



Liebert[®] CRV CCD10

User Manual (Original Instructions)

50/60 Hz, Condenser

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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

SAVE THESE INSTRUCTIONS

This manual contains important safety instructions that should be followed during the installation and maintenance of the Vertiv™ Liebert® CRV CCD10 condenser (referred as "the unit" or "the condenser" in the following chapters). 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 and 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 opening doors or equipment panels must be carried out only by properly trained and qualified personnel.

To identify the unit model and serial number for assistance or spare parts, locate the identification label on the unit.



WARNING! Arc flash and electric shock hazard. Can cause serious injury or death. Disconnect all local and remote electric power supplies and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.



WARNING! Verify with a voltmeter that power is Off. The unit's controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components still require and receive power even during the "Unit Off" mode of the controller. The factory-supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.



WARNING! Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. Follow all local codes.



WARNING! Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



WARNING! Risk of over-pressurization of the refrigeration system. Can cause serious injury or death. Can cause explosive discharge of high-pressure refrigerant, loss of refrigerant, environmental pollution, or building and equipment damage. 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 design pressure marked on the unit's nameplate.



WARNING! For systems requiring EU CE compliance, the system installer must provide and install a pressure relief valve in the high side refrigerant circuit that is rated same as the refrigerant high side “Max Allowable Pressure” rating that is marked on the unit serial tag. Do not install a shutoff valve between the condenser and the field installed relief valve. The pressure relief valve must be CE-certified to the EU Pressure Equipment Directive by an EU “Notified Body.”



WARNING! Risk of improper moving. Can cause serious injury or death. Building and equipment damage may also result. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. The center of gravity varies depending on the unit size and selected options. The slings must be equally spaced on either side of the center of gravity.



WARNING! Risk of contact with high-speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure.



WARNING! Risk of contact with extremely hot and/or cold surfaces. Can cause injury. Verify that all components have reached a temperature that is safe for human contact or wear appropriate, OSHA-approved 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 wire sizing/rating and loose electrical connections. Can cause overheated wire and electrical connection terminals resulting in smoke, fire, equipment and building damage, injury or death. Use correctly sized copper wire only and verify that all electrical connections are tight before turning power On. Check all electrical connections periodically and tighten as necessary.



CAUTION: To ensure the safety, before welding the pipeline and patching welding, all nitrogen of air condition system must be discharged to release the system pressure.



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



CAUTION: Risk of excessive refrigerant line pressure. Can cause equipment damage or injury resulting from tubing and component rupture. Do not close off the refrigerant-line isolation valve for repairs unless a pressure-relief valve is field- installed in the line between the isolation valve and the check valve. The pressure-relief valve must be rated 5% to 10% higher than the system-design pressure. An increase in ambient temperature can cause the pressure of the isolated refrigerant to rise and exceed the system-design pressure rating (marked on the unit nameplate).

NOTICE

Vertiv™ Liebert® CRV CCD10 condenser is used with Vertiv™ Liebert® CRV CRD10 row-based cooling unit. Read SL-70637 Vertiv™ Liebert® CRV CRD10 Row-Based Cooling Unit User Manual before installing and using the CCD10 condenser.

NOTICE

Risk of improper maintenance. Can cause equipment damage. All maintenance must be performed only by authorized properly trained and qualified personnel. Ignoring safety instructions is dangerous. Soiled parts cause a loss of performance and, for switch or control devices, can lead to the breakdown of the unit performance and operation.

NOTICE

Risk of release of hazardous substances into the environment. Can cause environmental pollution and violation of environmental regulations. The unit contains substances and components hazardous for the environment (electronic components, refrigerating gases and oils). At the end of its useful life, the unit must be dismantled by specialized refrigerating technicians. The unit must be delivered to suitable centers specializing in the collection and disposal of equipment containing hazardous substances.

NOTICE

Risk of improper power supply connection. Can cause equipment damage and loss of warranty coverage. Prior to connecting any equipment to a main or alternate power source (for example: back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power-source voltages should be stabilized and regulated to within $\pm 10\%$ of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

NOTICE

Risk of control malfunction. Can cause improper unit operation. Verify that all low-voltage electrical wiring has been performed per the schematic diagram provided and that all low-voltage wiring connections are tight.

NOTICE

Risk of improper lifting. Can cause equipment damage. Make sure that the spreader bars are wider than the unit. If the spreader bars are too short, the slings may crush the unit.

NOTICE

Risk of doorway/hallway interference. 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 prior to moving the unit to verify clearances.

NOTICE

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

1.1 Conformity to EU Directives

Fabbricante-Manufacturer-Hersteller-Fabricant-Fabricante

Fabricante- Tillverkare – Fabrikant – Valmistaja – Produzent

Fabrikant – Κατασκευαστής – Producent

Il Fabbricante dichiara che questo prodotto è conforme alle direttive Europea:

The Manufacturer here by declares that this product conforms to the European Union directives:

Der Hersteller erklärt hiermit, dass dieses Produkt den Anforderungen der europäischen Richtlinien gerecht wird:

Le Fabrican déclare que ce produit est conforme aux directives Européennes:

El Fabricante declara que este producto es conforme a las directivas Europeas:

O Fabricante declara que este produto está em conformidade com as directivas Europeias:

Tillverkare försäkrar härmed att denna produkt överensstämmer med Europeiska Unionens direktiv:

De Fabrikant verklaart dat dit product conform de Europese richtlijnen is:

Vaimistaja vakuuttaa täten, että tämä tuote täyttää seuraavien EU-direktiivien vaatimukset:

Produzent erklærer herved at dette produktet er i samsvar med EU-direktiver:

Fabrikant erklærer herved, at dette product opfylder kravene i EU direktiverne:

κατασκευαστής δηλώνει ότι το παρόν προϊόν εβναι άααααεααμύνο αγμ ωνα με τη οδηγβει τηj E.E.:

For CCD101S-00B: 2006/42/EC, 2014/30/EU, 2014/35/EU, 2011/65/EU with its amendment (EU) 2015/863

For LAK10CE: 2006/42/EC, 2014/30/EU, 2014/68/EU, 2011/65/EU with its amendment (EU) 2015/863

2 Nomenclature and Components

2.1 Model Number Nomenclature

Table 2.1 below and Table 2.2 below describe the model number for Vertiv™ Liebert® CRV CCD10 condenser.

