refrigerant removal shall be performed following the manufacturer's instructions.



**CAUTION:** Risk of contact with sharp edges, splinters, and exposed fasteners. It can cause injury. Only properly trained and qualified personnel wearing appropriate, approved PPE should attempt to move, lift, remove packaging from, or prepare the unit for installation.

#### NOTICE

Risk of passageway interference. It can cause unit and/or structure damage. The unit may be too large to fit through a passageway on or off the skid. Measure the unit and passageway dimensions and refer to the installation plans before moving the unit to verify clearances.

#### NOTICE

Risk of damage from forklift. It can cause unit damage. Keep tines of the forklift level at a height suitable to fit below the skid and/or unit to prevent exterior and/or underside damage.

#### NOTICE

Risk of improper storage. Keep the unit in its original package, upright, indoors, and protected from dampness, freezing temperatures, and contact damage.

### 3.1 Inspecting the Unit

Upon the Unit's arrival and before unpacking:

- Verify that the labeled equipment matches the bill of lading.
- Inspect that there are no visible or concealed damages on the package.
- Additional unit inspection is warranted to ensure no exterior or internal damage.

Report damage immediately to the carrier and file a damage claim with a copy sent to Vertiv™ or your sales representative.

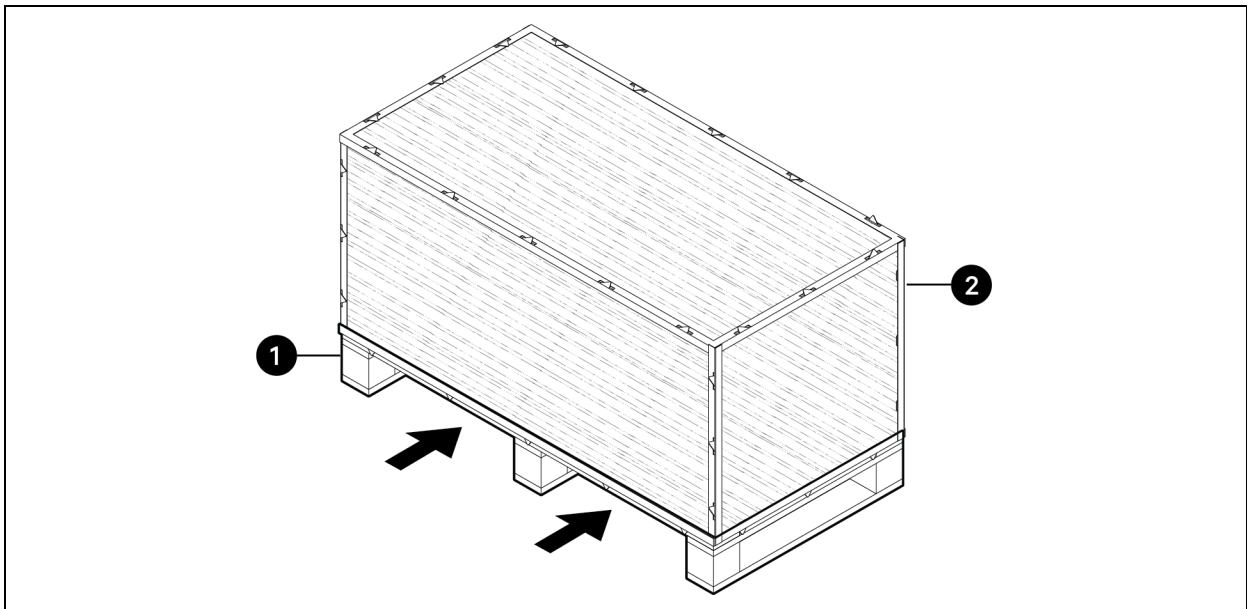
### 3.2 Moving the packaged Unit

**NOTE: Before moving, installing, or servicing this unit, please read the Safety Instructions sheet provided as a separate document shipped with the unit.**

Mechanical transport equipment, such as a forklift or crane, is recommended when unloading and transferring the condenser closest to the installation site.

When a forklift is used, insert the tines in the direction shown in the figure below.

**Figure 3.1 Inserting the Forklift in this direction.**



Item	Description
1	Pallet
2	Packaged Unit

### 3.3 Unpacking the Unit

To unpack the Vertiv™ Coolphase Condensing Unit from the wooden box:

1. Place the package on a level surface, then unfold the mild steel tabs on the wood box edges with the help of a flat screwdriver and a hammer.
2. Once all tabs are flattened, remove the wood panels to release the unit.
3. Remove all foam pads.
4. Lift the plastic bag protecting the unit, then remove the desiccant and documentation bags.
5. With a screwdriver, detach the lifting brackets on the pallet's backside and keep them for plenum installation.

**Figure 3.2 Unpacking the Unit**

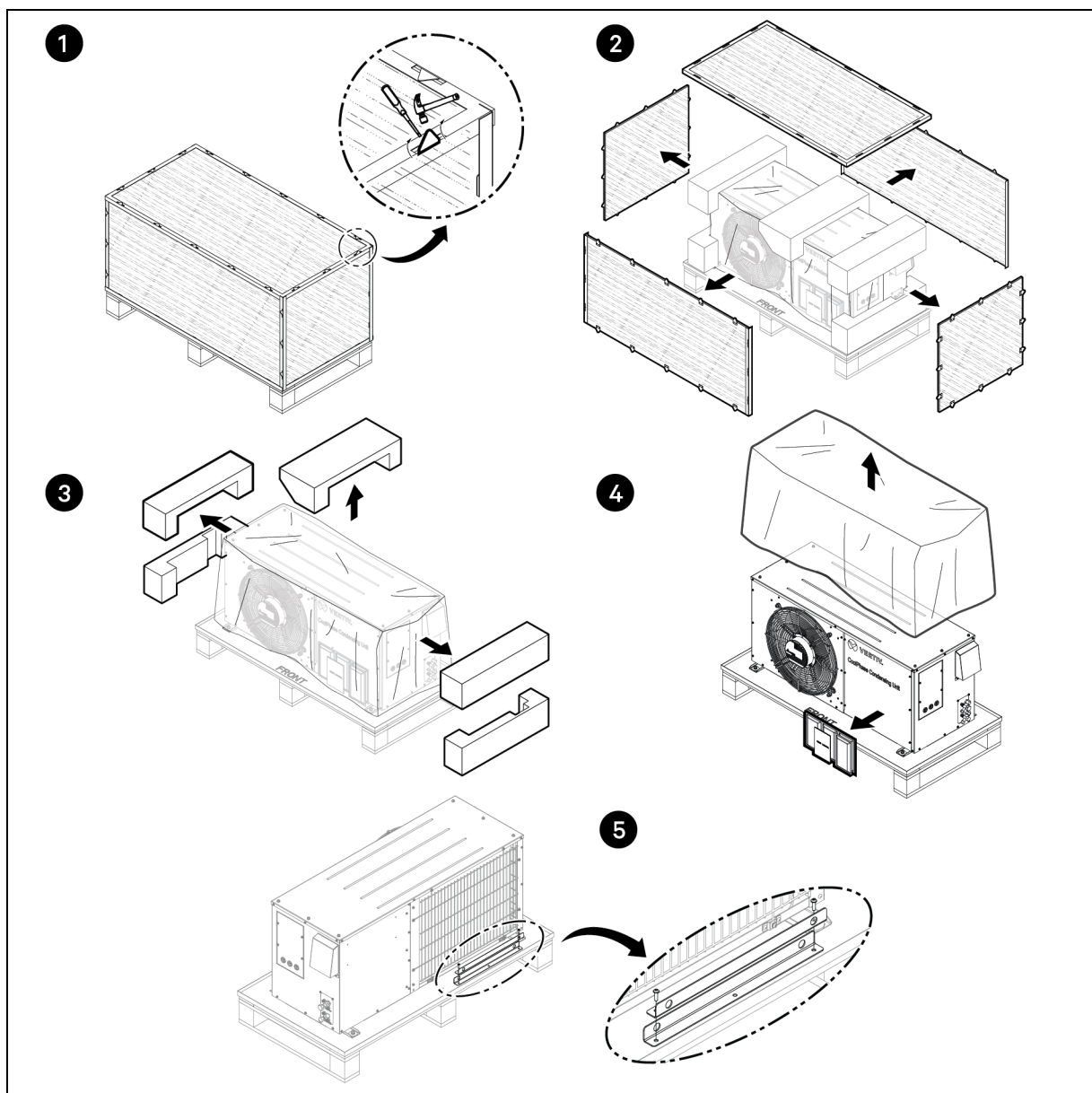
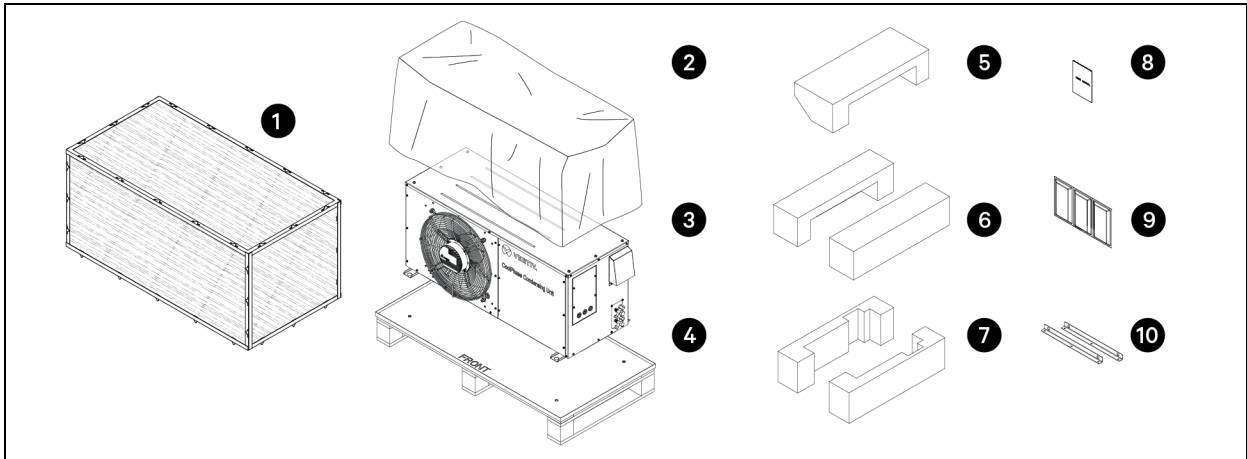


Figure 3.3 Package content.



Item	Description	Item	Description
1	Wood box	6	Top Foam pads
2	Plastic Bag	7	Bottom Foam Pads
3	Vertiv™ Coolphase Condensing Unit	8	Plastic Bag with product documentation: User manual, Safety Declaration, Certification declarations (UKCA and CE) and Product Inspection Report.
4	Pallet	9	Desiccant bags
5	Center Top pad	10	Lifting Brackets

**NOTE:** CUD11 and CUL11 models don't include the UKCA and CE certifications declaration files.

Follow the instructions in the next section to remove the unit from the pallet.

### 3.4 Removing Unit from the Pallet



**WARNING!** Two or more adequately trained and qualified personnel are required to move the unit to its installation location.

To remove the unit from the pallet:

1. Remove the shipping brackets from the pallet by removing four M8 hex screws and washers for each bracket ( Figure 3.4 ).
2. If the unit needs to be lifted, attach the lifting brackets on the top of the unit ( Figure 3.5 ), reusing the six screws on the top panel to secure them.
3. Hoist the Unit to its designated installation location with the help of a crane anchoring the slings to the lifting brackets.

Figure 3.4 Removing Unit from pallet, step 1.

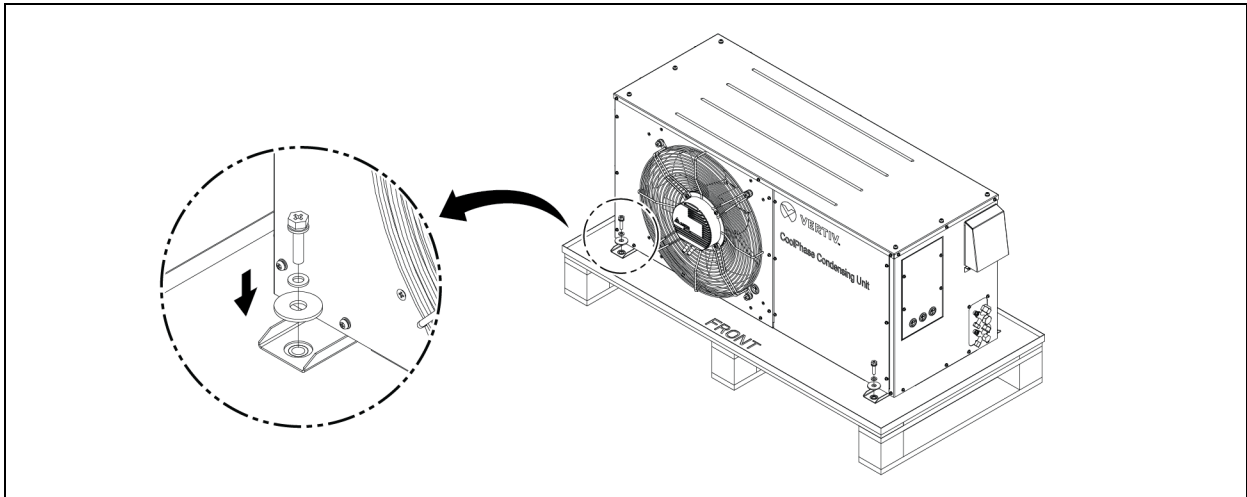
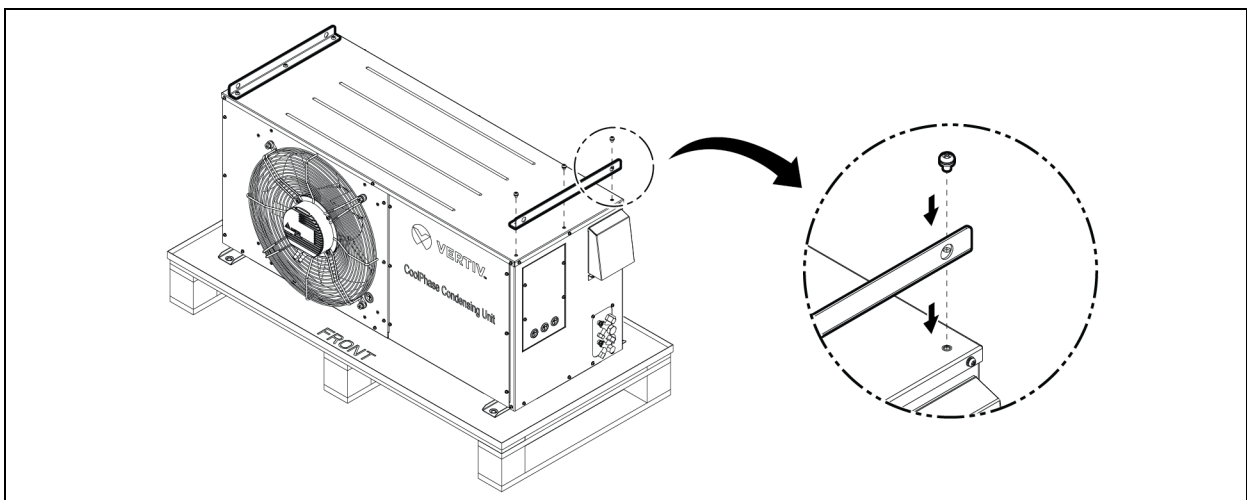


Figure 3.5 Removing Unit from pallet, step 2.



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## 4 Installation

### 4.1 Installation Notes

- Vertiv™ Coolphase Condensing Unit are always used with Vertiv™ Coolphase Evaporator Units. Read the Evaporator User Manual before installing and using this Condensing Unit.
- Do not install the unit in an environment with noise restrictions.
- Do not place the unit near vapors, hot surfaces, and waste gases.
- Install the unit in a clean place and keep it away from dust and foreign objects.
- When the standard condensing unit is installed in an outdoor environment and the temperature can be down to 23°F (-5 °C) or below, the wind baffle should be selected and installed. The wind baffle can help ensure the stability and reliability of the standard condensing unit running in a low-temperature environment.
- When the ambient temperature is lower than -4°F (-20 °C) up to -31 °F (-35 °C), the low ambient version must be used.

