



Liebert® XDU1350

Coolant Distribution Unit

**Installation and Commissioning Guide**

The information contained in this document is subject to change without notice and may not be suitable for all applications. While every precaution has been taken to ensure the accuracy and completeness of this document, Vertiv assumes no responsibility and disclaims all liability for damages resulting from use of this information or for any errors or omissions.

Vertiv recommends installing a monitored fluid detection system that is wired to activate the automatic closure of field-installed coolant fluid supply and return shut off valves, where applicable, to reduce the amount of coolant fluid leakage and consequential equipment and building damage. 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 relating 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.

# TABLE OF CONTENTS

<b>1 Important Safety Information</b> .....	<b>1</b>
1.1 General .....	5
1.2 Installation/Handling .....	6
1.3 Application .....	6
1.4 Warranty .....	6
1.5 Electrical Connection .....	6
1.6 Replacement Parts .....	7
1.7 Waste Disposal .....	7
1.8 Documentation .....	7
<b>2 Agency</b> .....	<b>9</b>
2.1 Product Standards and Approvals .....	9
2.2 ROHS 2 Compliance .....	9
<b>3 Product Description</b> .....	<b>11</b>
3.1 General .....	11
3.2 Vertiv™ Liebert® XDU1350 Model Number Nomenclature .....	11
3.3 Product Views .....	13
<b>4 Technical Data</b> .....	<b>17</b>
4.1 General .....	17
4.2 Pipe Connections .....	19
4.3 Circuit Fluid Volumes .....	20
4.4 Electrical Data .....	21
4.5 Noise .....	21
<b>5 Installation</b> .....	<b>23</b>
5.1 Unloading and Positioning .....	23
5.2 Piping .....	25
5.2.1 Primary Facility Connections .....	25
5.2.2 Secondary Circuit Connections .....	27
5.3 Electrical .....	31
5.3.1 Power Wiring .....	31
5.3.2 Controls Wiring .....	33
5.3.3 Communications Wiring .....	33
5.3.4 Group Control .....	35
5.4 Pre-Commissioning Checks .....	36
5.4.1 Site Check .....	36
5.4.2 Mechanical Installation Check .....	37
5.4.3 Electrical Installation Check .....	37
5.4.4 Primary Liquid (Facility) Specification .....	40
5.4.5 Secondary Liquid Specification .....	41

- 6 Commissioning ..... 43**
- 6.1 Primary Circuit ..... 43
  - 6.1.1 Primary Pipework Installation ..... 43
  - 6.1.2 Facility Water Supply ..... 43
  - 6.1.3 Primary Control Valves ..... 43
  - 6.1.4 Primary Circuit Filling ..... 44
  - 6.1.5 Primary Flow Setup ..... 44
- 6.2 Secondary Circuit ..... 44
  - 6.2.1 Secondary Pipework Connections ..... 44
  - 6.2.2 Secondary Circuit Filling ..... 44
- 6.3 Unit Configuration ..... 45
- 6.4 Unit Low Speed Circulation ..... 46
- 6.5 Overrides and Full Speed Operation ..... 46
- 6.6 Pump Rotation ..... 48
- 6.7 Full Manual Control ..... 48
- 6.8 Subsequent Filling ..... 49
- Appendices ..... 53**
- Appendix A: Technical Support and Contacts ..... 53
- Appendix B: Pipe Schematic Vertiv™ Liebert® XDU1350 ..... 55
- Appendix C: Modbus Register Table ..... 57
- Appendix D: Warranty Details ..... 61
- Appendix E: Notes ..... 63
- Appendix F: Disposal Information ..... 65
- Appendix G: Vertiv™ Liebert® XDU1350 BACnet Points List ..... 67

# 1 Important Safety Information

## Save These Instructions

This manual contains important instructions that should be followed during operation and maintenance of the Vertiv™ Liebert® XDU1350.



**WARNING!** Arc flash and electric shock hazard. Can cause serious injury or death. Building and equipment damage may also result. 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.

Verify with a voltmeter that power is Off. The Vertiv™ Liebert® iCOM™ 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 Liebert® iCOM™ 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.

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. Building and equipment damage may also result. 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 Liebert® iCOM™ 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 Liebert® iCOM™ controller.

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 short circuits and electric shock. Can cause serious injury or death. Building and equipment damage can result from cut insulation or damaged wires. Can cause overheated wiring, smoke, fire, activation of fire suppression systems and EMS personnel, and loss of power to fans. Verify that all wiring connections are tight and that all wiring is contained within the junction box prior to closing and securing the cover.

Insert CSA-certified or UL-listed bushings into holes and/or knockouts used to route wiring through metal panels to protect the wire insulation from contact with sheet metal edges.



**WARNING!** Risk of improper wire sizing/rating and loose electrical connections causing overheated wire and electrical connection terminals resulting in smoke or fire. Can cause serious injury or death. Building and equipment damage may also result. 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.



**WARNING!** Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. 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 who are wearing appropriate, OSHA-approved PPE.