Table 2.1 CCD10 Model Number Example

Model Number										
1	2	3	4	5	6	7	8	9	10	11
C	C	D	1	0	0	S	-	0	0	B

Table 2.2 CCD10 Model Number Digit Definitions

Digit	Variable	Description of Variable
1	CCD	CCD10 Condenser
2		
3		
4	10	Model number
5		
6	0,1	0: 208/230 V/1 Ph/60 Hz, UL 1: 230 V/1 Ph/50/60 Hz, CE
7	S	Standard temperature (-15 °C to 45 °C (5 °F to 113 °F))
8	-	Separator
9	0	R410 A refrigerant
10	0	Free digit
11	A-Z	Revision

2.2 Main Components

2.2.1 Fan

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

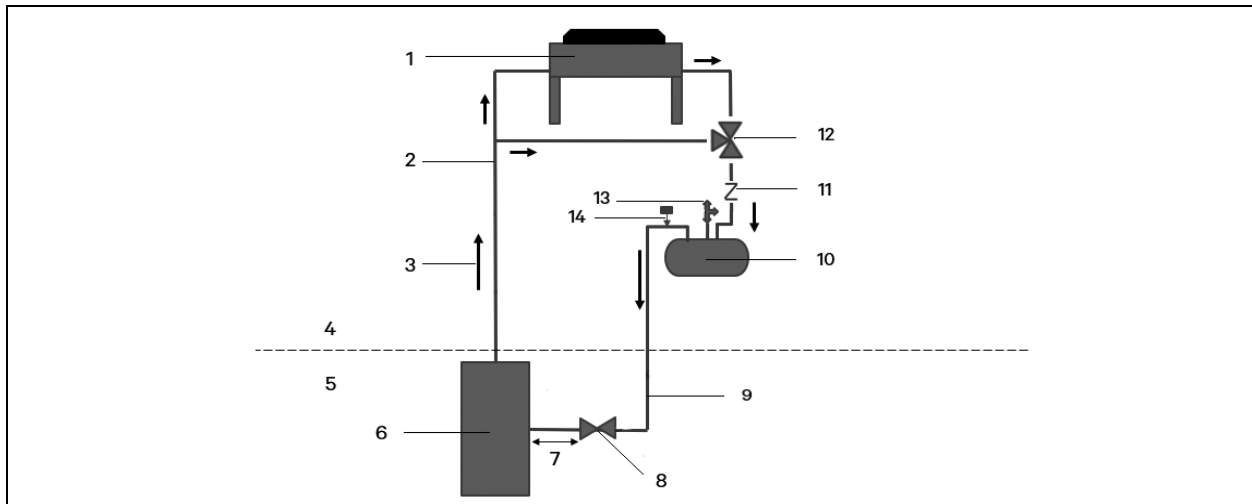
2.2.2 Heat Exchanger

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

2.2.3 Low Ambient Kit

The low ambient kit consists of a receiver with two heater pads, a head pressure valve, a safety valve, a check valve, and a pressure switch. The kit is designed to maintain proper operating pressure in outdoor temperature down to - 34 °C (-29.2 °F). The low ambient kit is an optional component and is field-installed.

Figure 2.1 Diagram of Condenser with Low Ambient Kit



Item	Description
1	Condenser
2	Discharge pipe Diameter: <ul style="list-style-type: none"> 16 mm (5/8 in.) if pipe length ≤ 40 m (131.2 ft) 18 mm (3/4 in.) if 40 m (131.2 ft) < pipe length ≤ 91 m (300.0 ft)
3	Refrigerant flow direction
4	Outdoor environment
5	Indoor environment
6	Evaporator
7	Max 2 m (6.6 ft)
8	Solenoid valve

Item	Description
9	Liquid pipe Diameter: <ul style="list-style-type: none"> • 12.7 mm (1/2 in.) if pipe length ≤ 40 m (131.2 ft) • 16 mm (5/8 in.) if 40 m (131.2 ft) < pipe length ≤ 91 m (300.0 ft)
10	Receiver
11	Check valve
12	Head pressure valve
13	Safety valve
14	Pressure switch

Receiver

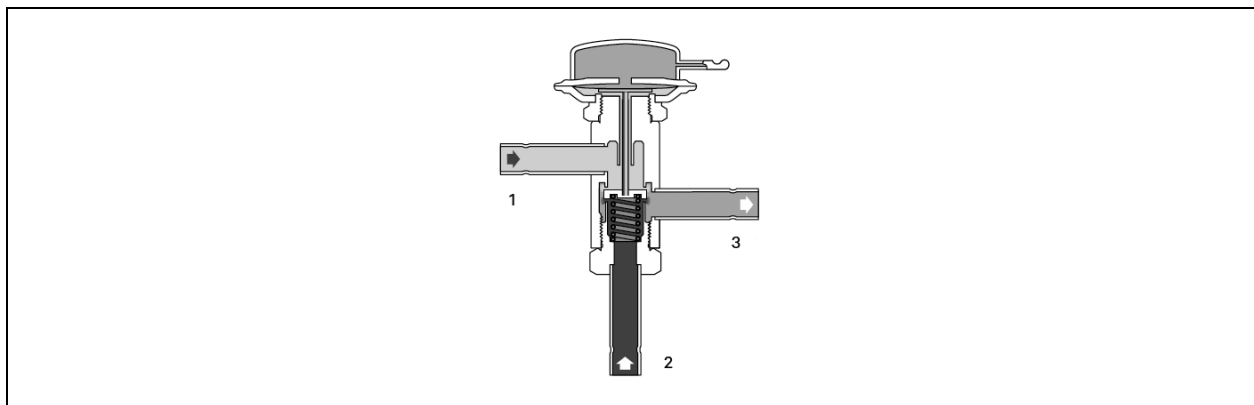
The receiver stores refrigerant to help fulfill the needs for low temperature load in winter and high temperature load in summer. There are three connection ports in the receiver to connect refrigerant inlet pipe, refrigerant outlet pipe, and safety valve. Two sight glasses are also installed on the receiver to observe the refrigerant level in the receiver conveniently.

Head Pressure Valve

The head pressure valve is a three-way modulating valve that responds to discharge pressure. When the discharge pressure falls below a certain value, the discharge port is opened and the discharge gas bypasses the condenser. When the discharge pressure is high, the discharge port is closed and there is full liquid flow to the condenser.

During the soldering process, care must be taken not to overheat and damage valves.

Figure 2.2 Structure Diagram of Head Pressure Valve



Item	Description
1	Connected with discharge pipe
2	Connected with condenser
3	Connected with receiver

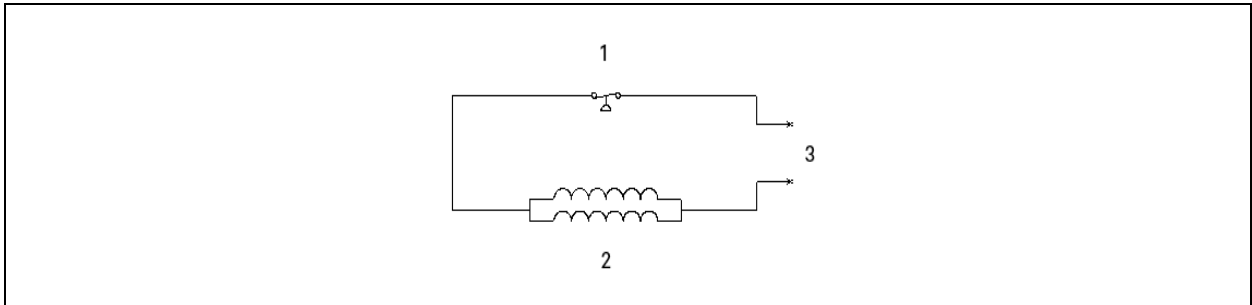
Heater Pad

The receiver is equipped with two heater pads which consume a total power of 150 Watts. The heater pad is controlled by the pressure of refrigerant in the receiver. When the pressure is lower than 1.4 MPa, the heater pad will start heating. When the pressure is higher than 1.9 MPa, the heater pad will stop heating.