### 4.2 Placing the Unit



**CAUTION: Do not tilt the Unit more than 5 degrees to prevent compressor damage.**



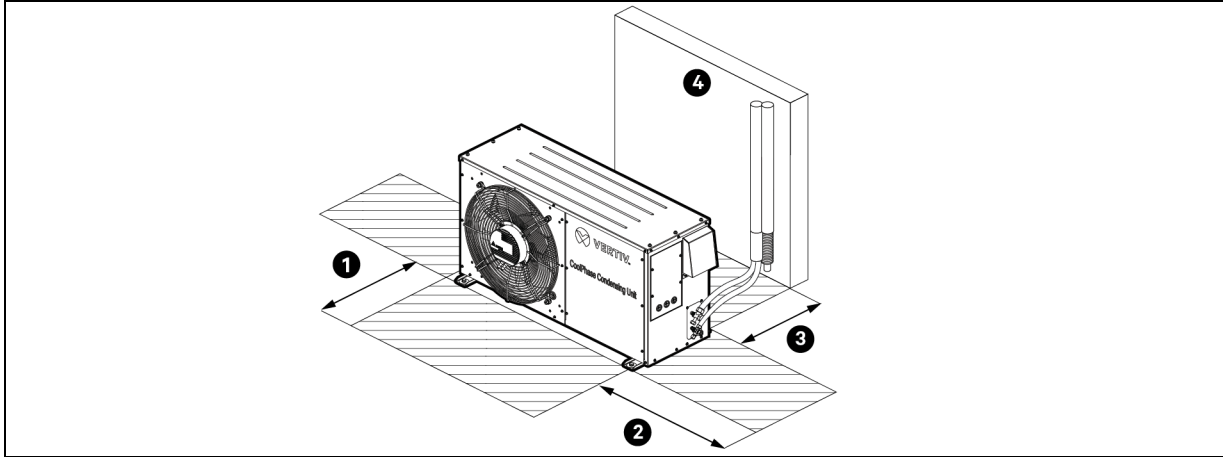
**CAUTION: To prevent Unit malfunction, power on the unit within 6 hours after all installations are completed, but don't turn it on yet.**

The Condensing Unit needs to be placed on a leveled horizontal surface; otherwise, place the unit on a flat and leveled base.

### 4.3 Clearance Requirements

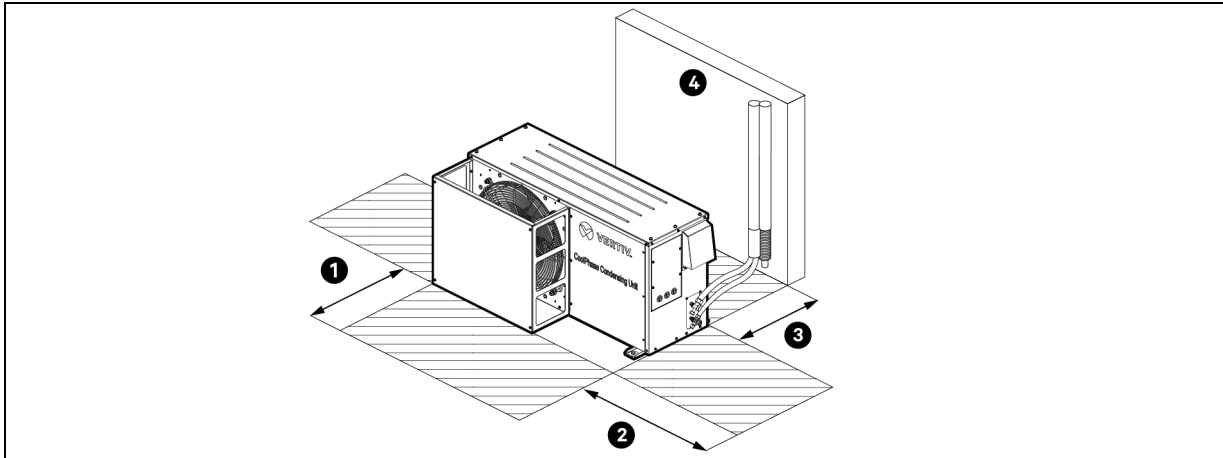
Proper airflow through the Condensing unit coil is critical for correct unit operation. When installing, consider service, inlet, outlet, and minimum allowable space requirements as illustrated in Figure 4.1 , Figure 4.2 , and Figure 4.3 .

**Figure 4.1 Condensing unit clearances**



Item	Description	Item	Description
1	23.6 in (600 mm) Minimum distance	3	11.8 in (300 mm) Minimum distance
2	23.6 in (600 mm) Minimum distance	4	Wall

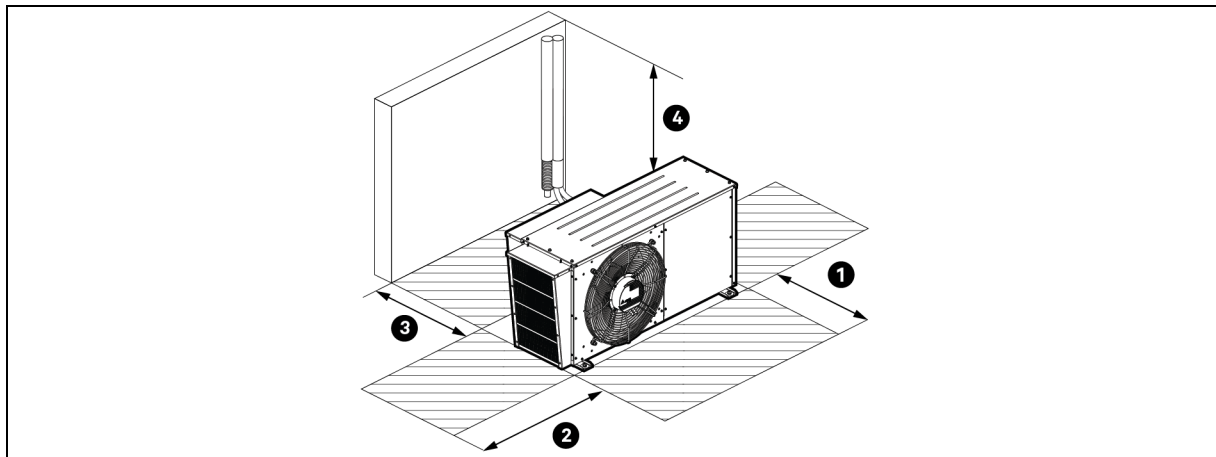
**Figure 4.2 Condensing unit clearances with Wind Baffle installed.**



Item	Description	Item	Description
1	23.6 in (600 mm) Minimum distance	3	11.8 in (300 mm) Maximum distance
2	23.6 in (600 mm) Minimum distance	4	Wall

**NOTE:** When installing the wind baffle, there must be a wall behind the unit, and the maximum clearance is 11.8 in (300 mm)

Figure 4.3 Condensing unit clearances with Hail Guard installed.



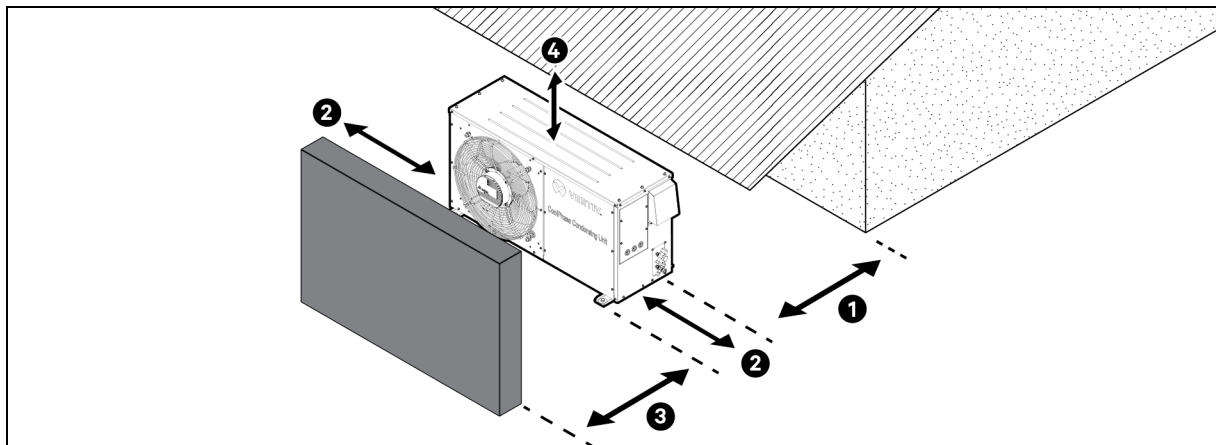
Item	Description	Item	Description
1	11.8 in (300 mm) Minimum distance	3	11.8 in (300 mm) Minimum distance
2	23.6 in (600 mm) Minimum distance	4	11.8 in (300 mm) Minimum distance

When placing the Condensing unit under an overhang, awning, sunroof, or other “roof-like” structure, observe the clearance requirements for height in relation to the unit. This clearance ensures that heat radiation from the condenser is not restricted around the unit. See Figure 4.4 and Figure 4.5 for recommendations for other obstacles.

If installing the unit on a roof, adhere to all clearance requirements. Level the unit and ensure that it is adequately anchored. Consult local codes for rooftop mounting requirements.

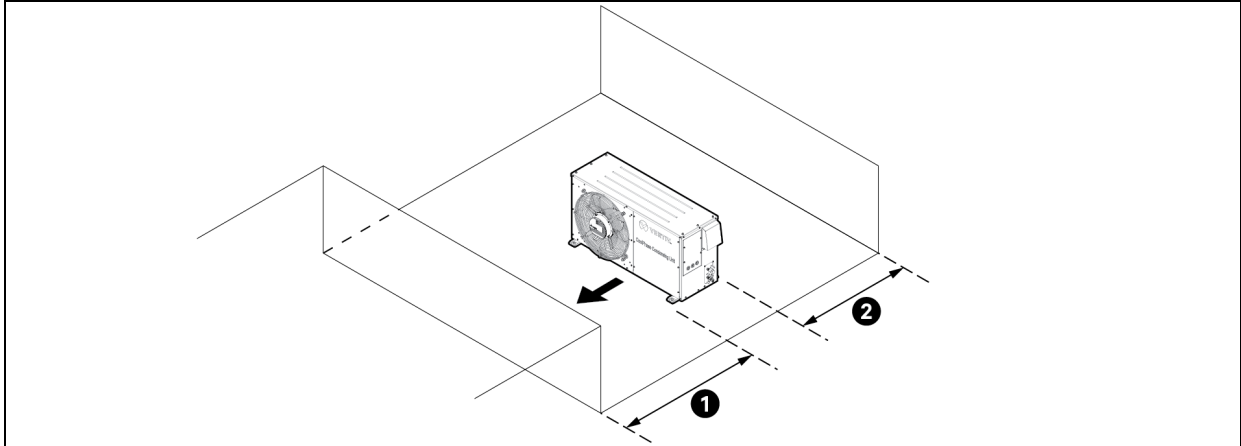
**NOTE: Do not place the unit where animals and/or plants will be on the warm air path or where the warm air and/or noise will disturb neighbors.**

Figure 4.4 Condensing Unit sunroof/awning clearances



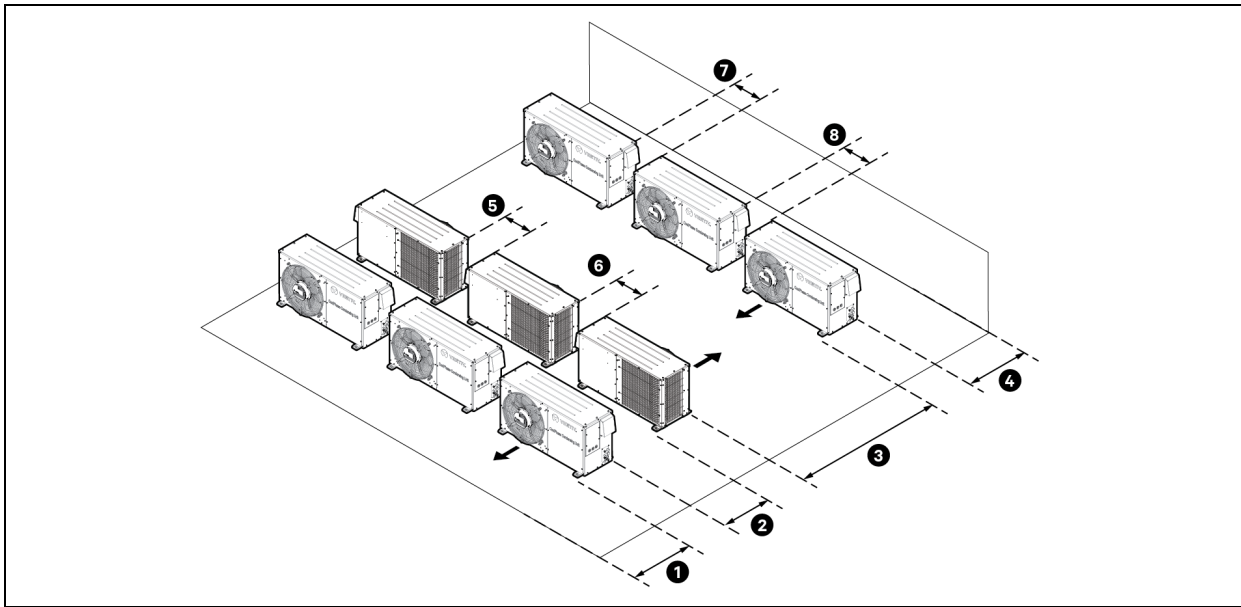
Item	Description	Item	Description
1	11.8 in (300 mm) Minimum distance	3	23.6 in (600 mm) Minimum distance
2	23.6 in (600 mm) Minimum distance	4	11.8 in (300 mm) Minimum distance

Figure 4.5 Clearances when there are obstacles on both air inlet and air outlet sides.



Item	Description
1	23.6 in (600 mm) Minimum distance
2	11.8 in (300 mm) Minimum distance

Figure 4.6 Clearances when several units are mounted side by side.



Item	Description	Item	Description
1	59 in (1500 mm) Minimum distance	5	11.8 in (300 mm) Minimum distance
2	23.6 in (600 mm) Minimum distance	6	11.8 in (300 mm) Minimum distance
3	118.1 in (3000 mm) Minimum distance	7	11.8 in (300 mm) Minimum distance
4	11.8 in (300 mm) Minimum distance	8	11.8 in (300 mm) Minimum distance

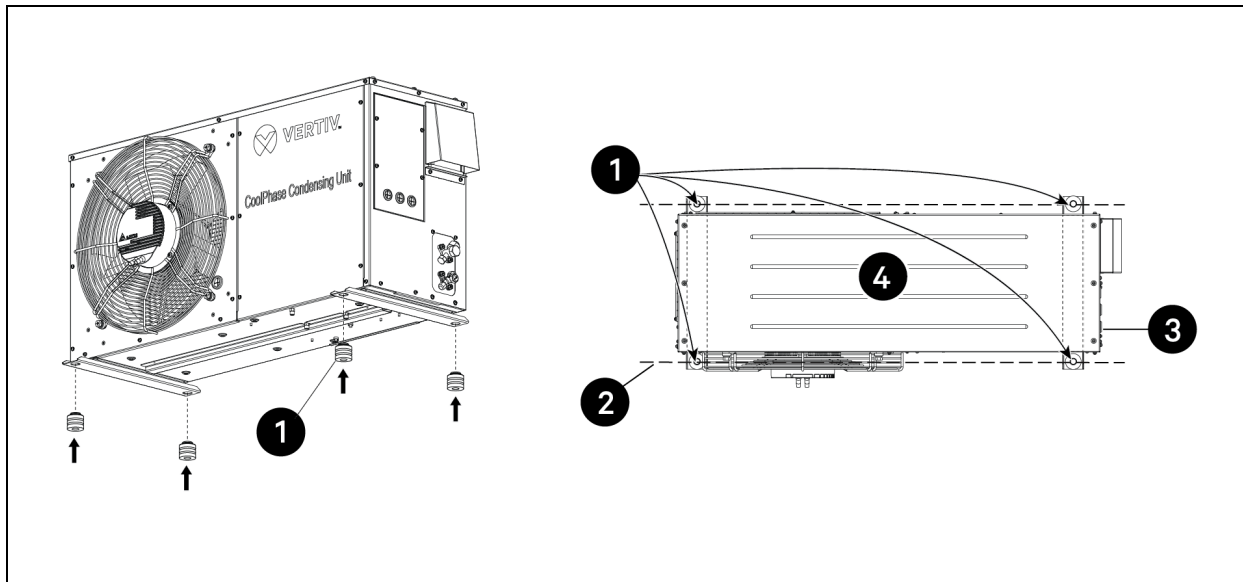
## 4.4 Roof Mounting the Condensing Unit

The Vertiv™ Coolphase Condensing Unit should be placed in a well-ventilated area over a flat, leveled surface, with enough room to install the connecting pipes and cables and access them for maintenance.