**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 indicator. Shipping weights and unit weights are listed in the tables in [General](#) on page 17 . Use the center of gravity indicators on the unit to determine the position of the slings.



**WARNING!** Risk of top-heavy unit falling over when improperly lifted or moved. Can cause serious injury or death. Building and equipment damage may also result. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation. Unit weights are specified in [General](#) on page 17 .



**WARNING!** Risk of unsecured unit rolling off pallet. Can cause serious injury or death. Building and equipment damage may also result. The unit is on casters. Ensure that the unit and pallet are located on a flat surface before loosening the hardware securing the unit to its shipping pallet.



**CAUTION:** Risk of contact with extremely hot 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 with 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.



**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, remove packaging from or prepare the unit for installation.



**CAUTION:** Risk of improper handling heavy and lengthy parts. Can cause injury. Building and equipment damage may also result. Cabinet panels can exceed 5 ft. (1.5 m) in length and weigh more than 35 lb (15.9 kg). Follow relevant OSHA lifting recommendations and consider using a two-person lift for safe and comfortable removal and installation of cabinet panels. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to remove or install cabinet panels.



**CAUTION:** Risk of improper piping installation, leak checking, fluid chemistry and fluid maintenance. Can cause injury. Building and equipment damage may also result. 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 who are wearing appropriate, OSHA-approved PPE.

#### 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 +/- 5% of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

See transformer label for primary tap connections. Installer will need to change transformer primary taps if applied unit voltage is other than pre-wired tap voltage.

#### NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward pump rotation and unit damage. Service technicians should use a gauge set on the system during the initial start up to verify that the three-phase power is connected properly. Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that the pump rotates in the proper direction. Incoming power must be properly phased to prevent pump from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that the power connections were made correctly. We also recommend verifying discharge and suction pressures during start up to ensure that the pumps are running in the correct direction.

## NOTICE

Risk of piping-system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Heat exchangers and piping systems are at high risk of freezing and premature piping corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil and piping corrosion. When the cooling unit or piping may be exposed to freezing temperatures, charge the system with coolant fluid based on the coldest ambient design temperature. Automotive antifreeze is unacceptable and must NOT be used in any fluid system. Use only coolant fluid solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

The system coolant fluid must be analyzed by a competent fluid-treatment specialist before start up to establish the inhibitor and antifreeze solution requirement and evaluated at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

The fluid complexity and variants of required treatment programs make it extremely important to obtain the advice of a competent and experienced fluid-treatment specialist and follow a regularly scheduled coolant-fluid system-maintenance program.

Fluid chemistry varies greatly as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components.

The chemistry of the coolant fluid used must be considered, because some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The coolant fluid must be treated and circulating through the system continuously to prevent the buildup of deposits and/or growth of sulfate reducing bacteria. Proper inhibitor maintenance must be performed to prevent corrosion of the system.

Consult fluid manufacturer for testing and maintenance of inhibitors.

Commercial-grade coolant fluid is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the coolant fluid from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

Vertiv recommends installing a monitored fluid-detection system that is wired to activate the automatic-closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant-fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

## NOTICE

Risk of no-flow condition. Can cause equipment damage. Do not leave the water/coolant fluid-supply circuit in a no-flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of the tubes. Keep unit switched On and water/ coolant fluid-supply circuit system operating continuously.

## NOTICE

Risk of leaking chilled water lines. Can cause equipment and building damage. Lines and joints must be inspected regularly. Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in severe property damage and loss of critical data center equipment. Do not locate unit directly above any equipment that could sustain water damage.

Vertiv recommends installing monitored leak detection equipment for the unit and supply and return lines.

**NOTICE**

Risk of a catastrophic water circuit rupture. Can cause expensive building and equipment damage.

Install an overflow drain pan under the unit with a monitored leak detection system in the pan and shutoff valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shutoff valves should be spring return and must be rated for a close-off pressure that is the same as or higher than the supply water pressure. If it is not possible to install an overflow drain pan, then a monitored leak detection system should be installed in the base of the unit or under the unit to actuate the shutoff valves immediately on a leak detection signal.

The overflow drain pan should have a drain line connected to it that flows to a floor drain or maintenance sink in case of a shutoff valve or leak detection system malfunction.

**NOTICE**

Risk of passageway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a passageway while on or off 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 damage from forklift. Can cause unit damage. Keep tines of the forklift level and 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, indoors and protected from dampness, freezing temperatures and contact damage.

**NOTICE**

Risk of improper control circuits. Can cause equipment damage.

When using jumpers for troubleshooting, always remove jumpers when maintenance is complete. Jumpers left connected could override controls and cause equipment damage.

**1.1 General**

Mechanical and electrical equipment such as coolant distribution units present potential mechanical and electrical hazards. All safety, installation, operation, and maintenance instructions must be adhered to. Any work on or use of the equipment must only be carried out by technically competent personnel who are fully trained. This product is designed to minimize all potential hazards by restricting access through unit casings, doors, and covers while equipment is operational.