Pressure Switch

Pressure switch controls the heater pad. When the refrigerant pressure in the receiver is lower than 1.4 MPa, the pressure switch will be closed and the heater pad will start working. When the refrigerant pressure in the receiver is higher than 1.9 MPa, the pressure switch will be opened and the heater pad will stop working.

Figure 2.3 Circuit Diagram of Heater Pad and Pressure Switch



Item	Description
1	Pressure switch
2	Heater pad
3	Power supply

Check Valve

Check valve is installed between the head pressure valve and the receiver on the liquid 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 towards the receiver.

2.3 Dimensions and Weights

Table 2.3 Dimensions and Weights of Condenser (Without Stands)

Condenser Model	Unit Dimensions (Without Stands) (W x D x H) mm (in.)	Shipping Dimensions (W x D x H) mm (in.)	Net Weight kg (lb)	Shipping Weight kg (lb)
CCD101S-00B	1300 x 605 x 745 (51.2 x 23.8 x 29.3)	1620 x 685 x 950 (63.8 x 22.0 x 37.4)	55 (121)	111 (245)

2.4 Operation Environment

Table 2.4 Operation Environment

Item	Requirements
Installation position	The maximum equivalent pipe length between the indoor unit and the condenser is 91.4 m (300 ft) Vertical difference: -8 m (-26.2 ft) ≤ ΔH ≤ 30 m (98.4 ft)
Installation mode	Standard condenser: horizontal airflow installation and vertical airflow installation Condenser with low ambient kit: vertical airflow installation
Ambient temperature	Standard condenser: -15 °C to + 45 °C (5 °F to 113 °F) Condenser with low ambient kit: -34 °C to +45 °C (-29.2 °F to 113 °F)
Ambient humidity	Outdoor: 5% RH to 95% RH
Operation power	CCD101S: 230 V ±10%, 1 Ph, 50/60 Hz
Altitude	≤ 2000 m (6562 ft). Derating is required if the altitude exceeds 2000 m (6562 ft)
Protection level	IPX4
<p>NOTE: The value of vertical difference is positive if the condenser is installed higher than the indoor unit; otherwise the value is negative.</p> <p>NOTE: Vertical difference varies with pipe length. For details, See Vertical Distance between Condenser and Indoor Unit in SL-70637 Vertiv™ Liebert® CRV CRD10 Row-Based Cooling Unit User Manual.</p>	

2.5 Storage Environment

Table 2.5 Storage Environment

Item	Requirements
Storage environment	Clean indoor environment with good ventilation and no dust
Ambient temperature	-40 °C to +70 °C (-40 °F to 158 °F)
Ambient humidity	5% RH to 95% RH
Storage time	The total storage time should not exceed 6 months, or its performance needs to be re-calibrated

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3 Pre-installation Preparation



WARNING! Risk of improper moving. Can cause serious injury or death. Building and equipment damage may also result. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. The center of gravity varies depending on the unit size and selected options. The slings must be equally spaced on either side of the center of gravity.



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

NOTICE

Risk of improper lifting. Can cause equipment damage. Make sure that the spreader bars are wider than the unit. If the spreader bars are too short, the slings may crush the unit.

NOTICE

Risk of doorway/hallway interference. 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 prior to moving the unit to verify clearances.

NOTICE

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

Upon arrival of the unit and before unpacking:

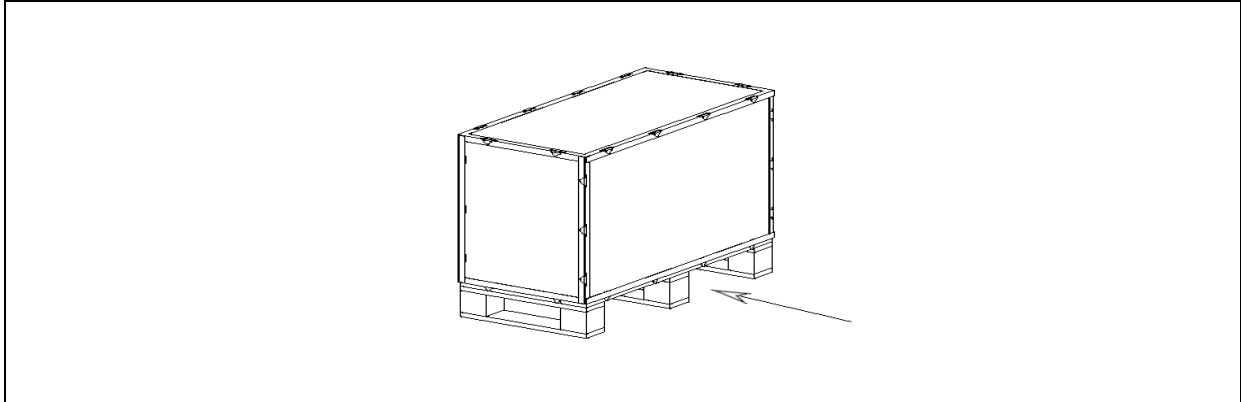
- Verify that the labeled equipment matches the bill of lading.
- Carefully inspect all items for visible or concealed damage.
- Report damage immediately to the carrier and file a damage claim with a copy sent to Vertiv or to your sales representative.

3.1 Moving the Unit

It is recommended to use mechanical transport equipment such as forklift or crane when unloading and transferring the condenser closest to the installation site.

When a forklift is used, insert the tines of the forklift in the direction as shown in the **Figure 3.1** below .

Figure 3.1 Inserting the Forklift in this Direction



3.2 Unpacking the Unit

3.2.1 Unpacking the Condenser

1. Pull straight the hooks on the top and side wooden panels using a claw hammer.
2. Remove the top and side wooden panels and foam from the condenser. Do not remove the protection cardboard of the fins until the condenser is in its installation position.

3.2.2 Unpacking the Low Ambient Kit

1. Pull straight the hooks on the top and side wooden panels using a claw hammer.
2. Remove the top and side wooden panels from the low ambient kit. Loosen the clamp that secures the kit to the bracket and then remove the kit.

4 Mechanical Installation

4.1 Installation Notes

- Vertiv™ Liebert® CRV CCD10 condenser is used with Vertiv™ Liebert® CRV CRD10 row-based cooling unit. Read SL-70637 Vertiv™ Liebert® CRV CRD10 Row-Based Cooling Unit User Manual before installing and using the CCD10 condenser.
- Do not install the unit in the environment with noise restrictions.
- Do not place the unit close to vapors, hot gases, and waste gases.
- Install the unit in a clean place and keep it away from dusts and foreign objects.
- It is recommended to install the unit in vertically upward direction.
- When the ambient temperature is lower than $-15\text{ }^{\circ}\text{C}$ ($5\text{ }^{\circ}\text{F}$), the low ambient kit needs to be used. The low ambient kit can only be used on the outdoor unit that has been installed in vertically upward direction.