Before installation, place four field supplied vibration isolation pads on the unit's base, as indicated in Figure 4.7. Securely attach the Condensing Unit to the roof, a condenser pad, base rails, or another mounting platform securely anchored to the ground or building structure with M10 anchor bolts. See Figure 4.8 below.

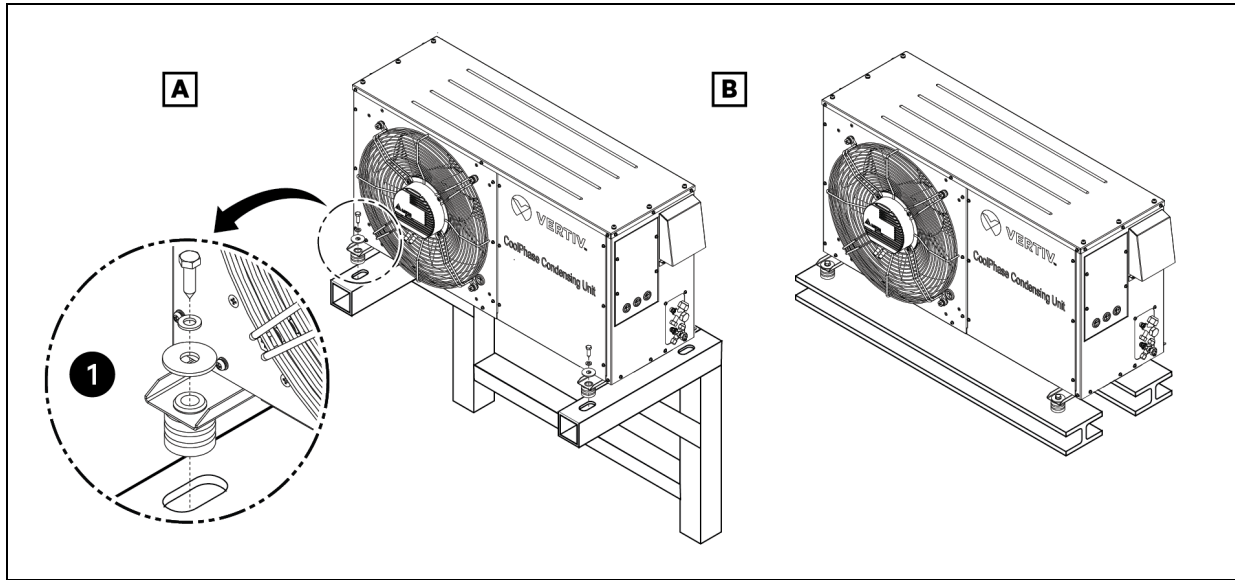
Follow local codes for clearance, mounting, anchoring, and vibration attenuation requirements.

**Figure 4.7 Condensing unit vibration isolation pads placement.**



Item	Description	Item	Description
1	Vibration isolation pad	3	Piping connection
2	Vibration isolation pads placement	4	Top of unit
2	Base reference		

Figure 4.8 Condensing unit mounting methods.



Item	Description	Item	Description
A	Platform mounting	B	Base rails mounting
1	Bolt placement		

#### 4.4.1 Mounting Platform Guidelines

The underlying structure or foundation must be able to support the unit's weight. Avoid placing the unit in a low-lying area where water may accumulate. When installing the Condensing Unit on the wall or rooftop, anchor the mounting base securely to account for wind, earthquake, or vibration.

#### 4.4.2 Tie-down and Wind-restraint Guidelines

The strength of the Condensing Unit frame is adequate for use with field-provided wind restraint tie-downs. A local, professional engineer must approve the overall tie-down configuration.

**NOTE:** Always refer to local code when designing a wind-restraint system.

#### 4.4.3 Considerations for Snow and Ice Conditions

In climates that experience snow build-up, place the unit on a raised platform to ensure condenser airflow. The raised support platform must be high enough for the unit to remain above possible snow drifts. Mount the unit on a field-provided snow stand at a minimum height equal to the average annual snowfall plus 20 in. (508 mm). Design the mount base to prevent snow accumulation on the platform in front or back of the unit case. Provide a field fabricated hood to avoid snow, ice, and/or drifting snow from accumulating on the coil surfaces if necessary. Use inlet and discharge ducts or hoods to prevent snow or rain from collecting on the fan inlet and outlet guards. The best practice is to prevent snow from accumulating on top of the unit. Consider the tie-down requirements in case of high winds or where required by local codes.

## 4.5 Plenum Mounting of the Unit



**WARNING!** Risk of ceiling collapse and heavy unit falling. It can cause building and equipment damage, serious injury, or death. Verify that the supporting roof structure can support the weight of the unit(s) and the accessories. See Dimensions and Weights in [section 2.5](#) for the unit weights. Securely anchor the top ends of the suspension rods and verify that all nuts are tight.



**WARNING!** When installing the unit within a plenum, the refrigerant charge shall not exceed 3.9 lbs (1.8 kg); if the system exceeds this charge, this condensing unit shall be located outdoors.

### 4.5.1 Location Considerations

Refer to section 8.2, Refrigerant and Lubricating Oil Charges, on the indoor unit User Manual for maximum refrigerant line lengths.

The ceilings and ceiling support of existing buildings may require reinforcement. Follow all applicable national and local codes.

If possible, install the ceiling mounting over an unobstructed floor space. This will allow easy access for routine maintenance or service. Do not attach additional devices (such as smoke detectors, etc.) to the housing, as they could interfere with the maintenance or service.

Do not install units in areas where a typical unit operating sound may disturb the working environment.

When installing an air-cooled or water-cooled unit inside a space, ensure that national and local codes are met for refrigerant concentration limits that might vary with building type and use.

### 4.5.2 Installing Suspension Rods and Ceiling Mounting

**NOTE:** The Low ambient version of the Condensing Unit cannot be installed in plenum areas, only the standard version is plenum rated.

**NOTE:** To lift the unit closer to its final location, use the lifting brackets contained in the package (see section 3.4 [Removing Unit from the Pallet](#) on page 39 for further indications).

**NOTE:** Follow all national and local building, electrical, and plumbing codes.

**NOTE:** The unit must be leveled to work correctly.

**NOTE:** The duct kit is needed when the unit is adapted to a Plenum Mounting. Before mounting the unit to the ceiling, it must be attached for proper component access and installation. Please refer to the Duct Kit Quick Installation Guide for more installation details.

**NOTE:** Four 3/8-inch 16 TPI threaded suspension rods are required and field supplied.

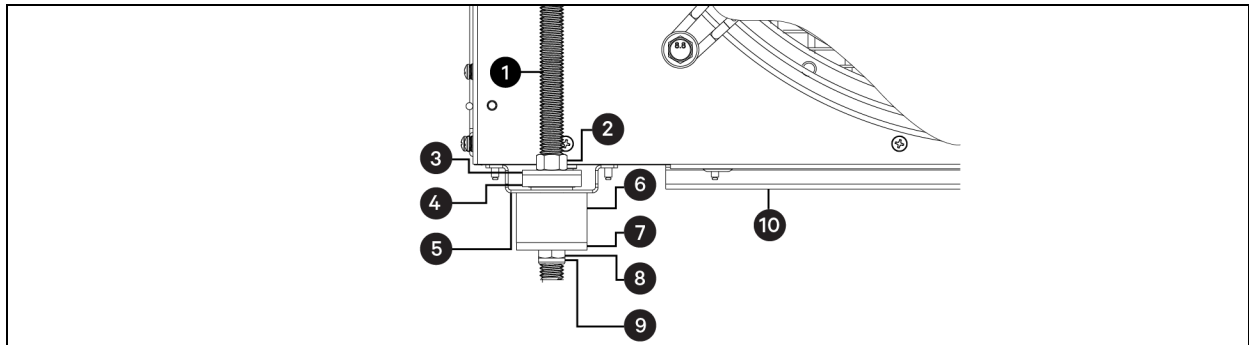
**To install the suspension rods:**

1. Install the four field-supplied 3/8-inch 16 TPI threaded rods by suspending them from suitable building structural members so that they will align with the four mounting locations on the unit base (see Figure 4.10 )
2. Securely anchor the top ends of the suspension rods with field-supplied nuts.
3. Make sure all nuts are tight and locked.

**To lift and install the unit on the rods:**

1. Referring to Figure 4.9 below, place the hex nuts (Item 2) on the threaded rods and add the washer, sleeve, and isolator (Items 3, 4, and 6) to the bracket holes on the unit.
2. Using the lifting brackets included in the package (refer to section 3.3, [Removing Unit from the Pallet](#) on page 39 ), raise the unit and pass the threaded rods through the four mounting locations in the unit base.
3. Attach the threaded rods to the flanges using the washer and plain nut (Items 7 and 8) to hold the unit in place, as shown in Figure 4.10 .
4. Adjust the plain nuts to distribute the unit's weight evenly by the rods, ensuring that the unit does not rest on the ceiling grid and is level.
5. Use the Nylock nuts to "jam" the plain nuts into place.

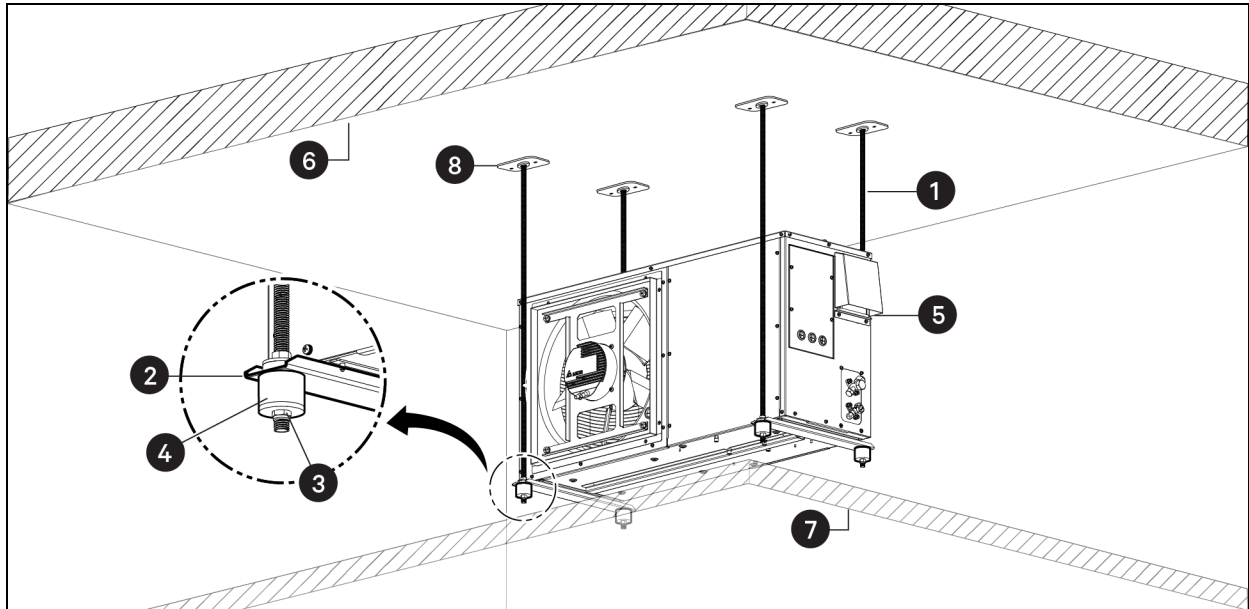
**Figure 4.9 Installing threaded rods and hardware of ceiling-mounted Condensing units.**



Item	Description	Item	Description
1	3/8-in. threaded rod, field supplied	6	Field provided Isolator
2	3/8-in. hex nut	7	3/8-in. fender washer
3	3/8-in. washer	8	3/8-in. hex nut
4	Sleeve	9	3/8-in. Nylock locking nut
5	Bracket on unit	10	Unit base pan (reference)



Figure 4.10 Plenum-Installed Unit.



Item	Description	Item	Description
1	Threaded rods	5	Condensing Unit
2	Unit base bracket	6	Roof
3	Nylock locking nut	7	Ceiling
4	Suspension rod grommet	8	Supports

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## 5 Piping Connections

Prior to starting with the piping connection, please read the [Important Safety Instructions section](#) of this Manual.

### 5.1 General Connections



**WARNING! Do not allow the refrigerant to leak during brazing. If the refrigerant is combusted, it generates a toxic gas that can cause physical injury or death. Do not braze in an enclosed location, and always test for gas leaks before/after brazing. After brazing, check for refrigerant gas leaks.**



**WARNING! Do not allow the refrigerant to leak during brazing. The threat of suffocation exists due to air displacement from refrigerant gas being heavier than air, especially in small, confined spaces.**



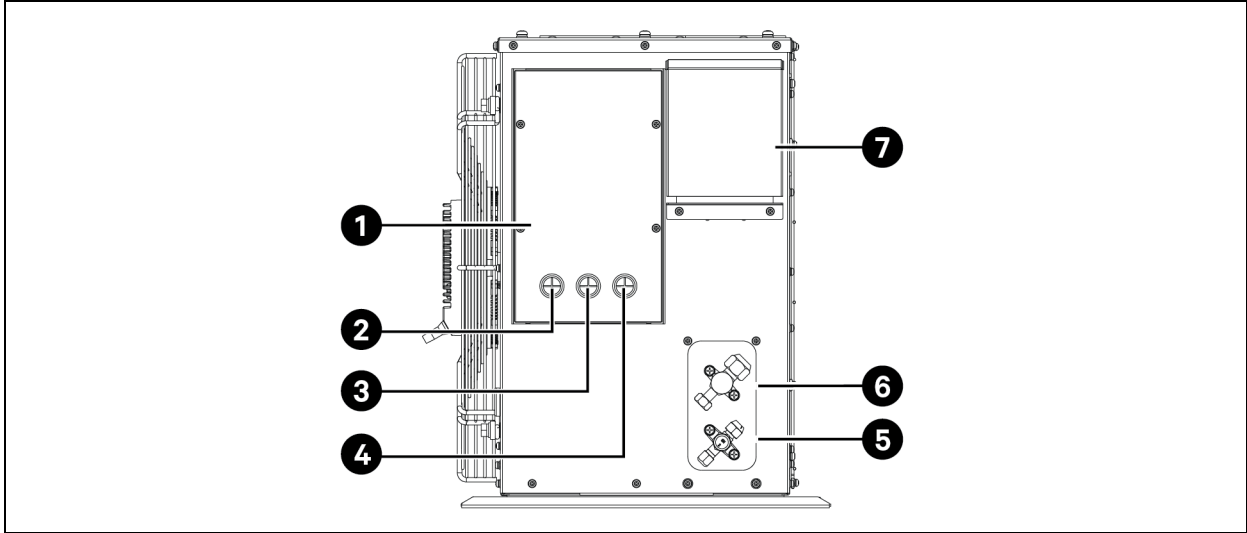
**WARNING! Competent persons shall only carry out every working procedure that affects safety means.**

Pipework, including piping material, pipe routing, and installation, shall be in compliance with national gas regulations and local codes and standards, such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.

The following indications must be considered:

- Do not use kinked pipe caused by excessive bending in one specific area on its length.
- Pipe-work shall not be installed in unventilated areas.
- Mechanical connections shall be accessible for maintenance purposes.

Figure 5.1 Location of Pipe and Cable Outlets



Item	Description	Item	Description
1	Electrical Box Panel	5	Liquid Line Valve
2	Communications Cable Input	6	Suction Line Valve
3	Condensing Unit Power Supply Input	7	VFD Box Air Filter Cover
4	Indoor Unit Power Supply Output		

## 5.2 Connection of Condensing Unit to Indoor Unit

### 5.2.1 Connection Limitations

These systems always consist of one outdoor/condensing unit and one indoor/evaporator unit. One of their most critical elements is the refrigerant piping. For the maximum length and elevation of the piping reference, see Figure 5.2 and Figure 5.3

**NOTE:** For more installation requirements and connection limitations between indoor units and condensing units, refer to the corresponding indoor unit manual.