Before any maintenance work being carried out, ensure:

1. Equipment is switched OFF.
2. Equipment and controls are disconnected from the electrical supply.
3. All rotating parts such as pumps and 3-way valve have come to rest.

If in any doubt over anything regarding safety, installation, operation or maintenance instructions, it is essential that the manufacturer, their agent or appointed representative is consulted for clarification and advice.

## 1.2 Installation/Handling



**WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. 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 who are wearing appropriate, OSHA-approved PPE.**

Installation and operation must be conducted in accordance with local and national regulations and normal codes of good practice. When moving or lifting the product, caution must be observed to ensure the safety of personnel. Only the appropriate lifting equipment must be used.

## 1.3 Application

This product is to be used indoors only and must be only used for the application it was designed for. This product must not be used in a hazardous environment.

## 1.4 Warranty

Failure to comply with the Vertiv installation, maintenance, and operation instructions may affect the reliability and performance of the unit and invalidate any warranty.

## 1.5 Electrical Connection



**WARNING! Arc flash and electric shock hazard. Can cause serious injury or death. Building and equipment damage may also result. 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.**

**Verify with a voltmeter that power is Off. The Vertiv™ Liebert® iCOM™ 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 Liebert® iCOM™ 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.**

**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.**

Electrical connections should be carried out in accordance with local and national regulations by a qualified electrician. Never make any electrical connections inside, or to the unit unless the electricity supply has been switched OFF at the disconnect (isolator).

## 1.6 Replacement Parts

Any parts replaced during maintenance or servicing must be the same specification as those being replaced and should only be obtained from Vertiv.

The use of incorrect replacement parts may affect the operation or reliability of the unit and invalidate any warranty. Please contact your local Vertiv representative for Vertiv engineered parts, check <https://www.Vertiv.com/en-us/support/> or call 1-800-543-2778.

## 1.7 Waste Disposal

Any waste or single use materials must be disposed of in a responsible manner and in strict adherence to local and national environmental regulations. For details, consult local environmental agencies.

## 1.8 Documentation

Operation and maintenance documentation together with commissioning, maintenance or service records must remain with the unit always.

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## 2 Agency

### 2.1 Product Standards and Approvals

Vertiv products installed and operated in compliance with this document, the operation and maintenance guide and installation and commissioning guide, conform to the Low Voltage directive 2014/35/EU, the EMC directive 2014/30/EU and the Pressure Equipment directive 2014/68/EU. As manufactured, Vertiv products are designed to comply with an IP21 rating. This product is cUL listed for the appropriate voltage models and certificates will be made available on request (cUL certificate pending).



### 2.2 ROHS 2 Compliance

Vertiv certifies that all products manufactured and supplied by Vertiv are fully RoHS compliant in accordance with EU RoHS Directives 2002/95/EC – 2011/65/EU and the Council of 8 June 2011 directives, unless specified otherwise.



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## 3 Product Description

### 3.1 General

This document describes the physical and electrical characteristics of the Vertiv™ Liebert® XDU1350 for installation and commissioning purposes.

The Liebert® XDU1350 contains a Secondary closed loop circuit that provides a supply of cooling water to IT equipment, either through indirect cooling (e.g. rack mounted rear door heat exchangers), or direct cooling (e.g. cold plates at chip level).

The Secondary circuit is a low pressure sealed system with the heat removed from the high heat density areas of IT equipment rejected to an external cooled water source (Primary circuit) via a low pressure drop plate heat exchangers.

The Secondary circuit ensures that the cooling fluid in a data center environment can be kept to a minimum volume, is closely controlled for flow, pressure, and temperature (with condensation control) and can be accurately maintained for fluid quality (with filtration and additives).

The Primary cooling source can be a chilled water system (either dedicated or from building system), fluid cooler, cooling tower or dry air cooler, depending on the desired Secondary temperature and heat transfer duty (refer to the Application and Planning Guide for more information).

### 3.2 Vertiv™ Liebert® XDU1350 Model Number Nomenclature

The Liebert® XDU1350 can be configured for 2 x or 3 x (redundant) pumps, voltage options to suit most global locations. Secondary filtration, Primary Top/Bottom connections and Secondary Top/Bottom connections. The unit product code can be configured as shown below in **Table 3.1** below .