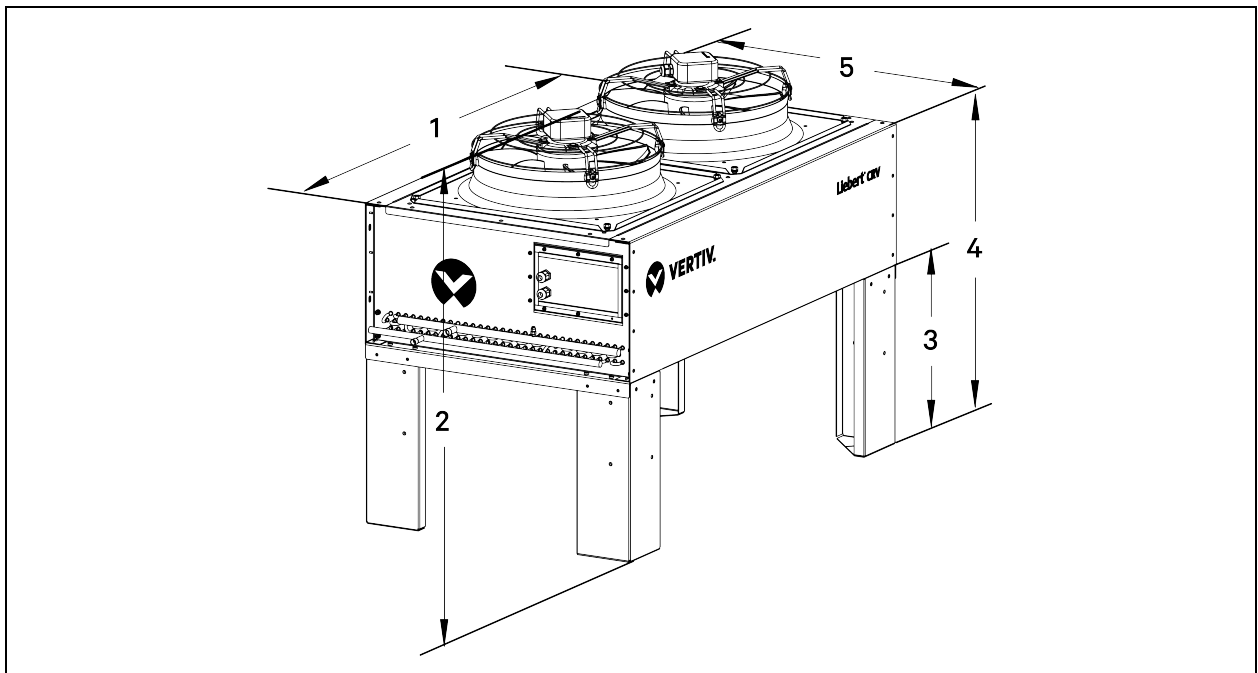
4.2 Installing the Unit

4.2.1 Vertical Airflow Installation

Mount the condenser on suitable support in accordance with local codes. Secure the stands to the mounting surface using a field supplied bolt in each of the two 12 mm (0.47 in.) holes in each stand.

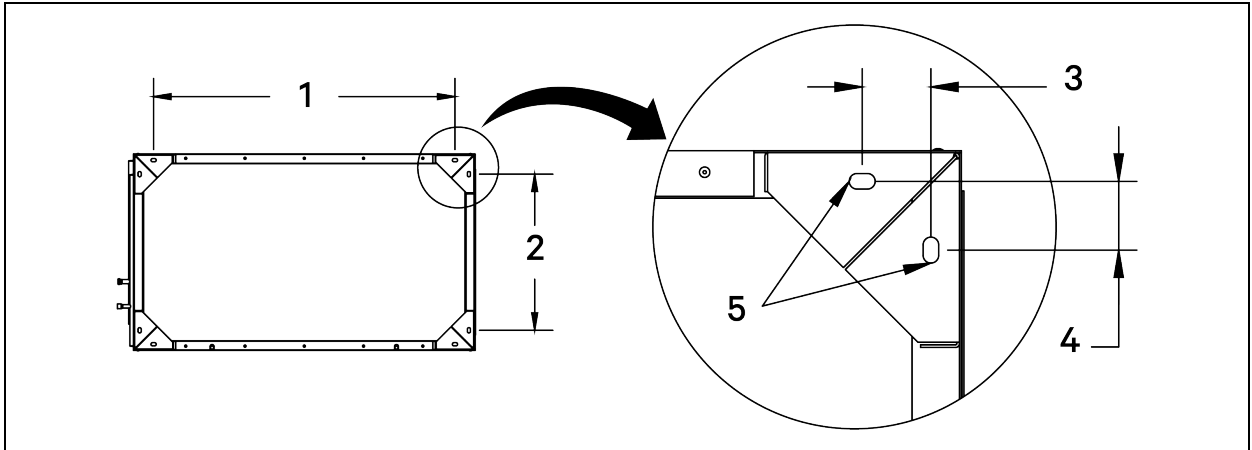
NOTE: A 4000 mm (157.5 in.) clearance is required above the condenser air outlet.

Figure 4.1 Dimensions of Condenser for Vertical Airflow Installation



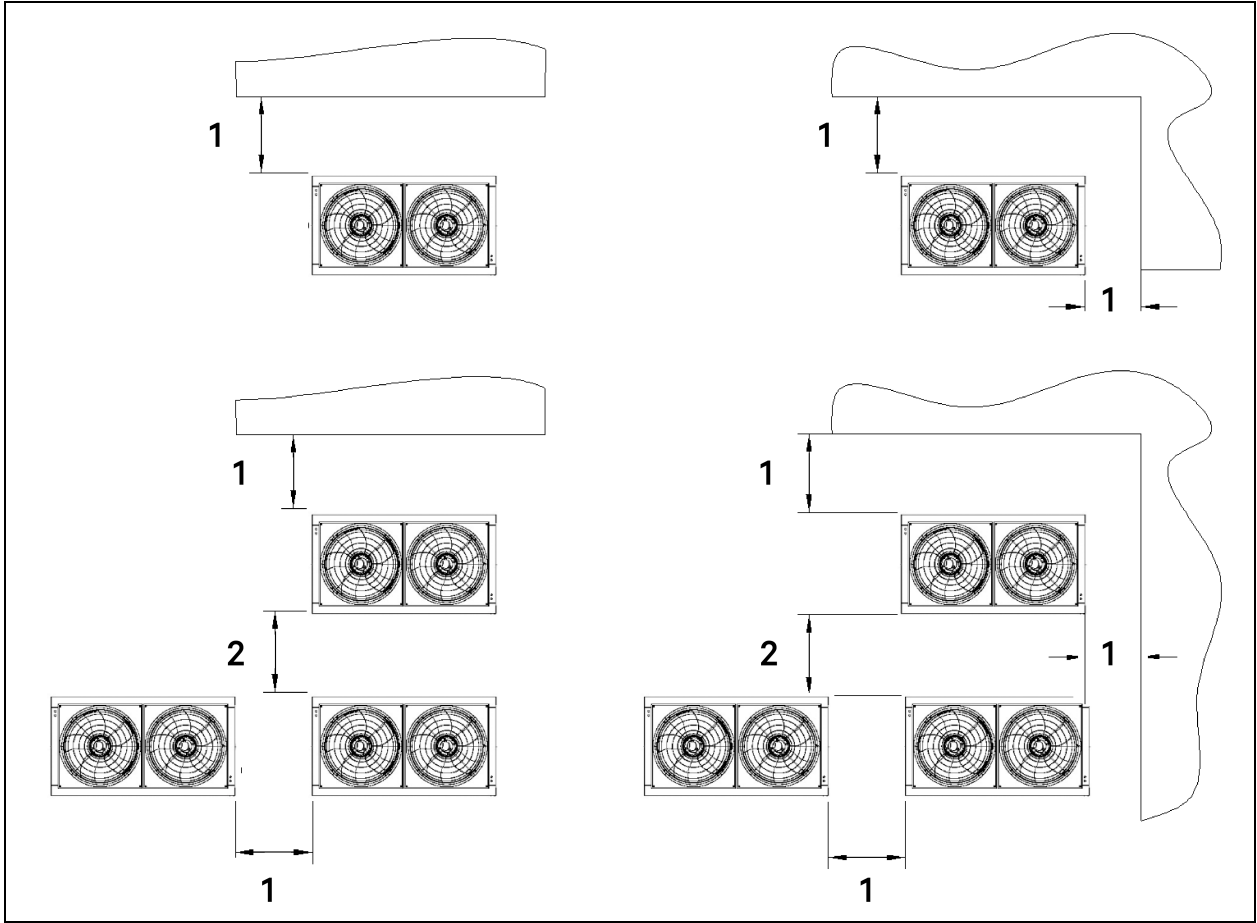
Item	Description mm (In.)
1	1300 (51.2)
2	1020 (40.1)
3	454 (17.9)
4	810 (31.9)
5	745 (29.3)