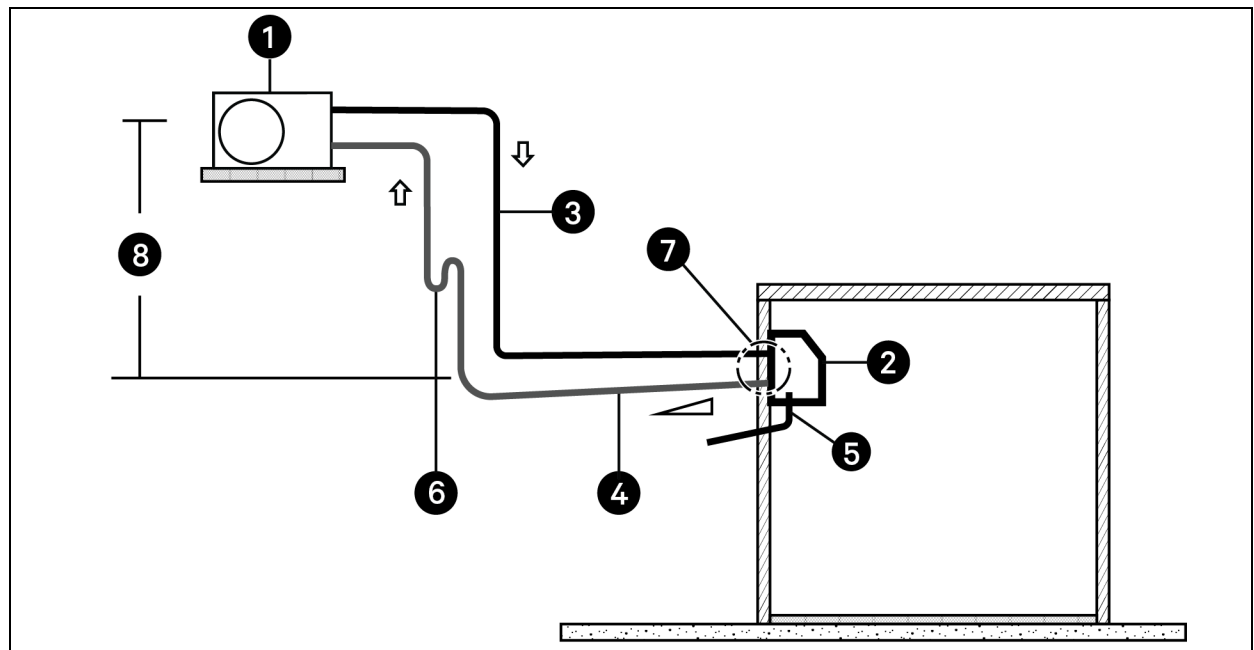
Table 5.1 Refrigerant-piping limitations

Specifications	Limitations	Distance
Pipe Length, ft (m)	Max Equivalent Length of Pipe	196.85 (60)
Height between indoor unit and condensing unit, ft (m)	The condensing unit is placed higher than the indoor unit.	Maximum: 98.4 (30)
	The condensing unit is placed lower than the indoor unit.	Maximum: -26.2 (-8)

**Table 5.2 Equivalent Length for Bends and Valves**

Liquid pipe outer diameter in (mm)	Equivalent length ft (m)			
	90° bend	45° bend	180° U bend	90° shut off valve
1/4 (6.35)	1.28 (0.39)	0.66 (0.20)	1.94 (0.59)	4.92 (0.15)
3/8 (9.52)	1.44 (0.44)	0.72 (0.22)	2.13 (0.65)	5.91 (1.80)
1/2 (12.7)	1.64 (0.50)	0.82 (0.25)	2.46(0.75)	6.90 (2.10)
5/8 (16)	1.80 (0.55)	0.88 (0.27)	2.79 (0.85)	7.87 (2.40)

**Figure 5.2 Condensing Unit Placed Higher than the Indoor Unit.**

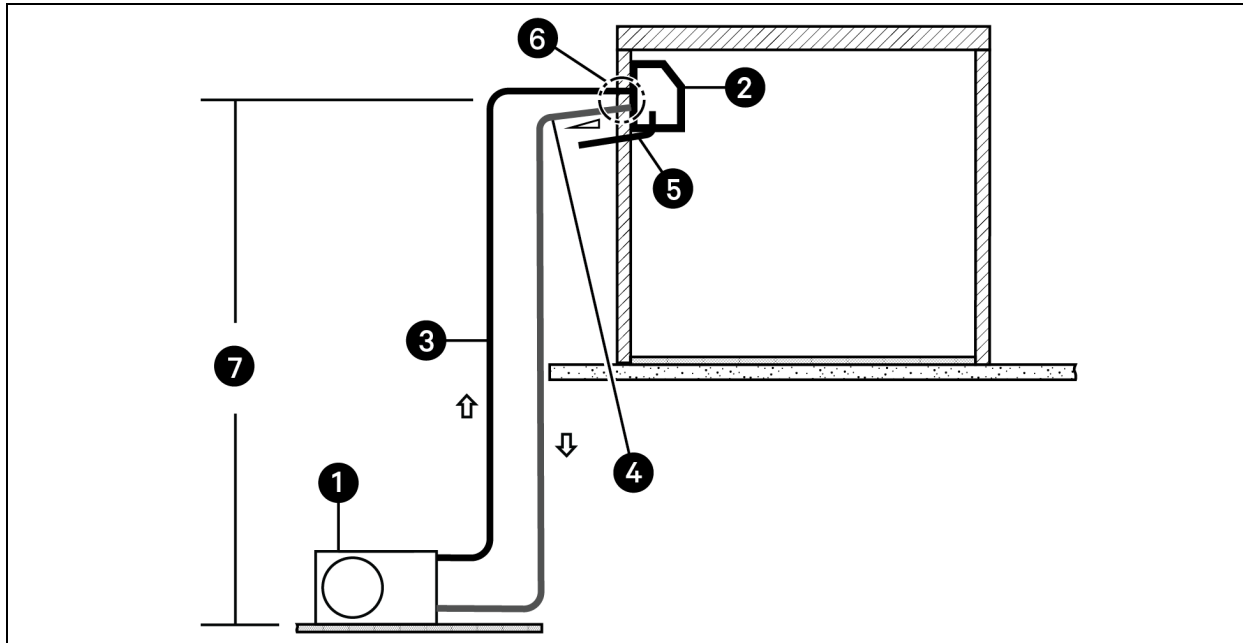


Item	Description	Item	Description
1	Condensing Unit	5	Condensate pipe
2	Indoor Unit	6	Oil trap (*)
3	Liquid line (high pressure)	7	The gap between the pipe and the wall needs to be sealed
4	Suction line (low pressure)	8	Max 98.4 ft (30 m) distance

**NOTE:** Suction line in the figure above is represented with a 1% lower gradient, whose arrow direction is pointing upwards.

**NOTE:** Install an oil trap every 7.5 m (24.6 ft) of the vertical suction/gas pipe.

Figure 5.3 Condensing Unit is lower than Indoor Unit.



Item	Description	Item	Description
1	Condensing Unit	5	Condensate pipe
2	Indoor Unit	6	The gap between the pipe and the wall needs to be sealed
3	Liquid line	7	Max 26.2 ft (8 m) distance
4	Suction line		

**NOTE:** Suction line in the figure above is represented with a 1% lower gradient, whose arrow direction is pointing downwards.

Refer to the following tables to see the required distances for the pipe-length limits that must be followed under different Indoor units and their compatible outdoor unit models.

Table 5.3 Connection size

Condensing Unit	Item	Pipe Size In (mm)	Coupling Size	Torque Value lb-ft
CUD03	Liquid pipe	1/4" (6.35 mm)	7/16"-20UNF	13.9 - 18
CUL03	Suction pipe	1/2" (12.7 mm)	3/4"-16UNF	39.7-47.7
CUD07	Liquid pipe	3/8" (9.52 mm)	5/8"-18UNF	24.5-30.3
CUL07	Suction pipe	1/2" (12.7 mm)	3/4"-16UNF	39.7-47.7
CUD111	Liquid pipe	3/8" (9.52 mm)	5/8"-18UNF	24.5-30.3
CUL111	Liquid pipe	3/8" (9.52 mm)	5/8"-18UNF	24.5-30.3
CUD115	Suction pipe	5/8" (16 mm)	7/8"-14UNF	45.5-59.2
CUL115	Suction pipe	5/8" (16 mm)	7/8"-14UNF	45.5-59.2

## 5.2.2 Pipe connection

**NOTE: The unit is equipped with nitrogen, the pressure of which is 29.01 psi (200 kPa).**

To connect the piping to the Condenser, please follow the indications below:

1. Remove the service valve caps.
2. Align the center of the refrigerant pipe and the corresponding connection, as shown in Figure 5.4 below.
3. Refer to figure 5.1 on [General Connections](#) on page 51 for the correct liquid and gas pipe attachment to the Condensing unit.
4. Before assembling, place a couple of drops of refrigerant oil on the flare's opening rim to prevent contaminants from entering, and tighten the flare nut by hand.
5. Following the torque guidelines in Table 5.3, finish tightening the flare nut with a torque wrench until the wrench clicks; refer to Figure 5.5 below for correct connection points.
6. Use as short refrigeration pipelines as possible to minimize the refrigerant's total charge and pressure drops.
7. Reduce the amount of bends to a minimum. The bend must have a large radius, at least equal to the pipe diameter.
8. Insulate all piping to avoid heat loss from piping or scalding of cables.
9. Install an oil trap every 24.6 ft (7.5m) of the vertical suction/gas line.
10. If brazing is required, use a brazing alloy at a minimum temperature of 1350°F (732°C) such as Sil-Fos. Avoid soft solders, such as 50/50 or 95/5, or stay Brite.

**NOTE: Consult Vertiv™ Technical Support if the piping run exceeds the equivalent length of 196.8 ft (60 m).**

**NOTE: Nitrogen gas must be used during brazing to prevent interior piping oxidation, fouling of the refrigerant system, and plugging the system filter dryer.**

**NOTE: When tightening the flare nut with a torque wrench, ensure the direction for tightening follows the arrow on the wrench.**

**Figure 5.4** Align the center of the piping connection.

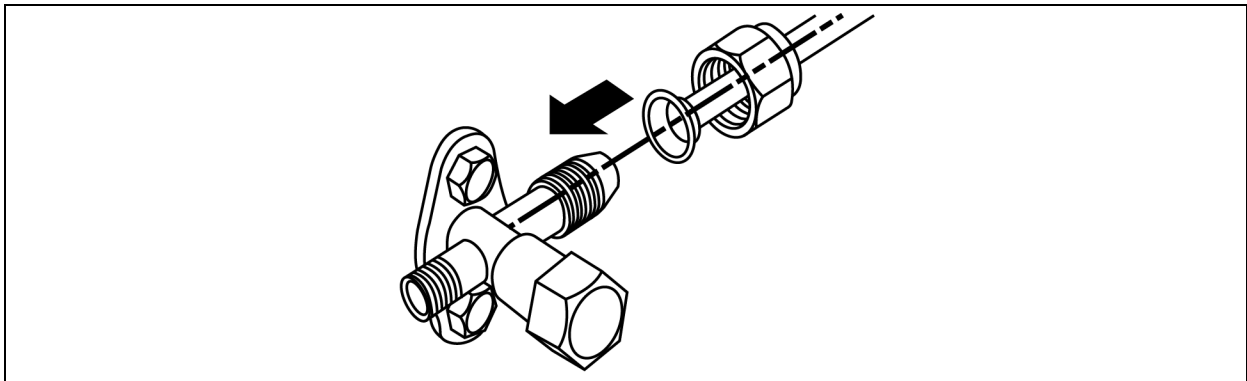
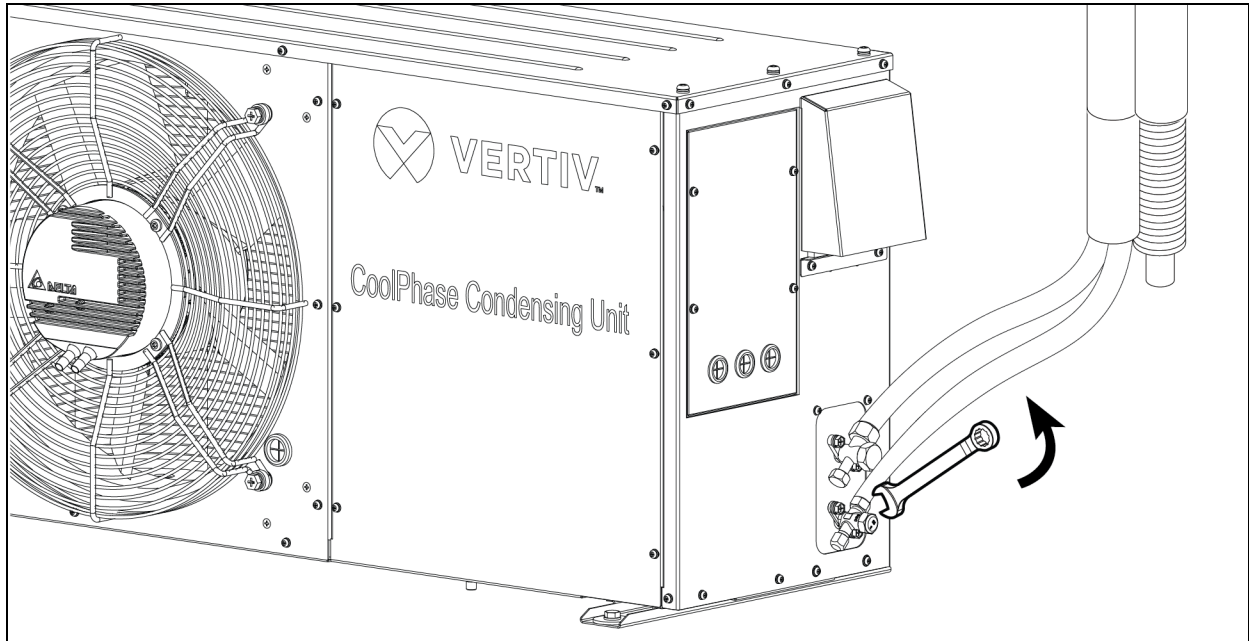


Figure 5.5 Correct piping attachment for Condensing Unit.

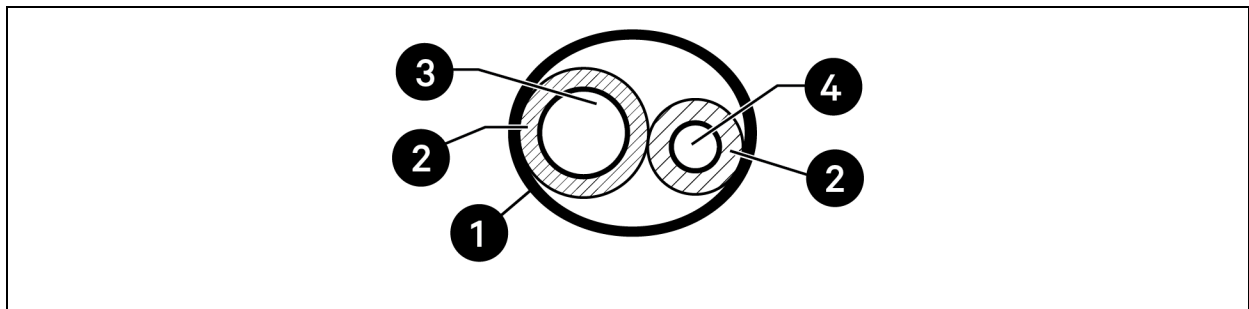


### 5.2.3 Piping insulation

To prevent heat loss/gain through the refrigerant piping, all refrigerant piping must be insulated separately, including liquid and suction lines. Insulation must be a minimum of 1/2 in. thick, and the thickness may need to be increased based on ambient conditions and local codes.

**NOTE:** Do not insulate gas and liquid pipes together, as this can result in pipe leakage and malfunction due to extreme temperature fluctuations. Be sure to insulate the piping connections fully.