**Table 3.1 Liebert® XDU1350 Model Number**

Digit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
Model #	X	D	U	1	3	5	0	A	A	0	0	A	2	B	B	0	0	0	0	0	0	1	2	3	4	E

**Table 3.2 Liebert® XDU1350 Model Number Definitions**

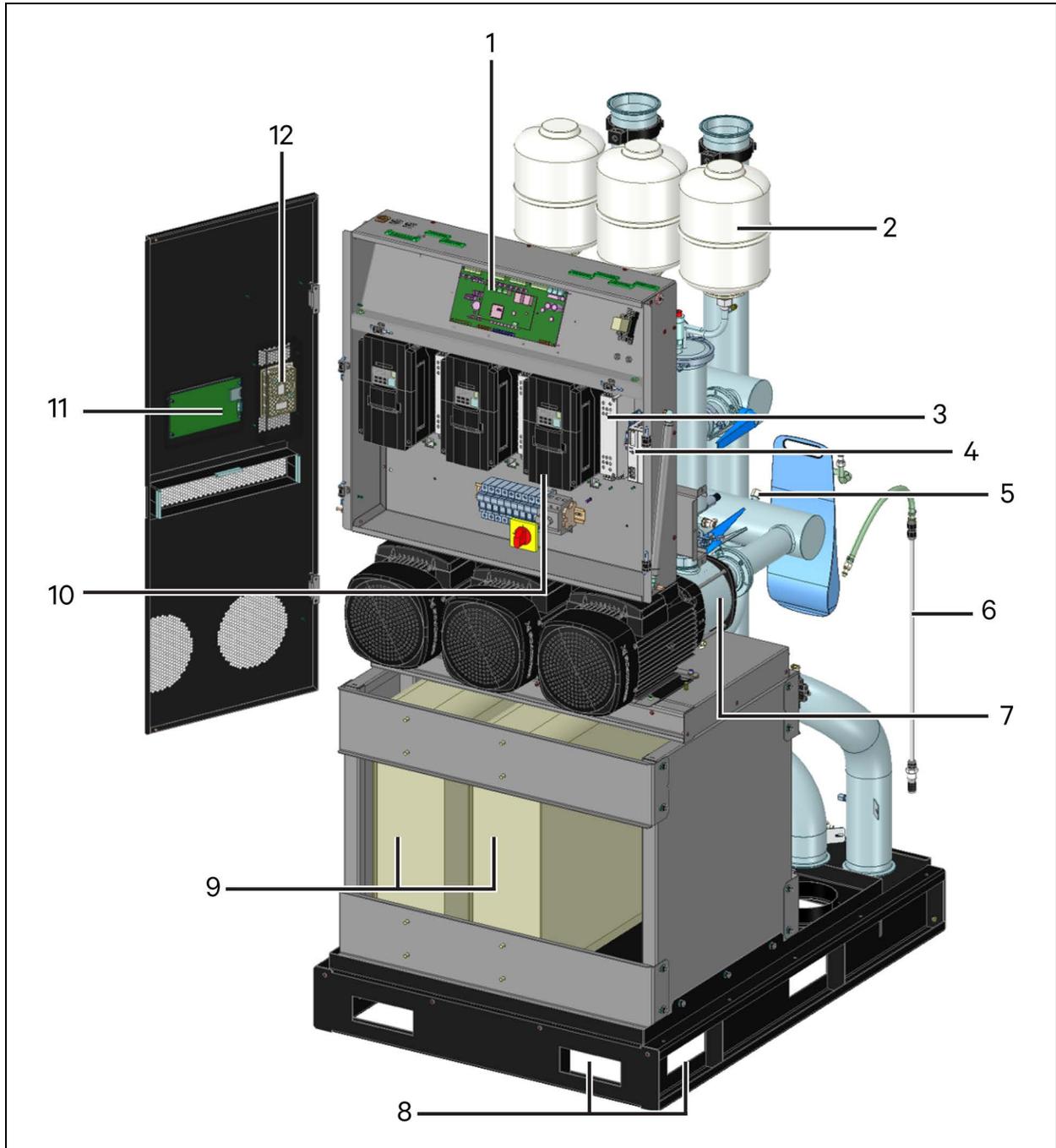
Digit	Description
Digit 1-7, Model	Liebert® XDU1350
Digit 8, Revision	A
Digit 9, Voltage	A = 460V/3PH/60Hz
Digit 10, ATS	0 = None A = ATS 440/480V
Digit 11, Communication	0 = Standard (Modbus) 1 = Standard with BACnet Gateway
Digit 12, Primary Filtration	0 = None
Digit 13, Secondary Filtration	0 = None (includes 6 bar relief) 2 = Fitted (50µ) (includes 3 bar relief)

**Table 3.2 Liebert® XDU1350 Model Number Definitions (continued)**

Digit	Description
Digit 14, Primary Connection	T = Top Connection B = Bottom Connection
Digit 15, Secondary Connection	T = Top Connection Kit B = Bottom Connection Kit
Digit 16, Manifolding	0 = None
Digit 17	Open
Digit 18	Open
Digit 19	Open
Digit 20	Open
Digit 21-24, Factory Configuration	-
Digit 25, Configuration Code Digit	A-Z = Standard Configuration (excluding S) S = Special Feature Authorization