Figure 4.2 Dimensions of Mounting Base for Vertical Airflow Installation



Item	Description mm (In.)
1	1143 (45)
2	592 (23.2)
3	53 (2.1)
4	53 (2.1)
5	Obround: 20 x 12 (0.79 x 0.47)

Figure 4.3 Vertical Airflow Installation Space Requirements

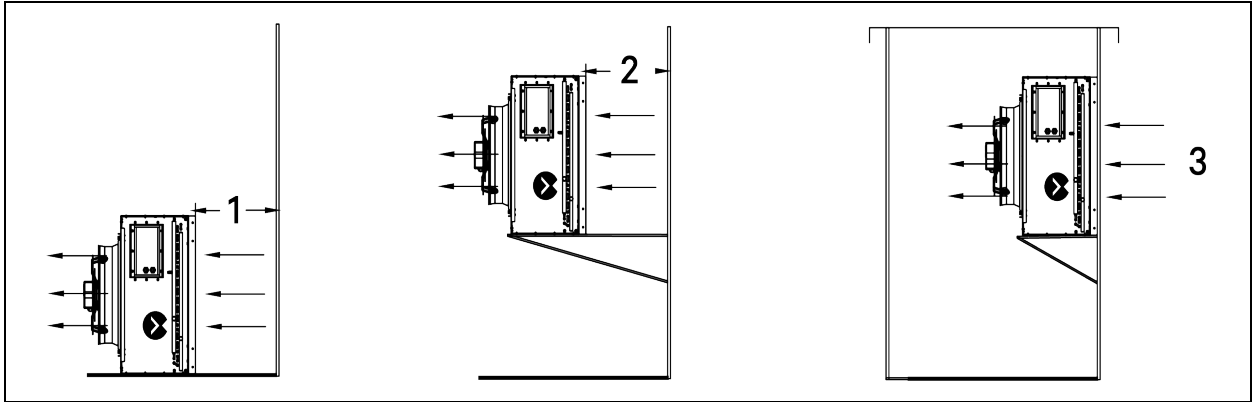


Item	Description mm (in.)
1	915 (36)
2	800 (31.5)

4.2.2 Horizontal Airflow Installation

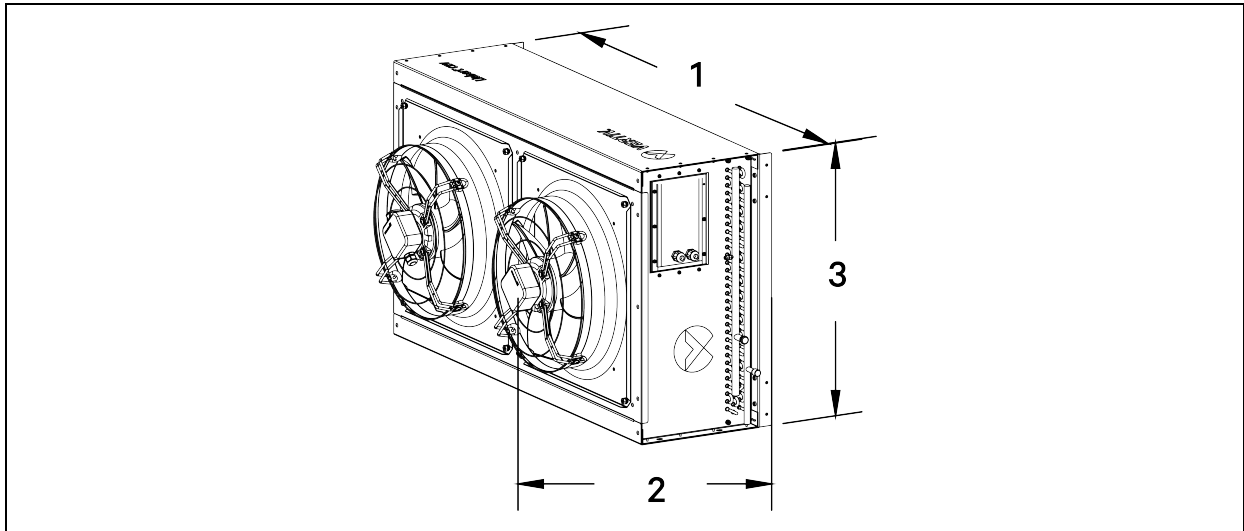
Mount the condenser on suitable other support in accordance with local codes. Secure the unit to the mounting surface using a field supplied bolt in each of the four 10 mm (0.39 in.) holes in sheet metal.