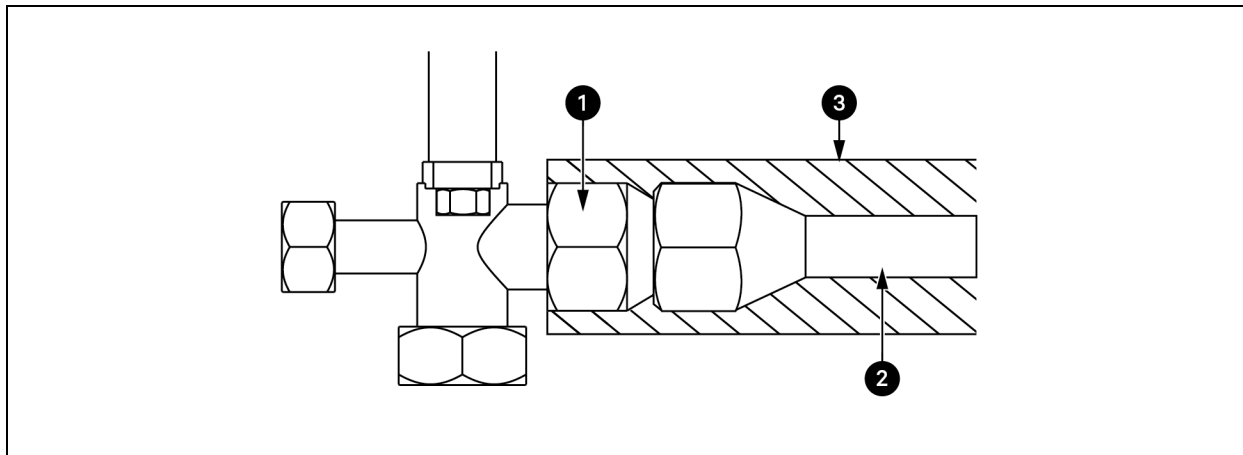
Figure 5.6 Typical pipe-insulation arrangement



Item	Description	Item	Description
1	Pipe sleeve	3	Suction Line
2	Insulation material	4	Liquid Line

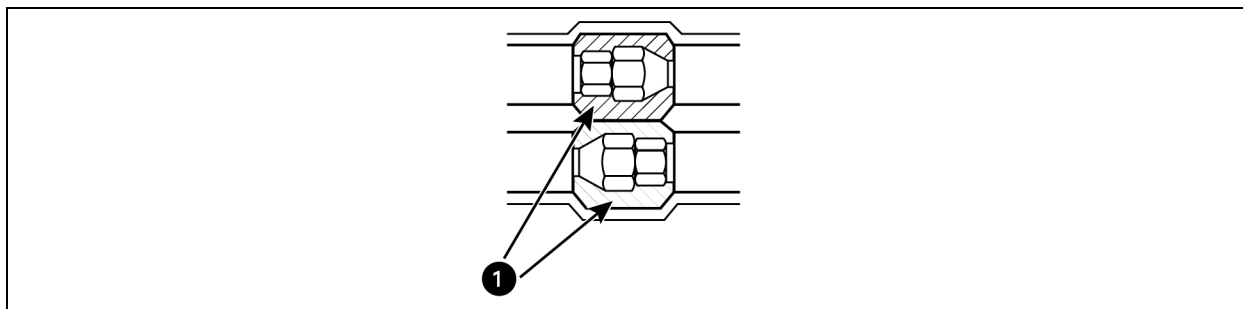


Figure 5.7 Typical butt-joint insulation at outdoor unit.



Item	Description	Item	Description
1	Valve	3	Field-supplied pipe insulation
2	Field-supplied pipe		

Figure 5.8 Typical refrigerant flare-fitting insulation



Item	Description
1	Field-supplied insulation

### 5.2.4 Piping leak test

Perform the leak test by pressurizing nitrogen gas to 145 psi (1000 kPa) on both the liquid and gas pipes. Test with the piping service valves open. The system passes the test if the pressure remains stable for 24 hours. If the pressure drops, there is a nitrogen leak in the system. Find the leak, repair it, and test again.

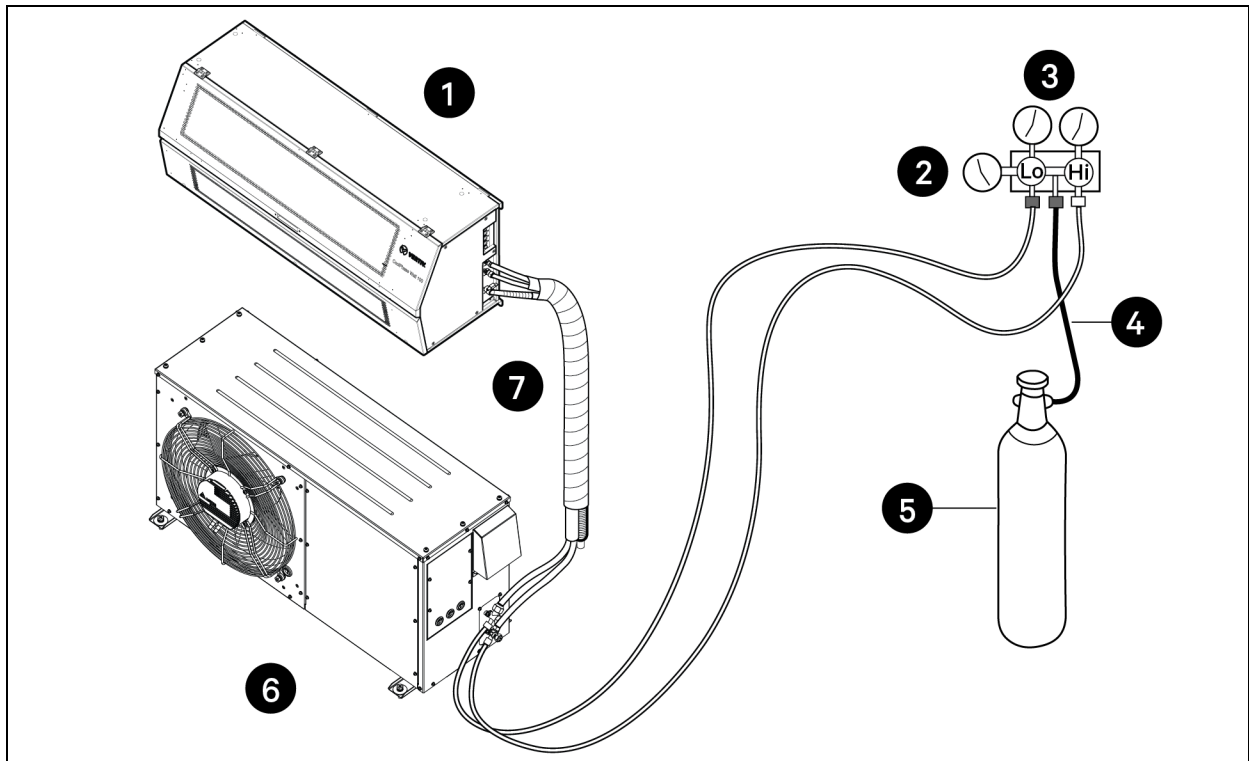
**NOTE:** When you pressurize the refrigerant system, the top of the cylinder must be higher than its bottom to prevent nitrogen from entering a liquid state. Also, be sure the cylinder is used in a vertical standing position. 1. Connect the manifold valve (which includes the pressure gauges) and the dry-nitrogen gas cylinder to the service valves using a charge hose. 2. Pressurize the system to a maximum of 145 psi (1000 kPa) with dry-nitrogen gas and close the cylinder valve when the gauge reaches 145 psi (1000 kPa).

#### Charge the dry-nitrogen gas and leaking test

1. Remove the caps from the suction valve and liquid valve.
2. Open the 2-way valve by turning the valve stem counterclockwise approximately 90 degrees.

3. Open the manifold valve and charge the dry-nitrogen gas.
4. While running nitrogen pressure, apply soapy water or liquid, neutral detergent on the indoor or Condensing Unit connections using a soft brush, and observe the connections for any leaks. Bubbles at connection points or joints indicate a leak.
5. Note any leaks along the liquid and suction lines.
6. Disengage the nitrogen pressure by loosening the charge hose at the cylinder, as shown in Figure 5.9.
7. When pressure returns to normal, disconnect the charge hose from the cylinder.
8. Repair all connections and piping where leaks were observed.
9. When repairs are complete, repeat the leak test using nitrogen pressure and check for further leaks.
10. Once the piping system is leak-free, proceed to Evacuation below.

**Figure 5.9 Leak test diagram**



Item	Description	Item	Description
1	Indoor unit	5	Nitrogen-gas tank (upright position)
2	Pressure gauge	6	Condensing Unit
3	Manifold valve	7	Piping bundle
4	Charge hose		

## 5.2.5 Evacuation

Evacuation is performed after all piping is connected between the indoor and the Condensing Unit. This step is necessary to ensure that no air or moisture is left in the piping. Going through a complete air-purging cycle ensures the lines are cleared out. Note that you may have to repeat this process if any air or moisture is found to remain in the piping. After air purging and evacuating the lines, do a leak test for all piping and tubing. Once the unit is evacuated and the system holds the negative pressure, the vacuum can be broken with refrigerant. The amount of refrigerant used to break the vacuum and charge the system needs to be weighed and compared to the recommended charge for the unit, based on its size, interconnecting line sizes, and line length.

Insufficient or incorrectly performed air purging may lead to the following:

- Pressure in the system can rise.
- Operating current can rise.
- Cooling or heating efficiency falls.
- Moisture in the refrigerant circuit may freeze and block capillary tubing.
- Water can lead to corrosion of parts in the system.

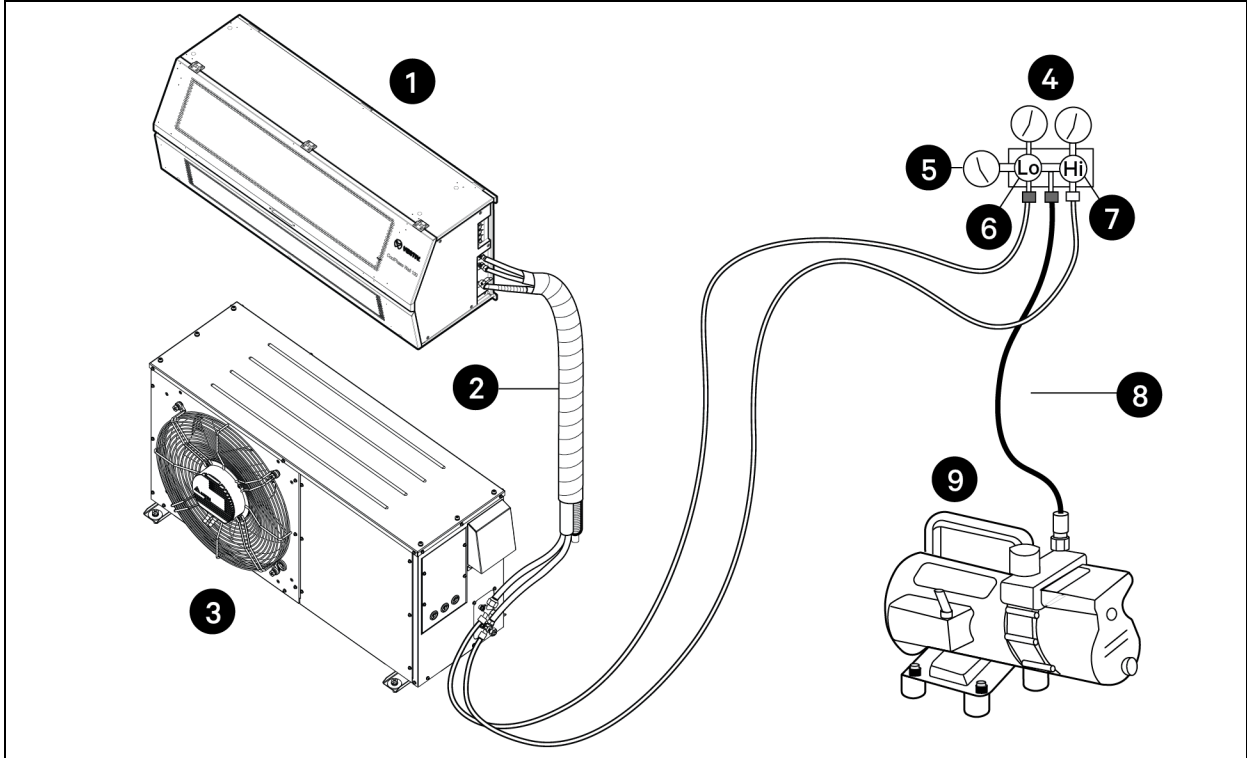
### Evacuating the System

1. Connect the manifold with the service valve and the vacuum pump. Please refer to Figure 5.10 .
2. Confirm that the “Lo” knob of the manifold valve is open.
3. Confirm that the “Hi” knob of the manifold valve is open.
4. Confirm that the suction valve and liquid valve are open.
5. Run the vacuum pump until the system is evacuated down to 40 Pa (300 microns) and continue running the pump for 15 minutes.
6. When the appropriate time has elapsed, turn off the pump and leave the connections secured on the service valves for 5 minutes.
7. If the system fails to hold 65 Pa (500 microns) or more, check all connections for a tight fit and repeat the evacuation steps.
8. When the correct vacuum is reached, close the “Lo” and “Hi” knob of the manifold valve and stop the vacuum pump.

**NOTE: The duration of running the vacuum pump will vary according to pipe length and pump capacity.**

**NOTE: The gauge set and vacuum pump must be compatible with R32.**

Figure 5.10 Evacuation Diagram.



Item	Description	Item	Description
1	Indoor unit	6	Low side
2	Piping bundle	7	High side
3	Condensing unit	8	Charge hose
4	Manifold valve	9	Vacuum pump
5	Pressure gauge		

## 6 Electrical Connections



**WARNING!** Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off, and wear appropriate, approved personal protective equipment (PPE) before working within the electric control enclosure. Failure to comply can cause severe injury or death. The customer must provide earth ground to the unit, per local codes. Before proceeding with installation, read all instructions, verify that all the parts are included, and check the nameplate to be sure the voltage matches the available utility power. The iCOM™ Edge controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components require and receive power even during the “Unit Off” mode of the controller. The only way to ensure NO voltage inside the unit is to install and open a remote disconnect switch. Refer to the unit electrical schematic. Follow all local codes.

### NOTICE

Risk of electrical phase reversal. It can cause equipment damage, unit malfunction, and loss of cooling operation.

If reversed phase, phase loss, momentary blackout, or power going on and off while the system operates is possible, install a field-supplied phase-loss protection circuit.

Do not connect the ground cable to the refrigerant, gas, water piping, lightning rods, telephone ground wiring, or building plumbing system.

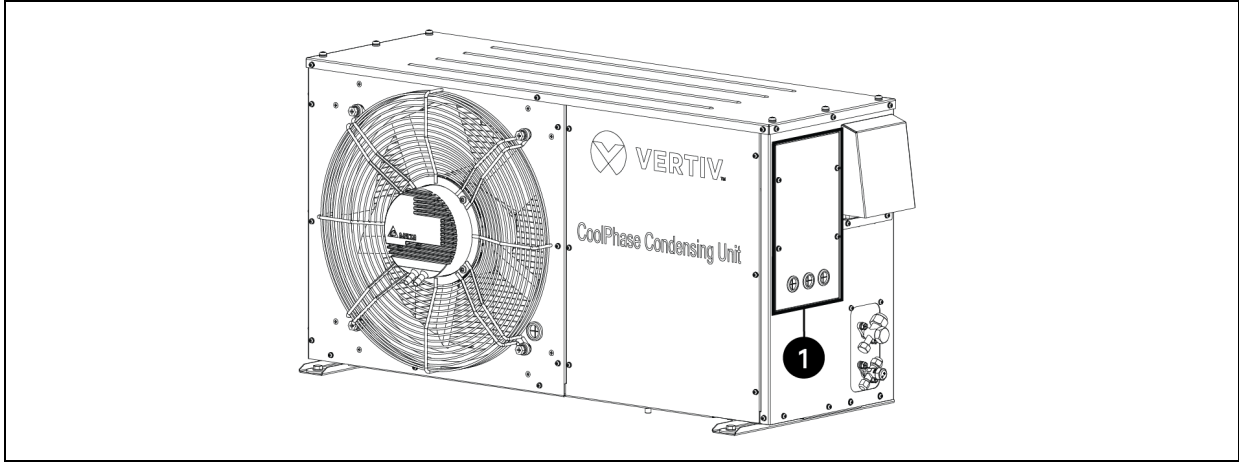
To protect the operator from the hazards noted, immediately after working on the unit, replace and securely fasten all control boxes and panel covers.