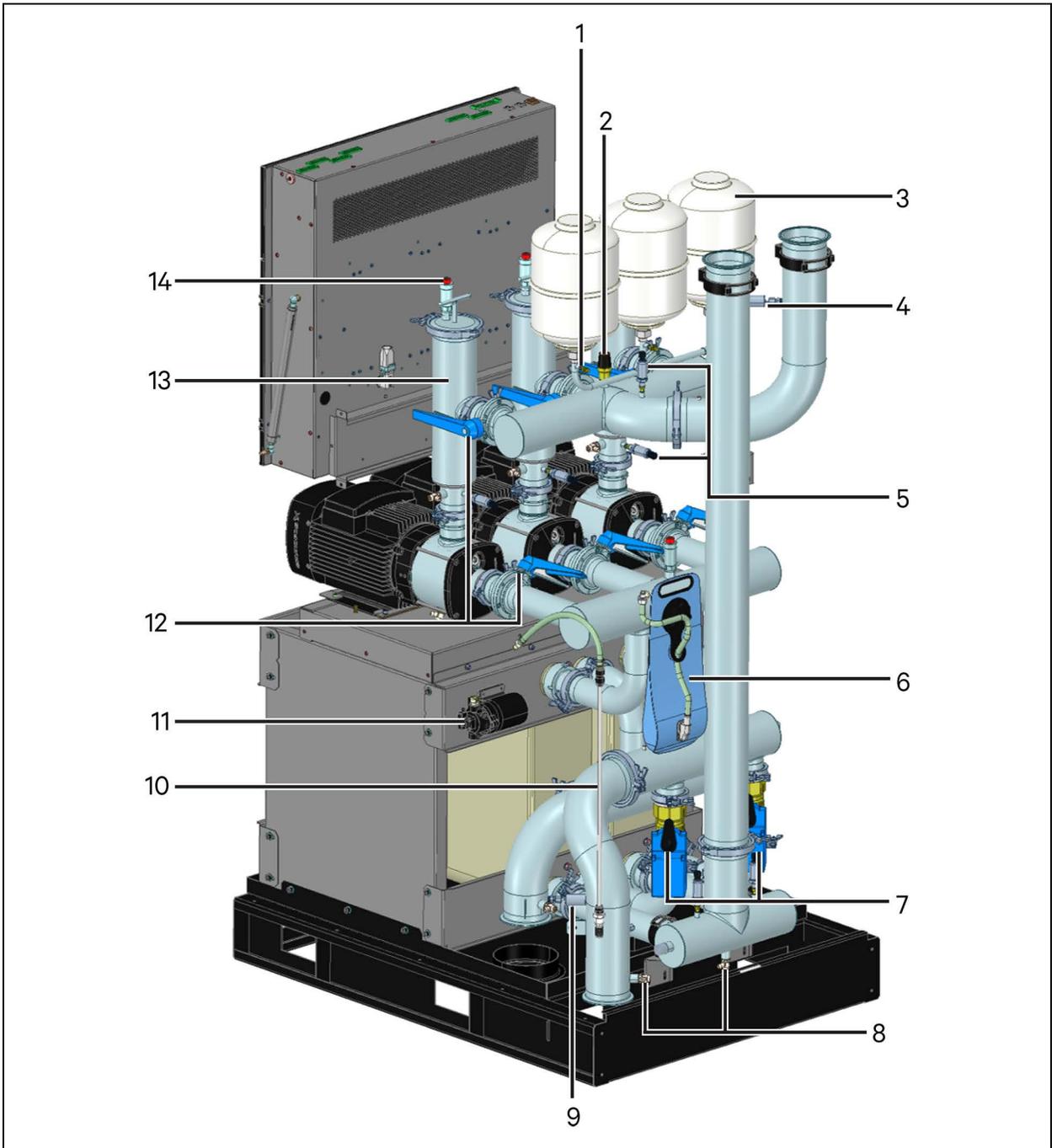
### 3.3 Product Views

Figure 3.1 Front View of Vertiv™ Liebert® XDU1350 (without panels)



Item	Description
1	Controller/processor board
2	Expansion vessels
3	EMC filters
4	Power supply
5	Level sensors
6	Filling wand
7	Secondary pumps
8	Front and side forklift access
9	Plate heat exchangers
10	Pump inverter drivers
11	Controller touchscreen (mounted to front door)
12	Room temperature and RH sensor

Figure 3.2 Rear View of Vertiv™ Liebert® XDU1350 (with bottom exit Primary and Secondary tails)



Item	Description
1	Manual air vents (fitted below each expansion vessel)
2	Pressure relief valve
3	Expansion vessels
4	Secondary flow meter
5	Pressure sensors
6	Flexible make-up container
7	Primary cooling valves (2-way with manual override)
8	Drain valves
9	Primary flow meter
10	Filling wand
11	Fill pump
12	Filter/pump isolation valves
13	Secondary filters
14	Auto air vent (fitted to each filter housing & pump inlet manifold)

## 4 Technical Data

### 4.1 General

Figure 4.1 Vertiv™ Liebert® XDU1350 (with or without factory-installed ATS inside unit)