Figure 4.4 Horizontal Airflow Installation Space Requirements



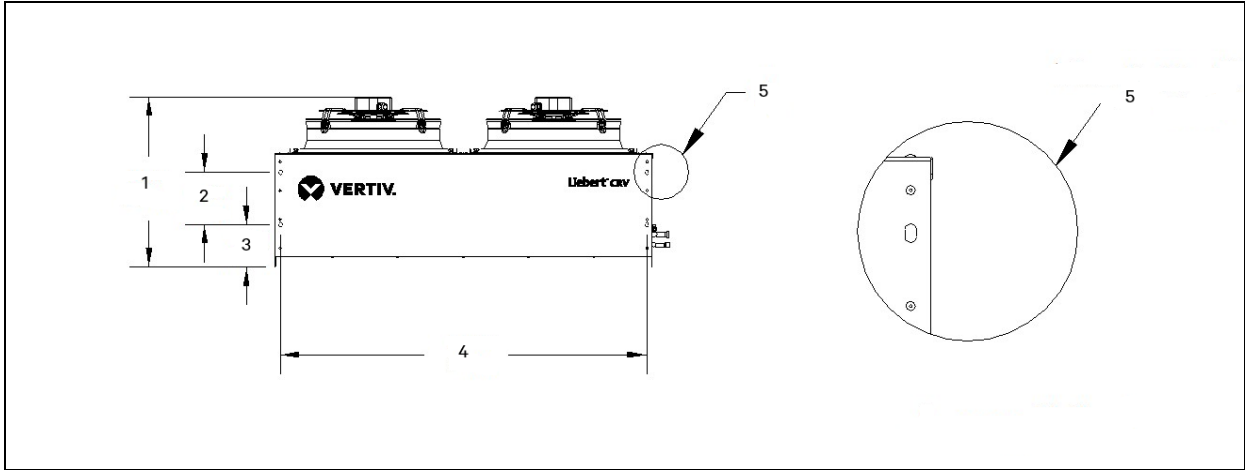
Item	Description mm (in.)
1	Min: 500 (19.7)
2	Min: 300 (11.8)
3	The area of airflow passage should be equivalent to or larger than the area of the frontal surface

Figure 4.5 Dimensions of Condenser for Horizontal Airflow Installation



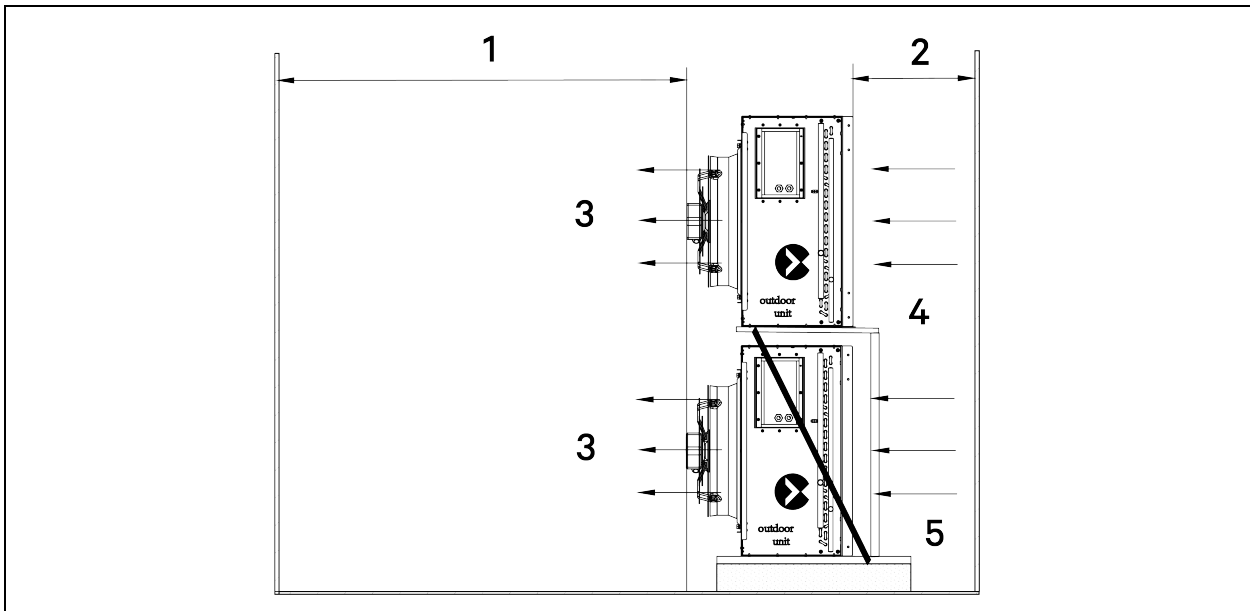
Item	Description mm (in.)
1	1300 (51.2)
2	605 (23.8)
3	745 (29.3)

Figure 4.6 Dimensions of Mounting Base for Horizontal Airflow Installation



Item	Description mm (In.)
1	605 (23.6)
2	181 (17.1)
3	148 (5.8)
4	1260 (49.6)
5	Obround: 16 (0.63) x 10 (0.39.)

Figure 4.7 Multiple Outdoor Units Placed in Overlap Mode



Item	Description
1	4 m (13.1 ft)
2	0.5 m (1.6 ft)
3	Airflow
4	Bracket
5	Minimum height of the base: 50 mm (2.0 in.)

NOTE: Use appropriate angle iron for bracket when two units are installed with one above the other. Use appropriate channel steel for bracket when three units are installed with one above another.

4.3 Installing the Low Ambient Kit

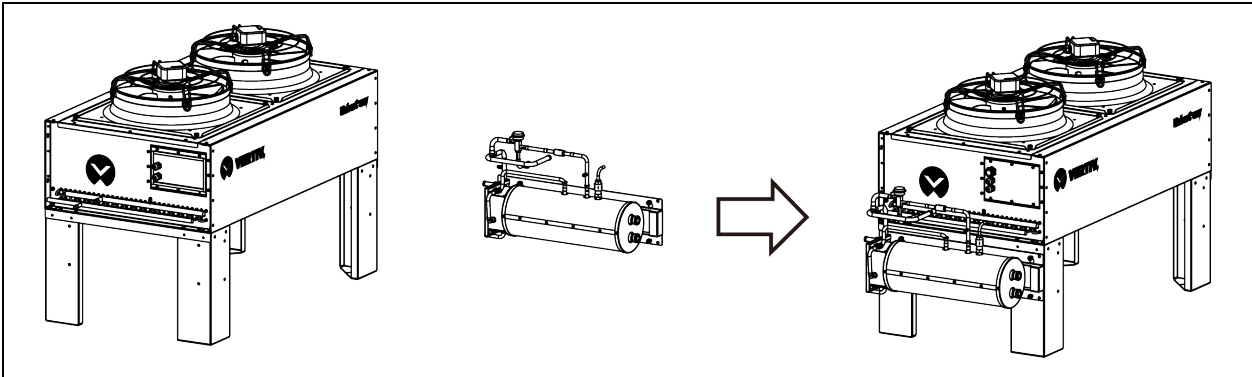
NOTE: Before welding off the cap on the inlet and outlet pipes of the condenser and the low ambient kit, release the protective gas through one Schrader valve on the condenser and three Schrader valves on the low ambient kit.

NOTE: When welding the copper pipe with the inlet and outlet pipes of the condenser and the low ambient kit, wrap a piece of wet cloth around the Schrader valve near the welding position to prevent the valve core from burning out.

Perform the following steps to install the low ambient kit:

1. Before installing the low ambient kit, weld off the cap on the inlet and outlet pipes of the condenser and the low ambient kit.
2. On the condenser stands on the same side of the electrical control box, install two M8 x 40 screws on the upper holes but do not tighten the screws.
3. Mount the low ambient kit on the screws. At this time, the pipe connectors of the low ambient kit and the condenser are coupled. Install the other two M8 x 40 screws on the lower holes and then tighten all four screws.
4. Weld the inlet connectors and the outlet connectors.