**NOTE:** Consider ambient conditions (temperature, direct sunlight, inclement weather, etc.) when selecting, installing, and connecting the power wiring.

## 6.1 Connecting Power Supply Cable

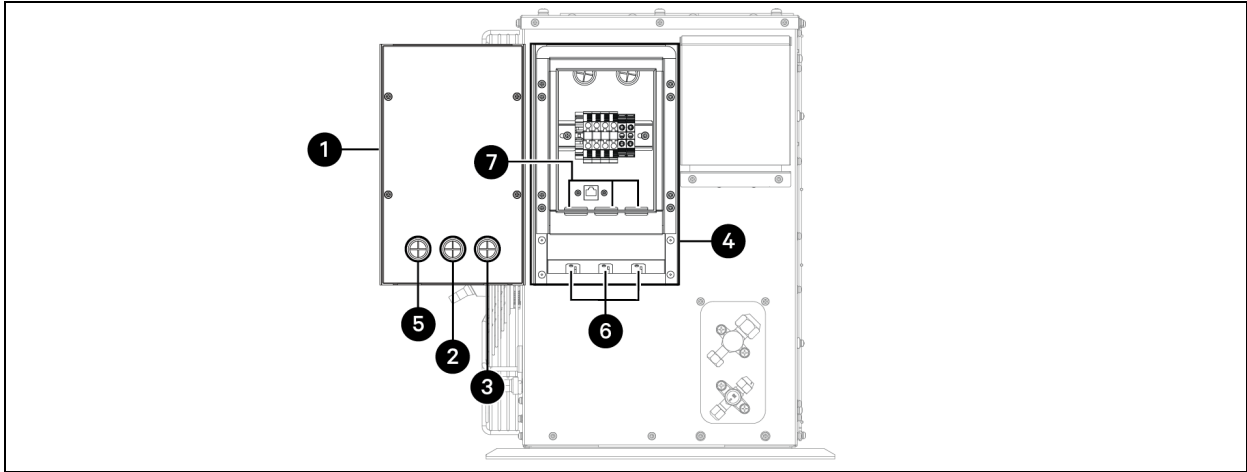
The power supply depends on the unit; refer to Table 2.9 in the [Electrical Data section](#) to see the power supply voltage for each model. The size of the power cable must support the full load current. Do not fit the supply cable in the raceways inside the electrical panel. Use multipolar cables with sheath (CEI20-22) only.

**Figure 6.1 Location of the Electrical Connections Panel in Condensing Units**



Item	Description
1	Electrical Box Panel

**Figure 6.2 The Electrical Box Structure**



Item	Description	Item	Description
1	Electrical Box Panel	2	Condensing Unit Power Supply Cable inlet
3	Indoor Unit Power Supply Cable Outlet	4	Electrical Box (E-Box)
5	Communication Cable inlet	6	Wire Saddle
7	Cable Hose		

**NOTE:** Item number 3 will only be used when the Indoor Unit is powered from the Condensing Unit.

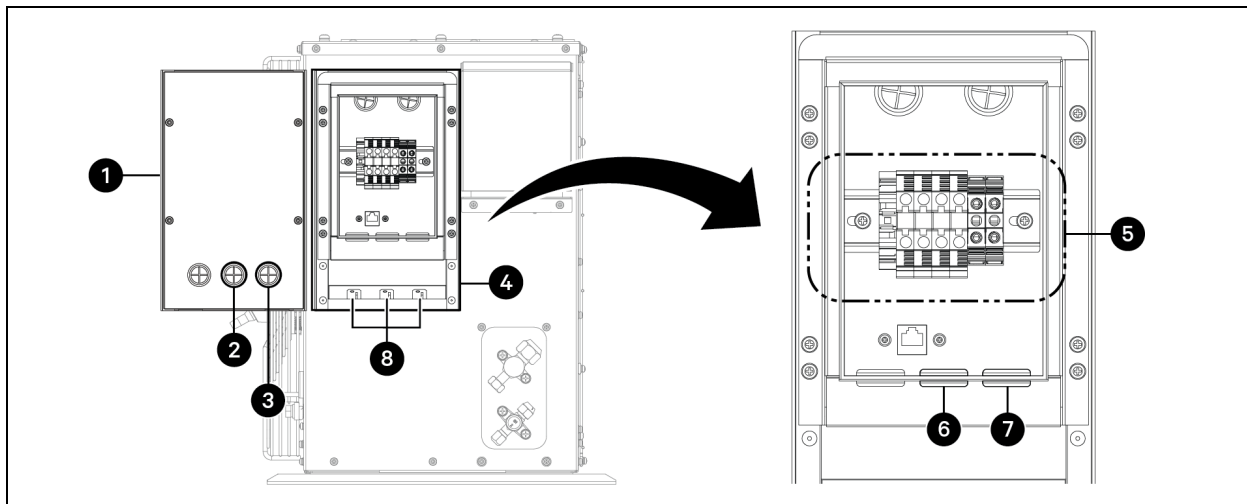
**NOTE:** Before connecting the Condensing Unit power cable, indoor unit power cable, and communication cable, please insert all cables into the cable inlet of the E-box panel in advance. Then, insert all of them into the cable clamp. Fix them with a wire tie at the cable clamp of the E-box, as shown in Figure 6.2 . Lastly, insert all the cables into the cable hose of the E-box.

## 6.2 Power Supply Connection

To connect the power supply cables:

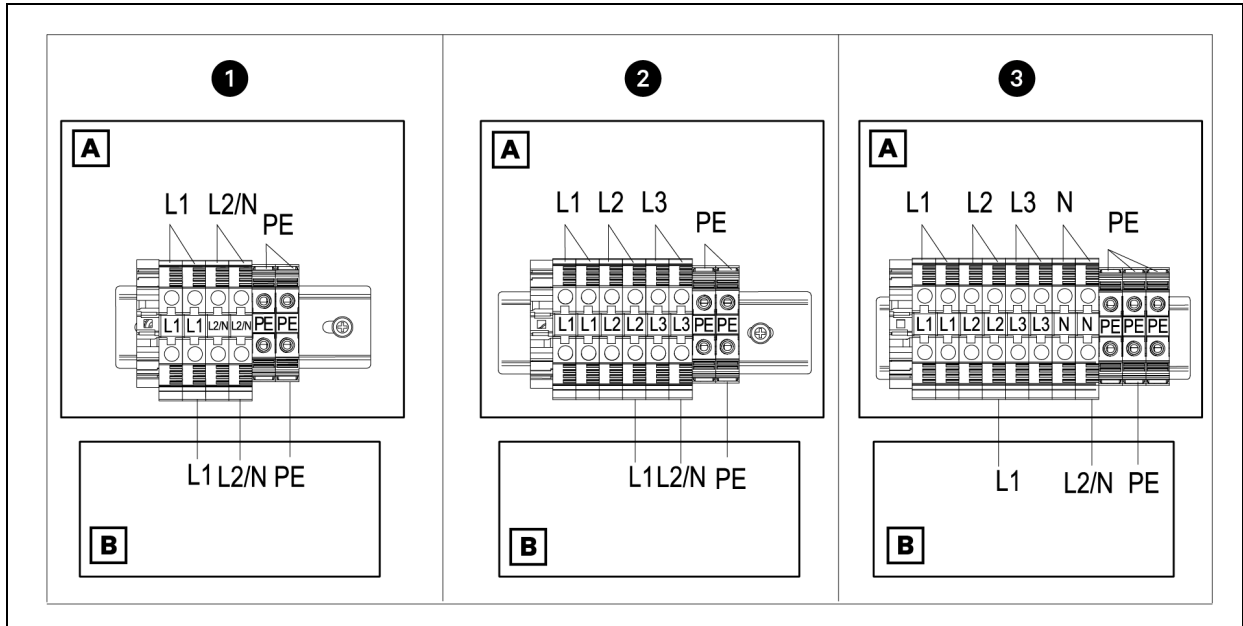
1. Viewing the unit from the right side, the electrical connection panel is located on the left upper corner.
2. Remove the cover plate from the electrical box panel by removing four M4X12 Phillips-head screws.
3. Open the terminal block's cover to reveal the screws for the connection. Route the power supply cables into the unit through the grommet on the E-box bottom.
4. Connect the Power cables as follows, please refer to Figure 6.4 for more details:
  - Connect the power cables to the L1, L2, and PE terminal blocks of the single-phase 3.5 kW and 7 kW Condensing units.
  - Connect the power cables to the L1, L2, L3, and PE terminal blocks of the 3 phase CUD111, CUL111 condensing units.
  - Connect the power cables to the L1, L2, L3, N, and PE terminal blocks of the 3 phase CUD115, CUL115 condensing units.
5. Insert the wire lug into the wiring terminal. Fix the cable with a wire tie at the cable clamp, as shown in Figure 6.3.

**Figure 6.3 Structure of the power supply connection of the E-Box**



Item	Description	Item	Description
1	Electrical Box Panel	5	Terminal Blocks
2	Condensing Unit Power Supply Input	6	Condensing Unit Power Supply grommet
3	Evaporator Unit Power Supply Outlet	7	Indoor Unit Power Supply Grommet
4	Electrical box (E-Box)	8	Wire Saddle

Figure 6.4 Power supply connection for Condensing Unit models.



Item	Description	Item	Description
A	Condensing Unit	2	Models: CUD111, CUL111
B	Power Supply	3	Models: CUD115, CUL115
1	Models: CUD030, CUL030, CUD070, CUL070		



## 6.3 Connecting Communications Cable

The unit does not include a communications cable. To connect it, connect one side of the communication wire to the COMM terminal of the indoor unit and the other side to the communication terminal in the E-box of the condensing unit. The Vertiv™ Liebert® iCOM™ Edge Controller controls the operation of the condenser fan and compressor through the communications cable.

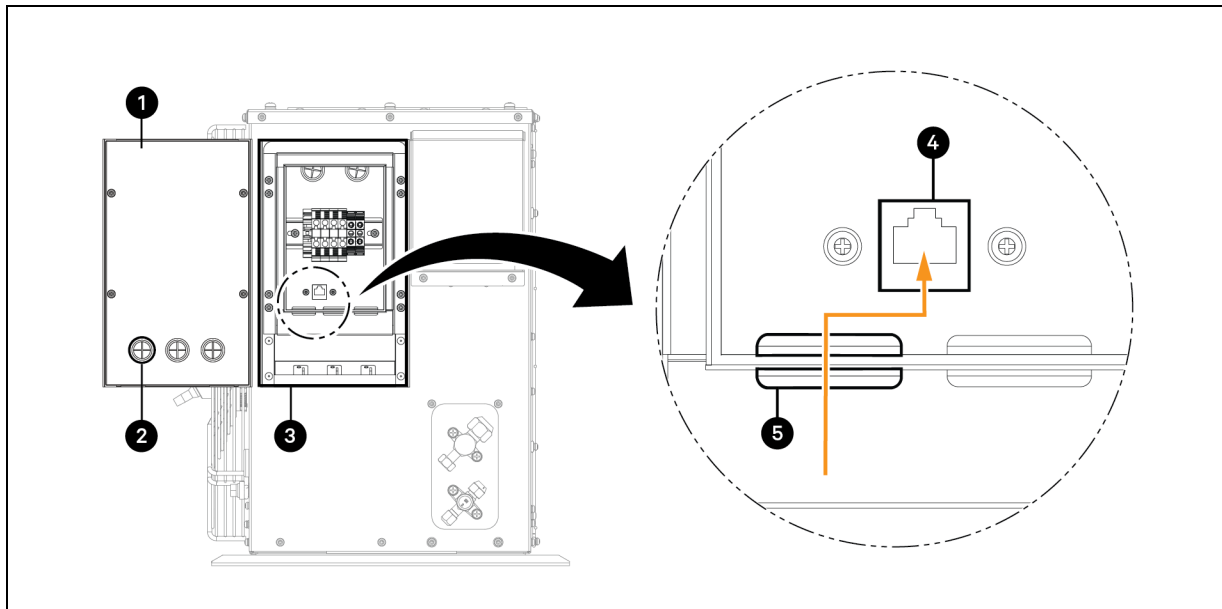
Detach the M4X12 Phillips-head screws of the electrical control box cover and remove the cover. Connect one cable to the COMM port in the electrical box. The communications terminal of the unit is shown in Figure 6.5.

**NOTE: The communication cable used must have shielding. The communication line should have a shielded grounding wire connected to the PE terminal.**

**NOTE: The cable should be 24 AWG, and the length should be shorter than 295.27 ft (90 m).**

**NOTE: Use standard Ethernet (K5E) as communication cables.**

Figure 6.5 Communications Port location.



Item	Description	Item	Description
1	Electrical Box Panel	4	COMM Port
2	Communications Cable Input	5	Communications Cable Grommet
3	Electrical box (E-Box)		

## 6.4 Connecting Indoor Unit Electrical Wiring

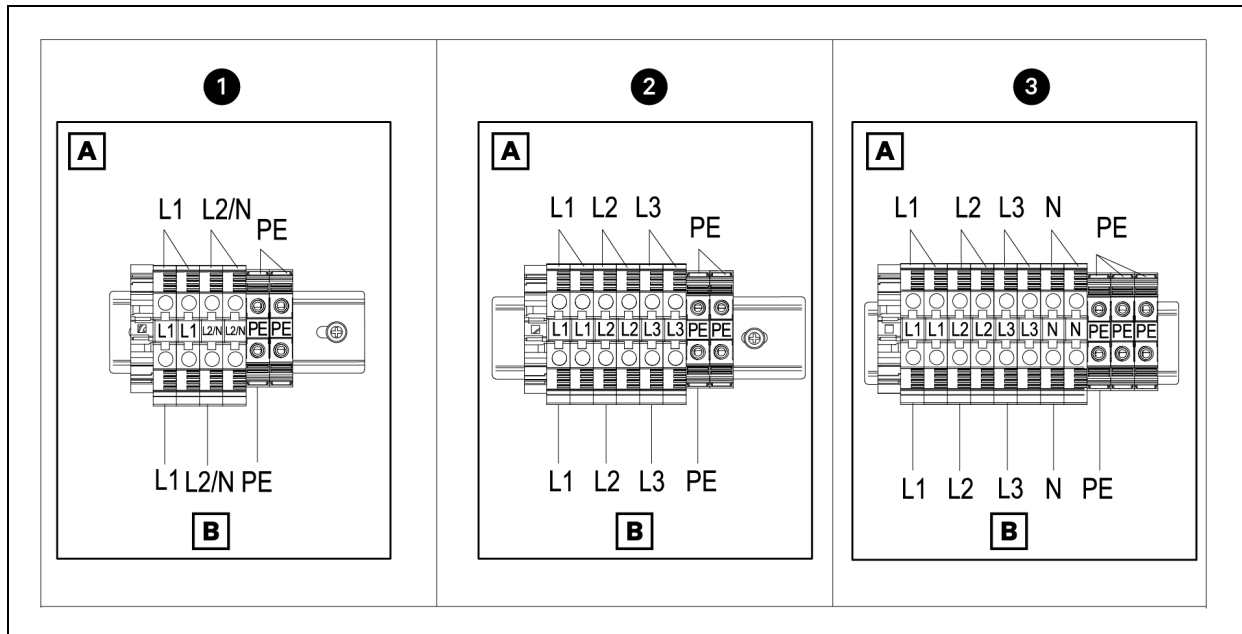
**NOTE:** This information only applies when the Indoor Unit is powered from the Condensing Unit, please refer to Figure 6.6 below for further details.



**WARNING!** Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and wear appropriate, approved personal protective equipment (PPE) before working within the electric control enclosure. Failure to comply can cause severe injury or death. The customer must provide earth ground to the unit, per local codes. Before proceeding with installation, read all instructions, verify that all the parts are included, and check the nameplate to be sure the voltage matches the available utility power. The iCOM™ Edge controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components require and receive power even during the “Unit Off” mode of the controller. The only way to ensure NO voltage inside the unit is to install and open a remote disconnect switch. Refer to the unit electrical schematic. Follow all local codes.

The general guidelines for connecting electrical and communication cables to the indoor unit are the same for each system. However, the actual connections on the terminal block will differ. Refer to the manual you are wiring for the correct contact on each terminal block. The location of the terminal block may vary depending on your indoor unit.