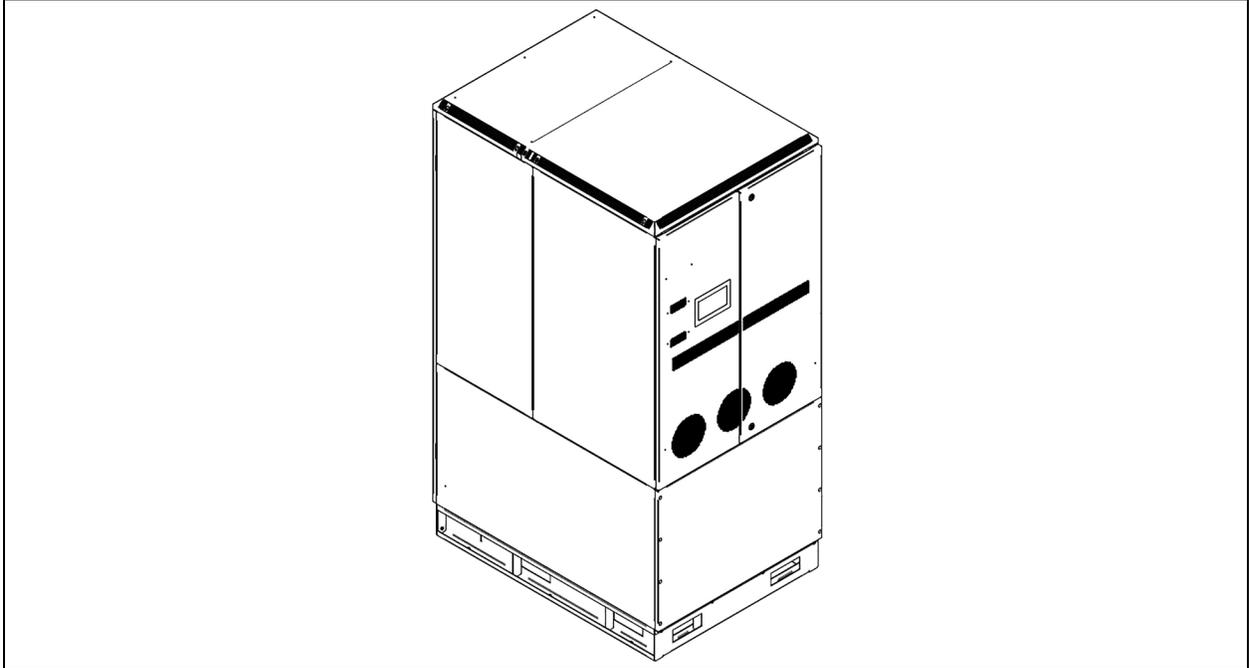


Table 4.1 Dimensions

Base Unit	Width		Depth		Height	
	in.	mm	in.	mm	in.	mm
Maximum	35.4	900	48.9	1242	81.5	2070
With ATS maximum	35.4	900	48.9	1242	81.5	2070

Table 4.2 Shipping

Base Unit	Width		Depth		Height	
	in.	mm	in.	mm	in.	mm
Maximum	40.9	1040	54.6	1387	90.7	2305
With ATS maximum	40.9	1040	54.6	1387	90.7	2305

**Table 4.3 Weight**

Base Unit	Dry		Operating		Shipping	
	lbs.	kg	lbs.	kg	lbs.	kg
Maximum	1509	684	1930	875	1919	870
With ATS maximum	1544	700	1965	891	1954	886

## 4.2 Pipe Connections



**CAUTION: Risk of improper piping installation, leak checking, fluid chemistry and fluid maintenance. Can cause injury. Building and equipment damage may also result. 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 who are wearing appropriate, OSHA-approved PPE.**

### NOTICE

Risk of piping-system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Heat exchangers and piping systems are at high risk of freezing and premature piping corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil and piping corrosion. When the cooling unit or piping may be exposed to freezing temperatures, charge the system with coolant fluid based on the coldest ambient design temperature. Automotive antifreeze is unacceptable and must NOT be used in any fluid system. Use only coolant fluid solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

The system coolant fluid must be analyzed by a competent fluid-treatment specialist before start up to establish the inhibitor and antifreeze solution requirement and evaluated at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

The fluid complexity and variants of required treatment programs make it extremely important to obtain the advice of a competent and experienced fluid-treatment specialist and follow a regularly scheduled coolant-fluid system-maintenance program.

Fluid chemistry varies greatly as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components.

The chemistry of the coolant fluid used must be considered, because some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The coolant fluid must be treated and circulating through the system continuously to prevent the buildup of deposits and/or growth of sulfate reducing bacteria. Proper inhibitor maintenance must be performed to prevent corrosion of the system.

Consult fluid manufacturer for testing and maintenance of inhibitors.