Figure 4.8 Installing the Low Ambient Kit



4.4 Connecting Pipelines



WARNING! For systems requiring EU CE compliance, the system installer must provide and install a pressure relief valve in the high side refrigerant circuit that is rated same as the refrigerant high side “Max Allowable Pressure” rating that is marked on the unit serial tag. Do not install a shutoff valve between the compressor and the field installed relief valve. The pressure relief valve must be CE-certified to the EU Pressure Equipment Directive by an EU “Notified Body”.



CAUTION: Before welding the pipeline, all nitrogen of air condition system must be discharged to release system pressure.

NOTE: Isolate piping from building using vibration isolating supports. Prevent the dust, water vapor and solid particles from entering the copper pipes.

NOTE: All the joints of the refrigerating pipes must be silver-brazed.

NOTE: Use a flow of dry nitrogen through the piping during brazing to prevent formation of copper oxide scale inside the piping. When copper is heated in the presence of air, copper oxide forms. PVE oils will dissolve these oxides from inside the copper pipes and deposit them throughout the system, clogging filter driers and affecting other system components.

To identify pipe sizes, refer to SL-70637 Vertiv™ Liebert® CRV CRD10 Row-Based Cooling Unit User Manual.

To identify the installation height of the condenser, refer to SL-70637 Vertiv™ Liebert® CRV CRD10 Row-Based Cooling Unit User Manual.

4.5 Connecting Power Cables



WARNING! Arc flash and electric shock hazard. Can cause serious injury or death. Disconnect all local and remote electric power supplies and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.



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

NOTE: Install a manual, electrical-disconnect switch within 1.6 m (5 ft) of the condenser and in accordance with local codes.

NOTE: The wiring cannot contact hot objects, such as the copper tube and water pipe without insulation, to avoid damaging the insulation layers.

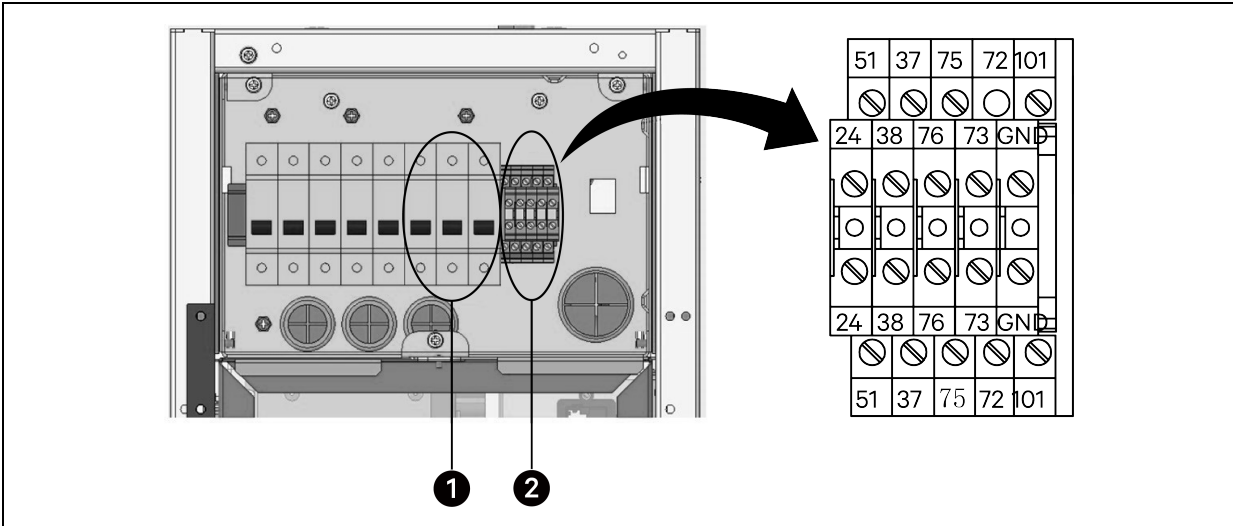
NOTE: The power supply of the equipment should be installed by professional personnel on site in accordance to local codes. If the power supply wires are damaged, to avoid risk, they must be replaced by the professional personnel from the manufacturer, maintenance department or similar department of the manufacturer.

NOTE: The power supply wires for the outdoor unit are L+N+PE. The recommended wire size for the power supply cable is no less than 16 AWG (1.5 mm²). The fan speed control wire size is not less than 22 AWG (0.5 mm²).

4.5.1 Connecting the power cable for the outdoor unit

Power is supplied to the outdoor unit from the indoor unit. Connect one end of the power supply cable and fan speed control cable to the outdoor breaker and corresponding terminals located in the EP-1 of the indoor unit.

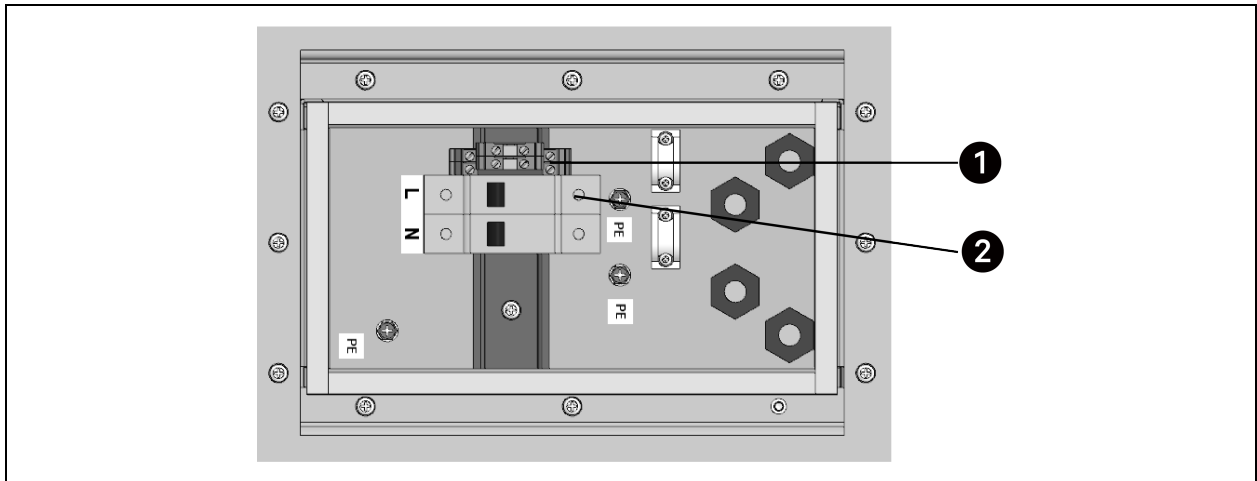
Figure 4.9 Diagram of the Indoor Unit Terminal Blocks



Item	Description
1	Outdoor breaker
2	Terminal block
51, 24	Floor water leak detection
37, 38	Remote shutdown
75, 76	Common alarm
72, 73	Liquid line solenoid valve (LLSV)
101, GND	Condenser fan speed control

Connect the other end of the power supply cable and fan speed control cable to the outdoor breaker and terminals in the electrical box of the outdoor unit. Connect the 10 V and GND terminals in the outdoor unit to the 101 and GND terminals in the indoor unit respectively.