**Figure 6.6** Connection indications of the indoor unit power supply.



Item	Description	Item	Description
A	Condensing Unit	2	Combination: CUD111, CUL111 +Indoor Unit
B	Indoor Unit	3	Combination: CUD115, CUL115+Indoor Unit
1	Combination: CUD030, CUL030 +Indoor Unit CUD070, CUL070 +Indoor Unit		

**NOTE: 1. Figure 6.6 shows the connection for the single-phase indoor unit. 2. For the 11 kW condensing unit, when the indoor unit power supply is also three-phase, please connect them in sequence according to the phase sequence. 3. For more specific indoor unit wiring connection methods, please refer to the corresponding indoor unit user manual.**

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# 7 Checklists

## 7.1 Piping Checklist

### Major Component Rough-in

1. The unit was connected properly per the local code and the product installation procedures.
2. All literature and bagged accessories have been removed from the unit.
3. The Condensing Unit was installed, adequately supported, and located in a non-corrosive environment.
4. Copper piping connections:
  - a. Over 5/8 in (15.9 mm)—Rigid ACR only
  - b. 5/8 in (15.9 mm) and under—can use soft ACR.
5. 15% silver brazing material only.
6. All refrigerant pipes and valves were insulated separately. Insulation butts up against the walls of the condensing units. No gaps or cracks. Insulation was not compressed at the clamps and hangers.

### Brazing Practices:

Dry nitrogen was used for purging during brazing (constant three psi (21 kPa) while brazing).

### Installation

Refer to the details in the Installation section for more information on any procedure.

### Refrigerant Piping

1. All pipe materials were stored correctly, capped, and cleaned. All burrs were removed after cutting, and pipe ends were reamed before brazing.
2. During refrigerant pipe installation, each pipe segment was recorded, along with its length (including expansion loops, offsets, and double-back sections), sizes, and the quantity and type of elbows used.
3. All long runs of straight pipe were provided with expansion loops.
4. A torque wrench and backup wrench were used to tighten all flare connections.
5. Before tightening flare fittings, the back side of all flares was lubricated with a small drop of PVE refrigeration oil.
6. Ensure all field-made flares are 45°. Used factory-supplied flare nuts only.
7. Pipe segments were properly supported, and all wall penetrations were sleeved.
8. Pipe insulation was not compressed at any point.
9. No oil traps, solenoid valves, sight glasses, filter driers, or other unauthorized refrigerant specialties were present.
10. Best practice included installing a minimum of 20-in (508 mm) straight pipe between each elbow.
11. The actual refrigerant charge is in accordance with the room size within which the refrigerant-containing parts are installed.
12. The ventilation machinery and outlets operate adequately and are not obstructed.
13. If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.
14. The markings on the equipment continue to be visible and legible. Illegible markings and signs shall be corrected.

15. Refrigerating pipes or components are installed in a position where they are unlikely to be exposed to any substance that may corrode refrigerant-containing components unless the components are constructed of materials that are inherently resistant to corrosion or are suitably protected against corrosion.

## 7.2 Electrical Checklist

After the system's electrical installation is completed, the following requirements should be met.

### Power Wire and Communication Cables

1. Power wiring was connected to a power supply corresponding to the unit's nameplate.
2. Ground wire was installed and adequately terminated at the unit.
3. The power supplied was clean, with voltage fluctuations within specifications. ( $\pm 10\%$  of nameplate).
4. Power wiring to the Condensing Unit was installed per all local electrical code requirements.
5. Power wiring to the indoor unit was installed per all local electrical code requirements.
6. Communication type RS-485-BUS type.
7. Straight-through Ethernet cables (RJ45) were used for communication connections.
8. Used appropriate crimping tools to attach ring, spade, or ferrule terminals to all power wiring and control cable terminations.
9. At least 2 in (51 mm) must separate the power wire from the communication wire.

**Table 7.1 Electrical Inspection Checklist**

Particulars	Results
The system's electrical loop has no open-circuit or short-circuit existing in the electrical connection.	
The power supply voltage meets the rated voltage on the unit's nameplate.	
Verify that the power wire sizing matches the recommended gauge for the unit that is being installed.	
The power and ground cables are connected to the breaker switches, indoor unit, and Condensing Unit correctly per the norms.	
The ratings and fuses of the Miniature Circuit Breakers (MCBs) are correct.	
The control cables are configured and, subsequently, appropriately fixed.	
All the cables and connector connections, including the fixing blocks, are firmly and appropriately fixed.	

Following the completion of the electrical inspection, the system must not be started until vacuuming and refrigerant charging have been fully carried out.

## 8 Comission

### 8.1 Charging the Refrigerant and Lubricating Oil

Prior to starting with the piping connection, please read the [Important Safety Instructions](#) section of this Manual.



**WARNING! This Condensing Unit shall be connected only to an Evaporator Unit suitable for R32 refrigerant.**



**WARNING! Competent persons shall only carry out every working procedure that affects safety means.**

**NOTE: The unit is not charged with refrigerant from the factory. You need to charge refrigerant on site. The refrigerant for the unit is R32.**

**NOTE: Do not use poor-quality or wrong-type refrigerant and lubricating oil, as they can damage the system.**

In addition to conventional charging procedures, the following requirements shall be followed:

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the unit is earthed prior to charging the unit with refrigerant.
- Label the unit when charging is complete. Indoor and outdoor units have locations where the total refrigerant charge can be written.
- Extreme care shall be taken not to overfill the refrigerant system.

**NOTE: Please read the user manual of the corresponding indoor unit for detailed amounts of refrigerant and lubricant oil charging.**

### 8.2 Charging Extra Lubricating Oil

After evacuating the unit as indicated in the Evacuation topic, specified in [section 5.2](#), remove the vacuum pump and connect the lubricating oil tank to the manifold valve. The oil is drawn into the unit. Repeat this procedure (evacuating and then adding oil) several times until the desired amount of oil is added.

**NOTE: Ensure the “Hi” knob and “Lo” knob of the manifold valve and the service valves of the condensing unit is open.**

**NOTE: Exhaust the air from the tube and oil tank before the tube enters the oil tank, making sure that no air is absorbed into the system. As an optional approach, the lubricating oil can be charged by pouring the oil into the suction pipe when connecting the suction pipes.**

**NOTE: The unit has been charged with a certain amount of lubricating oil in the factory. The lubricating oil for the unit is FW68S.**

**NOTE: If the Condensing Unit is a standard version and the liquid pipe length between the indoor unit and the Condensing Unit is longer than 82 ft (25 m), extra lubricating oil must be added.**

**NOTE: If the Condensing Unit is a Low Ambient version and the liquid pipe length between the indoor unit and the Condensing Unit is longer than 49.2 ft (15 m), extra lubricating oil must be added.**

## 8.3 Charging Refrigerant

### NOTICE

Vertiv™ Coolphase Condensing Unit is designed to be connected with different families of Vertiv evaporator units. The refrigerant charge will be determined in the field during the installation of the whole system; nevertheless, these units require a minimum refrigerant charge to work correctly without damage.

**NOTE: If the pipework length is between any of the table values in the Indoor Unit User Manual, the unit must be filled with the refrigerant charge stated in the immediately largest value. For example, if the pipework has a length of 59 ft (18m), the refrigerant charge for the unit should be the one stated for 65.6 ft (20m).**

## 8.4 Automatic Restart

The unit will automatically restart when power is restored after a power interruption.



## 9 Maintenance

Prior to starting with the piping connection, please read the [Important Safety Instructions](#) section of this Manual.



**WARNING!** Competent persons shall only carry out every working procedure that affects safety means.



**WARNING!** All maintenance operations must be carried out strictly by observing the European and National accident prevention regulations, especially those concerning electrical systems, refrigerators, and manufacturing resources. Only authorized and qualified technicians may maintain air conditioning equipment. The maintenance must adhere to the manufacturer's instructions to keep all warranties valid.



**WARNING!** The work shall be performed when the system is de-energized. Stop the system by disconnecting all power supplies and powering the air conditioner. Check that the device's electrical components are off and not receiving a power supply.



**WARNING!** Risk of electric shock. Power down the unit for 10 minutes before removing any cover.



**WARNING!** Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized.



**WARNING!** Work in confined spaces shall be avoided.



**WARNING!** Hot work conducted on the refrigerating equipment, or any associated parts must be performed with the appropriate fire extinguishing equipment available to hand. Have a dry powder or CO<sub>2</sub> fire extinguisher adjacent to the charging area.



**WARNING!** No person carrying out work in relation to the refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.



**WARNING!** Before breaking into the system or conducting any hot work ensure that the working area is open or it is adequately ventilated. Ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.



**WARNING!** If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment, so all parties are advised.



**WARNING!** Sealed electrical components shall be replaced. Do not attempt to repair those components.



**WARNING!** Intrinsically safe components must be replaced. Do not attempt to repair those components.



**WARNING!** Under no circumstances, potential sources of ignition shall be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.



**WARNING!** If a refrigerant leakage requires brazing, all the refrigerant shall be recovered from the system or isolated (by means of shut-off valves) in a part of the system remote from the leak. Refrigerant removal shall be performed following manufacturer's instructions.



**CAUTION:** Work shall be undertaken under a controlled procedure to minimize the risk of flammable gas or vapors being present while the work is being performed.



**CAUTION:** All maintenance staff and others working in the local area shall be instructed on the nature of the work being carried out.



**CAUTION:** The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants.

## NOTICE

Risk of release of hazardous substances into the environment. It can cause environmental pollution and violation of environmental regulations.

## 9.1 Maintenance Schedule

Conduct monthly, quarterly, biannual, and annual checks according to the following guidelines.

**Table 9.1 Maintenance Schedule.**

Component	Check Items	Maintenance Period			
		Monthly	3 months	6 months	1 year
General	Irregular noises from the condenser fan	X			
	Irregular noises from the compressor	X			
VFD Air Filter	The filter is out of debris or obstructions	X			
	Cleaning or replacement of the air filter, if necessary		X		
Condenser coil	Cleanliness of the condenser coil fins		X		
Fan	Impellers can freely move		X		
	Motor and bearings			X	
	The fan is securely fixed			X	
Electronics	The electrical box is out of water leaks.			X	
	Electrical connections stability				X
Refrigerant system	Main refrigerant circuit, and if there are any signs of oil leakage				X
	Compressor suction superheat is normal				X
	Compressor discharge temperature is normal				X

**NOTE: The Electrical box air filter must be checked once a month when the unit is installed in dirty conditions.**

**NOTE: When the Indoor unit's LCD Display reports “Cond Filter Run Hours Exceeded,” check the filter and perform the proper maintenance routine.**

Only original spare parts made by Vertiv™ may be used. Using third-party material can invalidate the warranty. When the spare parts must be brazed, be careful not to damage the internal parts (gaskets, seals, O-rings, etc.).

## 9.2 Condensing Unit Maintenance

### 9.2.1 Condenser Coil

To maintain the condenser coil:

- Clear all debris that will inhibit airflow. This can be done with compressed air, water from a garden hose, or a commercial coil cleaner.
- Check that there are no bent or damaged coil fins.
- Do not permit snow to accumulate around the Condensing Unit.
- Periodically clean the coil surface with dedicated degreasing products.
- Check all piping for proper support.
- Inspect for leaks.

### 9.2.2 Fan

Check that the fan runs normally and check it for problems such as abnormal noise, vibration, and bearing failure.

### 9.2.3 Refrigeration System

Perform the following steps for refrigeration system maintenance:

1. Check that the refrigeration pipes are firmly fixed. The refrigeration pipes shall not shake with the wall, earth, or equipment frame vibration. Otherwise, reinforce the refrigeration piping with pipe hangers for vibration isolation.
2. Look for signs of oil in or around the evaporator/condenser and interconnecting piping. If found, check for leaks with an electronic leak detector or soap bubbles.
3. Check that the insulation is fixed and no cracks and morphs. If found, please change the insulation and fix it using a bandage.

Note the following when maintaining the refrigerant system:

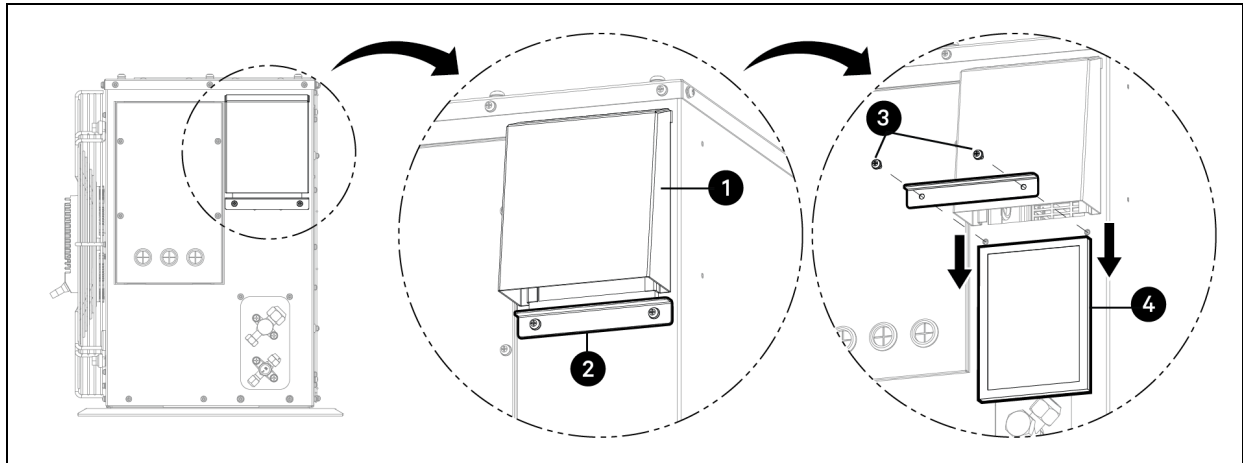
- When repairing the refrigeration circuit, collect all refrigerant in a container and do not allow the refrigerant to escape.
- When either removing (for repairs) or charging refrigerant statically, this must be performed on both the compressor's high- and low-pressure sides simultaneously; When charging the refrigerant dynamically, this must be performed on the compressor's low-pressure side.
- The compressor copper-plated steel connections should be brazed with a SIL-FOS material containing a minimum of 5% silver.

### 9.2.4 Variable Frequency Driver (VFD) Box Air Filter

Please follow these steps to clean or replace the VFD box air filter:

1. Remove the bracket below the filter cover, following the steps in the picture below.
2. After removing the bracket, take out the filter by sliding it down.
3. Rinse the filter with high-pressure air to remove debris. If the air filter is damaged or too dirty to clean, please replace it.
4. Clean the filter completely, then reattach it to the unit.

Figure 9.1 Air Filter Removal



Item	Description	Item	Description
1	Filter cover	3	Screws
2	Filter Bracket	4	Air Filter

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# 10 Troubleshooting

Please check Table 10.1 below before contacting the service. If the problem persists after corrective action, contact Vertiv™ technical support (refer to Appendix D, Technical Support and Contacts).

**Table 10.1 Self-Service Troubleshooting**

Problem	Possible Cause	Corrective Action
The unit does not work.	The indoor air temperature is too low.	No operation is required; the unit will start automatically when it meets the indoor air temperature demand.
	A burning smell and strange sounds are coming from the unit.	Power off the unit, check all electrical components, and the power supply cable connection.
	The power cable is damaged, or it is generating excessive heat.	Revise and replace with a new power cable if needed, according to the electrical parameters.
	The communication cable between the indoor and condensing units is damaged or disconnected.	Check that the indoor and Condensing Units' communication cable is correctly connected.
	No power to the unit.	Check that the air breakers are closed and that all the power supply connections are correctly connected.
	A switch, circuit breaker (safety, ground), or fuse is malfunctioning.	Replace the fuse or check if the circuit breaker is tripped.
	Power supply voltage is too high or too low.	Power off the unit, and the voltage will return to the value required by the nameplate before the power supply is restored.
	There is a serious alarm on the unit(display).	Troubleshoot and resolve the alarm.
High-pressure alarm	Insufficient condenser airflow	Clear up alien objects from the condenser coil surface or near the air inlet.
	The condenser fan does not run.	Check if the condenser fan cable connection is loose. Check if the condenser fan is damaged.

## 10.1 Refrigerant Leaks



**CAUTION:** Risk of exposure to excessive refrigerant concentration and oxygen depletion. It can cause illness or injury. The unit must be installed as indicated. If additional ventilation is needed, follow local or federal codes and take necessary measures to prevent the refrigerant concentration from exceeding safety limits in case of a refrigerant leak. Verify that the maximum refrigerant concentration level in the space where the indoor unit will be mounted meets the concentration limit for the application.