Commercial-grade coolant fluid is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the coolant fluid from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

Vertiv recommends installing a monitored fluid-detection system that is wired to activate the automatic-closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant-fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

**NOTICE**

Risk of no-flow condition. Can cause equipment damage. Do not leave the water/coolant fluid-supply circuit in a no-flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of the tubes. Keep unit switched On and water/coolant fluid-supply circuit system operating continuously. In multiple unit teams, allow standby units to enter the rotation automatically or schedule regular manual rotations.

**NOTICE**

Risk of leaking chilled water lines. Can cause equipment and building damage.

Lines and joints must be inspected regularly. Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in severe property damage and loss of critical data center equipment. Do not locate unit directly above any equipment that could sustain water damage.

Vertiv recommends installing monitored leak detection equipment for the unit and supply and return lines.

**NOTICE**

Risk of a catastrophic water circuit rupture. Can cause expensive building and equipment damage.

Install an overflow drain pan under the unit with a monitored leak detection system in the pan and shutoff valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shutoff valves should be spring return and must be rated for a close-off pressure that is the same as or higher than the supply water pressure. If it is not possible to install an overflow drain pan, then a monitored leak detection system should be installed in the base of the unit or under the unit to actuate the shutoff valves immediately on a leak detection signal.

The overflow drain pan should have a drain line connected to it that flows to a floor drain or maintenance sink in case of a shutoff valve or leak detection system malfunction.

Pipe connections for both Primary and Secondary circuits are made at the rear of the cabinet and can be either top or bottom exit according to how the unit has been specified.

**Table 4.4 Sanitary Flanges**

Primary (facility) circuit:	4 in. (DN100) sanitary flanges, top or bottom exit
Secondary circuit:	4 in. (DN100) sanitary flanges, top or bottom exit

**4.3 Circuit Fluid Volumes**

Pipe connections for both Primary and Secondary circuits are made at the rear of the cabinet and can be either top or bottom exit according to how the unit has been specified.

Primary (facility) circuit:	16.19 gal. (61.3 L) basic
Options (additional volume added to basic volume):	1.87 gal. (7.1 L) for bottom exit tails
	5.7 gal. (21.6 L) for top exit tails
Secondary circuit:	21.5 gal. (81.6 L)
Options (additional volume added to basic volume):	1.32 gal. (5.0 L) for filters
	4.12 gal. (15.6 L) for bottom exit tails
	5.6 gal. (21.2 L) for top exit tails

## 4.4 Electrical Data

Table 4.5 Supported Power Supplies

Voltage	FLA	WSA	OPD
480*	31.6 A	65 A	80 A
Installed load	26.3 kVA (max.)		
Typical Power	20.2 kW		
Tolerance on three phase power is 208 V (+/- 5%), 60 Hz (+/- 3 Hz)			

## 4.5 Noise

Sound power level at 3 m: < 55dBA

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## 5 Installation

### 5.1 Unloading and Positioning



**WARNING!** Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. 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 who are wearing appropriate, OSHA-approved PPE.



**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. Shipping weights and unit weights are listed in the tables in [General](#) on page 17 .



**WARNING!** Risk of top-heavy unit falling over when improperly lifted or moved. Can cause serious injury or death. Building and equipment damage may also result. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation. Unit weights are specified in [General](#) on page 17 .



**WARNING!** Risk of unsecured unit rolling off pallet. Can cause serious injury or death. Building and equipment damage may also result. The unit is on casters. Ensure that the unit and pallet are located on a flat surface before loosening the hardware securing the unit to its shipping pallet.



**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, remove packaging from or prepare the unit for installation.



**CAUTION:** Risk of improper handling heavy and lengthy parts. Can cause injury. Building and equipment damage may also result. Cabinet panels can exceed 5 ft. (1.5 m) in length and weigh more than 35 lb (15.9 kg). Follow relevant OSHA lifting recommendations and consider using a two-person lift for safe and comfortable removal and installation of cabinet panels. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to remove or install cabinet panels.

#### NOTICE

Risk of passageway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a passageway while on or off 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 damage from forklift. Can cause unit damage. Keep tines of the forklift level and 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, indoors and protected from dampness, freezing temperatures and contact damage.

On arrival at site, the Vertiv™ Liebert® XDU1350 crate should be placed on a level solid surface to safely unload the unit from the crate.

Check crate for any signs of external transit damage (any serious damage must be reported to manufacturer and shipper immediately, prior to unpacking).