Figure 4.10 Diagram of the Outdoor Unit Power Terminals



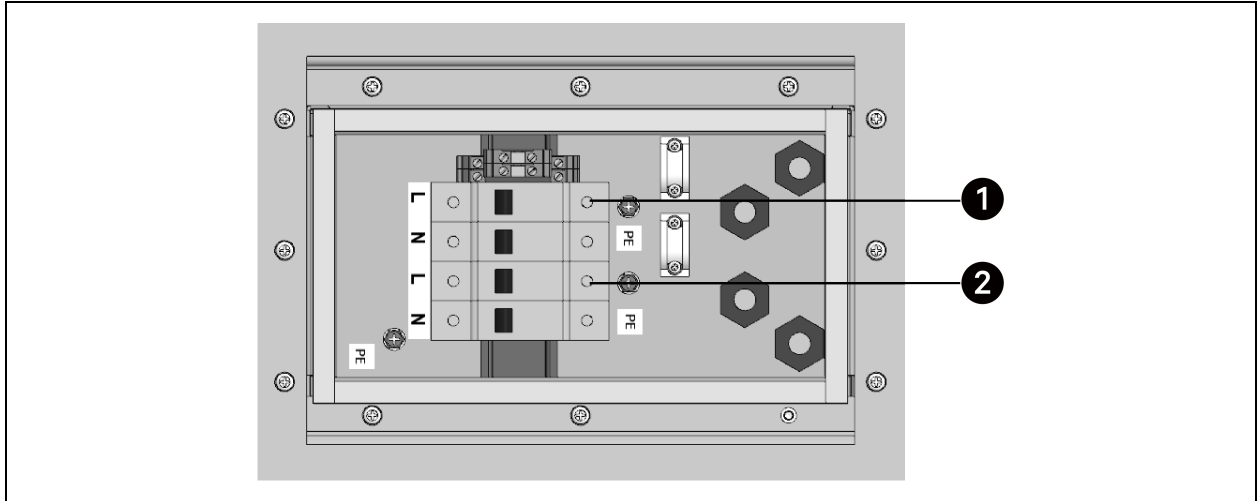
Item	Description
1	Terminals for controlling condenser fan speed
2	Outdoor breaker

4.5.2 Connecting the power cable for the low ambient kit

To connect the power cable for the low ambient kit:

1. Remove the electrical control box panel from the outdoor unit.
2. Take out the electrical control box panel, heater breaker and bus bar from the accessories package.
3. Install the heater breaker and connect it with the outdoor breaker in parallel through the bus bar.
4. Route the heater pad cable through the metal cable gland to the heater breaker.

Figure 4.11 Diagram of the Outdoor Unit and Heater Pad Power Terminals



Item	Description
1	Outdoor breaker
2	Heater breaker

4.6 Charging Refrigerant and Adding Lubricating Oil



WARNING! Risk of over-pressurization of the refrigeration system. Can cause serious injury or death. Can cause explosive discharge of high-pressure refrigerant, loss of refrigerant, environmental pollution, or building and equipment damage. 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 design pressure marked on the unit's nameplate.



CAUTION: Risk of excessive refrigerant line pressure. Can cause equipment damage or injury resulting from tubing and component rupture. Do not close off the refrigerant-line isolation valve for repairs unless a pressure-relief valve is field-installed in the line between the isolation valve and the check valve. The pressure-relief valve must be rated 5% to 10% higher than the system-design pressure. An increase in ambient temperature can cause the pressure of the isolated refrigerant to rise and exceed the system-design pressure rating (marked on the unit nameplate).

Refer to SL-70637 Vertiv™ Liebert® CRV CRD10 Row-Based Cooling Unit User Manual for charging refrigerant and adding lubricating oil.

5 Maintenance and Troubleshooting



WARNING! Arc flash and electric shock hazard. Can cause serious injury or death. Disconnect all local and remote electric power supplies and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.



WARNING! Verify with a voltmeter that power is Off. The unit's controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components still require and receive power even during the "Unit Off" mode of the controller. The factory-supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.



WARNING! Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. Follow all local codes.



WARNING! Risk of electric shock. Can cause serious injury or death. Open all local and remote electric power supply disconnect switches and verify that power is off with a voltmeter before working within any electric connection enclosures. The unit's microprocessor does not isolate power from the unit, even in the "Unit Off" mode. Fan-motor controls can maintain an electric charge for 10 minutes after power is disconnected. Wait 10 minutes after power is verified as off before working within the electric control/connection enclosures.



WARNING! Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



WARNING! Risk of contact with high-speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure.



WARNING! Risk of contact with extremely hot and/or cold surfaces. Can cause injury. Verify that all components have reached a temperature that is safe for human contact or wear appropriate, OSHA-approved 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.

NOTICE

Risk of improper maintenance. Can cause equipment damage. All maintenance must be performed only by authorized properly trained and qualified personnel.

NOTICE

Ignoring safety instructions is dangerous. Soiled parts cause a loss of performance and, for switch or control devices, can lead to the breakdown of the unit performance and operation.

NOTICE

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

NOTICE

The unit contains substances and components hazardous for the environment (electronic components, refrigerating gases and oils). At the end of its useful life, the unit must be dismantled by specialized refrigerating technicians. The unit must be delivered to suitable centers specializing in the collection and disposal of equipment containing hazardous substances.

5.1 Maintenance

5.1.1 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 vibration of wall, earth, or equipment frame. Otherwise reinforce the refrigeration pipes with fastening objects.
2. Check that there is no oil on the accessories of all refrigeration pipes, and make sure that the pipes do not leak.

5.1.2 Heat Exchanger

Perform the following steps for heat exchanger maintenance:

1. Clean the fin of heat exchanger regularly.
2. The best overall condenser coil cleaner to use is plain water or compressed air. If the coil has been maintained and cleaned at regular intervals, water or compressed air is sufficient to remove dirt and debris from the fins. Heavy build up on the exterior of the fins can be removed with a brush. Water pressure from a garden hose and sprayer usually works well. If the installation environment of the condenser does not allow the fins to be cleaned with water, the compressed air may be a better method. The recommended pressure for the air is about 0.3 MPa.
3. Check for damaged or bent fins and straighten them as needed.
4. Avoid snow accumulation around the condenser in winter.

5.1.3 Fan

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

5.2 Troubleshooting

Perform troubleshooting according to the **Table 5.1** below .

Table 5.1 Troubleshooting

Symptom	Possible Cause	Check or Remedy
Condenser will not start	No power to condenser	Check voltage at outdoor breaker
	No speed control signal	Check the signal cable
High pressure alarm	Insufficient condenser air flow	Clear the alien objects from the coil surface or near the air inlet
	Condenser fan does not run	Check fan motors Check if the outdoor unit cable connection is loosened

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Appendices

Appendix A: Technical Support and Contacts

A.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

A.2 Technical Support/Service in Europe, the Middle East and Africa

Europe, the Middle East and Africa: For technical support, please contact your local Vertiv or Partner office. You can also contact us using the contact details on our website: <https://www.vertiv.com/en-emea/contacts2>

A.3 Locations

United States

Vertiv Headquarters

1050 Dearborn Drive

Columbus, OH, 43085, 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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