**NOTE:** At the end of the Air-Conditioning equipment's life, take appropriate actions to recover, recycle, reclaim, or destroy R32 refrigerant according to applicable NATIONAL rules.

ASHRAE Standards 15-2010, 34-2010, and ISO 817 offer guidelines that address refrigerant safety and the maximum allowable refrigerant concentration in an occupied space. Refrigerant will dissipate into the atmosphere, but a specific air volume is required to occur safely. For R32 refrigerant, the maximum allowable concentration is 4.8 lbs/1,000 ft<sup>3</sup> of air in an occupied space. Buildings with 24-hour occupancy allow half of that concentration.

ASHRAE Standards 15 and 34 assume that if a system develops a leak, its entire refrigerant charge will dump into the area where the leak occurs. To meet ASHRAE Standards 15 and 34, calculate the refrigerant concentration that may occur in the smallest room volume on the system and compare the results to the maximum allowable concentration number. Also, consult state and local codes about refrigerant safety.

The system is designed to execute mitigation actions to avoid a hazardous refrigerant concentration in case of a leak. Do not turn off the unit; this may cause the refrigerant to stagnate and create a hazardous atmosphere.

Do not try to repair the unit yourself; call service personnel to address this issue.

After the leak has been repaired, the mitigation actions will remain operable for 5 minutes after resetting the unit to dissipate the rest of the refrigerant; otherwise, the unit will not be operable.

Once the mitigation actions have ended, you can use the appliance normally.

### 10.1.1 Regulation (EU)

Stationary air conditioners within the European market and operating with R32 Refrigerant must comply with the Reg. (EU) no.2037/2000, starting from 1st Jan 2015. The R32 refrigerant will be an alternative to the fluorinated greenhouse (F-gas, such as R407C, R134a, and R410A). According to the EU, from 1st January 2025, refrigerants with a Global Warming Potential (GWP) greater or equal to 750 will be prohibited in any appliances containing more than 3 kg of refrigerant. R32 refrigerant has a GWP indicator of 675.

R32 refrigerant was classified as a 2L class. This classification covers all the lower flammability and toxicity levels and allows it to be safely used in air conditioning.

Other directives that appliances need to cover are the Electromagnetic Compatibility Directive 2014/30/EU, Low Voltage Directive 2006/42/EU, Pressure Equipment Directive 2006/42/EU, and Restriction of Hazardous Substances Directive 2011/65/EU (Appendix A and Appendix B).



# Appendices

## Appendix A: Electrical Diagrams

Table 11.1 Electrical Diagrams

Drawing No.	Title	Applicable unit models
<a href="#">29044991</a>	Electrical Schematic for 3.5 kW and 7 kW 208/230V, 1 Phase, 50/60 Hz Coolphase Condensing Units (Standard and Low Ambient)	CUD030 CUL030 CUD070 CUL070
<a href="#">29044993</a>	Electrical Schematic for 11 kW 208/230V, 3 Phase, 50/60 Hz Coolphase Condensing Units (Standard and Low Ambient)	CUD111 CUL111
<a href="#">29044995</a>	Electrical Schematic for 11 kW 400V, 3 Phase+N, 50/60 Hz Coolphase Condensing Units (Standard and Low Ambient)	CUD115 CUL115

Figure 11.1 Electrical Schematic for 3.5 kW and 7 kW 208/230V, 1 Phase, 50/60 Hz Coolphase Condensing Units (Standard and Low Ambient)

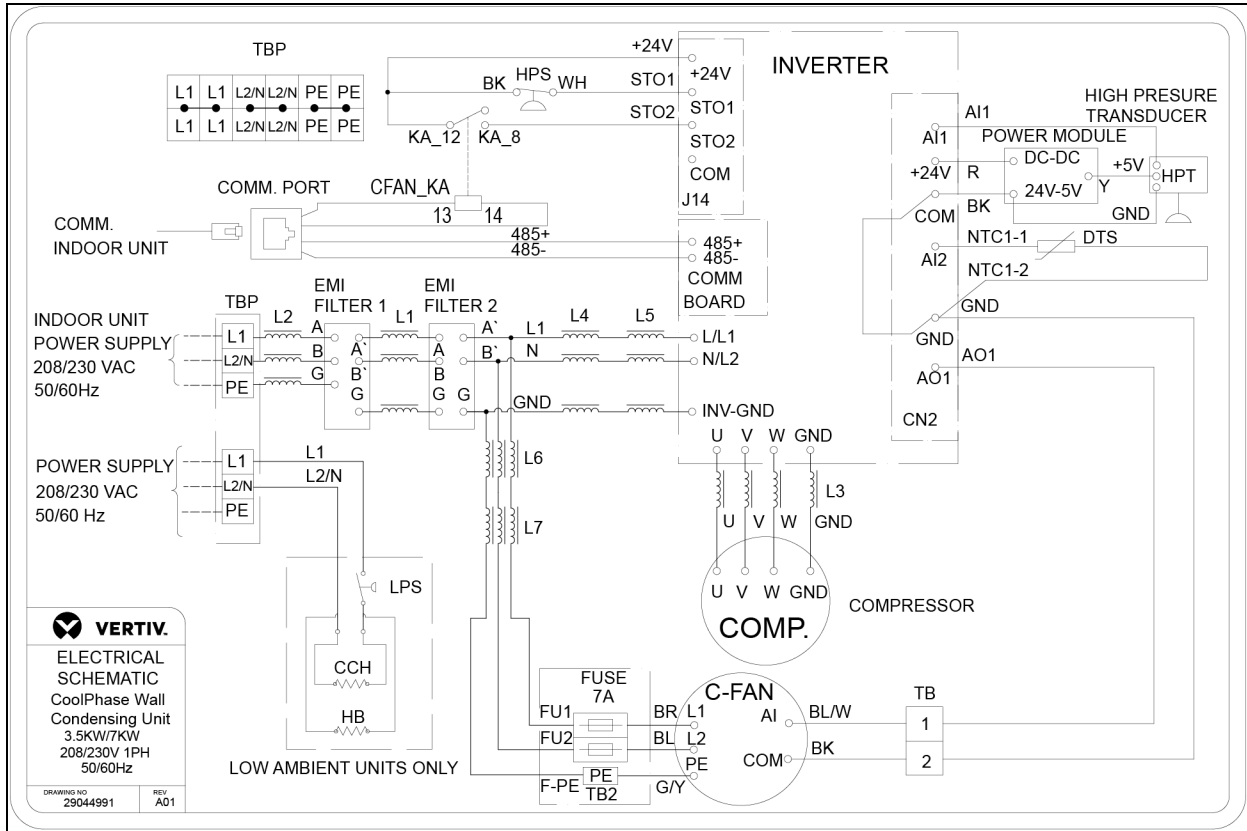


Figure 11.2 Electrical Schematic for 11 kW 208/230V, 3 Phase, 50/60 Hz Coolphase Condensing Units (Standard and Low Ambient)

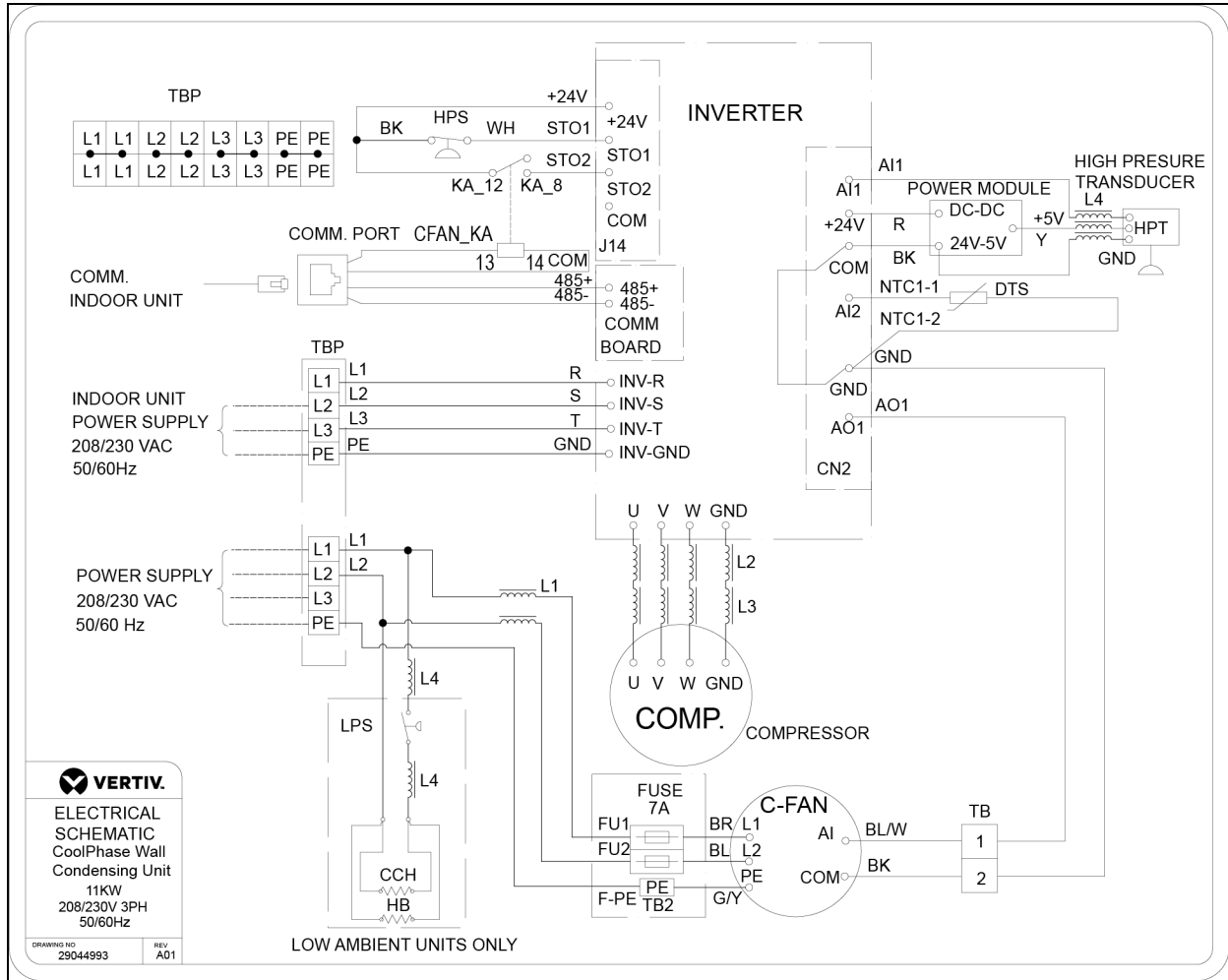
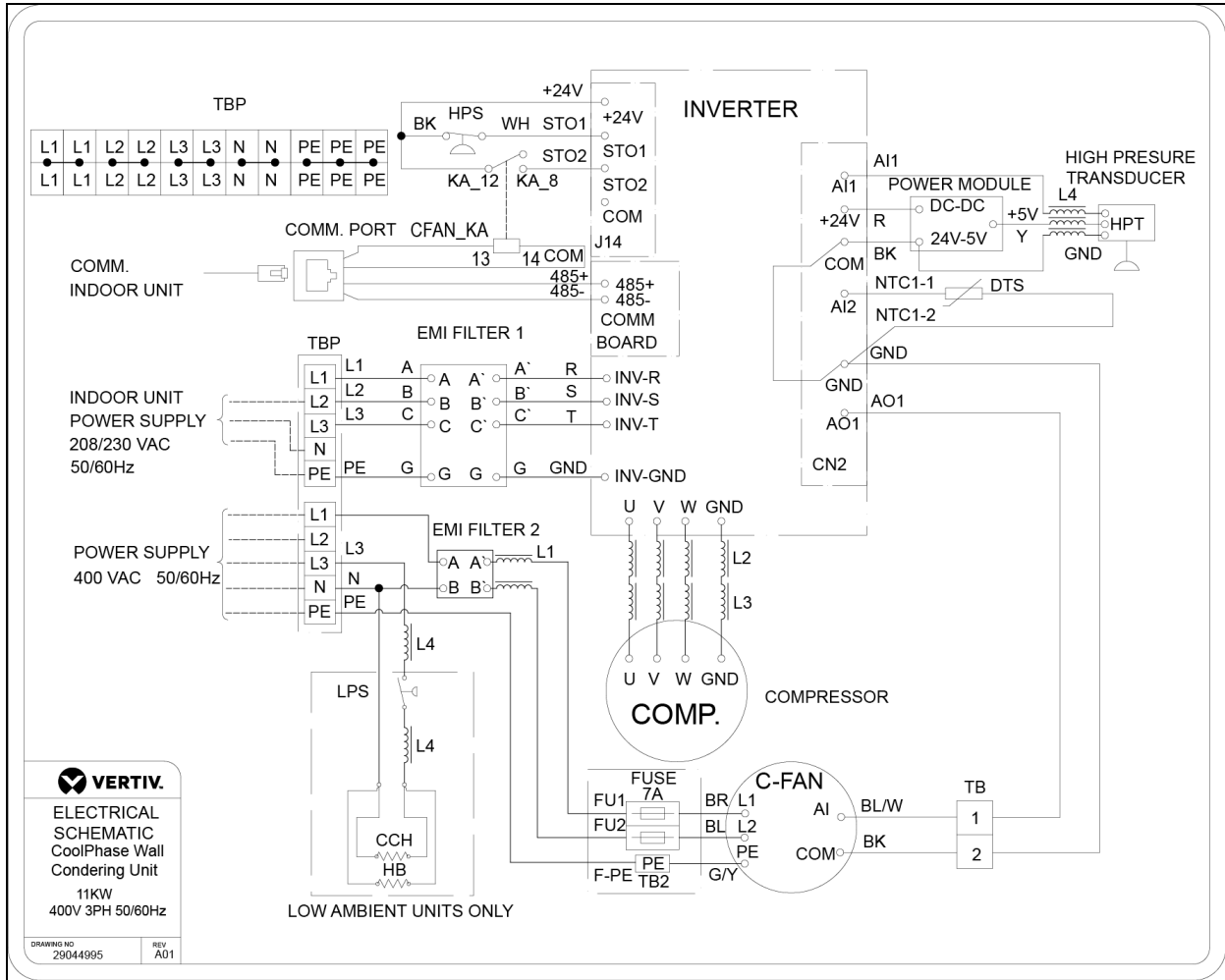


Figure 11.3 Electrical Schematic for 11 kW 400V, 3 Phase+N, 50/60 Hz Coolphase Condensing Units (Standard and Low Ambient).



## Appendix B: Conformity to EU Directives

The product complies with the following directives:

Directive	Standard(s)
Electromagnetic Compatibility Directive 2014/30/EU	EN IEC 61000-6-2:2019 EN IEC 61000-6-4:2019
Low Voltage Directive 2014/35/EU	EN 60335-1:2012 EN 60335-2-40:2023/A11:2023
Machinery Directive 2006/42/EU	EN 60335-1:2012 EN 60335-2-40:2023/A11:2023
Pressure Equipment Directive 2014/68/EU	EN 378-2:2016 EN 60335-2-40:2023/A11:2023
Restriction of Hazardous Substances Directive 2011/65/EU	EN 63000:2018

## Appendix C: Conformity to UK Legislation

Legislation	Standard(s)
Electromagnetic Compatibility Regulations 2016	EN IEC 61000-6-2:2019 EN IEC 61000-6-4:2019
Electrical Equipment (Safety) Regulations 2016	EN IEC 60335-1:2012 EN IEC 60335-2-40:2023/A11:2023
Supply of Machinery (Safety) Regulations 2008	EN 60335-1:2012 EN 60335-2-40:2023/A11:2023
Pressure Equipment (Safety) Regulations 2016	EN 378-2:2016 EN 60335-2-40:2023/A11:2023
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012	EN 63000:2018

## **Appendix D: Technical Support and Contacts**

### **D.1 Technical Support/Service in the United States**

Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2778

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

### **D.2 Locations**

#### **United States**

Vertiv Headquarters

505 N Cleveland Ave

Westerville, OH, 43082, USA

#### **Europe**

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

#### **Asia**

7/F, Dah Sing Financial Centre

3108 Gloucester Road, Wanchai

Hong Kong

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