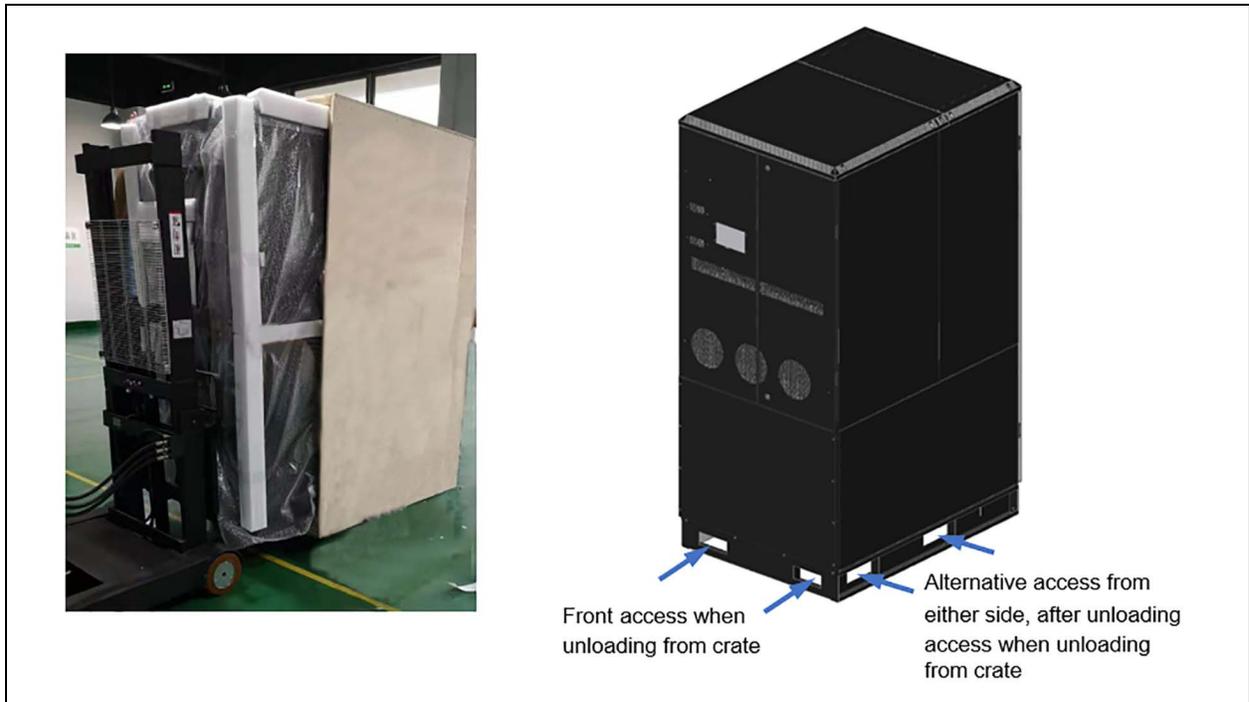
The crate has been designed to allow forklift access when the front panel of the crate has been removed. Forklift access slots are provided in the bottom panel as shown (see **Figure 5.1** below ). The top and sides of the crate may also be removed for improved access if required.



**CAUTION: The Liebert® XDU1350 is a heavy piece of equipment and a minimum of two operatives will be required to carry out the unloading task safely.**

**NOTE: If positioned on a raised floor, adequate under floor supports should be installed to bear the weight of the unit.**

**Figure 5.1 Unloading Liebert® XDU1350 Unit from Crate**



Once at floor level, the protective bubble wrap should be removed, and the unit inspected for any transit damage – any damage found must be reported to the manufacturer immediately and prior to installation.

The Liebert® XDU1350 must be maneuvered into position with the aid of a forklift. Once in its final location, the unit may be secured to the floor if required using the bolt holes provided on the base, along each side. The keys for front and rear doors are supplied in a bag tied to the inside of the front door.

A minimum space of 19 inches (475 mm) should be allowed at the front and rear of the unit to allow the access doors to be fully opened.

## 5.2 Piping

The Vertiv™ Liebert® XDU1350 is intended to be positioned on a smooth, level floor, ideally a raised floor (if bottom exit pipework) with at least 20 inches (500 mm) clear under floor space for a manifold system to IT equipment. If the Liebert® XDU1350 has bottom exit pipework, provision should be made to cut away the floor tiles as required to allow pipework to run to/from the XDU1350 under the floor.

Overhead field piping should be fitted by the installer with high point air vents to remove air during filing and commissioning. These may be manual or automatic style vents. Automatic vents should not be placed in lines overhead of cabinets containing sensitive electronics or other electrical equipment.

External isolation valves should be fitted by the installer to both supply and return pipes, as close as possible to the Liebert® XDU1350 for maintenance purposes and care should be taken that all inter-connecting pipework to/from the XDU1350 is adequately supported, as the XDU1350 is not designed for any external pipe loads. If the unit is to be installed in a seismic location, then suitable flexible connections should be fitted as determined by engineer of record.

### 5.2.1 Primary Facility Connections



**CAUTION: Risk of improper piping installation, leak checking, fluid chemistry and fluid maintenance can cause equipment damage and personal injury. 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 who are wearing appropriate, OSHA-approved PPE.**

#### NOTICE

Risk of leaking chilled water lines. Can cause equipment and building damage. Lines and joints must be inspected regularly. Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in severe property damage and loss of critical data center equipment. Do not locate unit directly above any equipment that could sustain water damage. Vertiv recommends installing monitored leak detection equipment for the unit and supply and return lines.

#### NOTICE

Risk of a catastrophic water circuit rupture. Can cause expensive building and equipment damage.

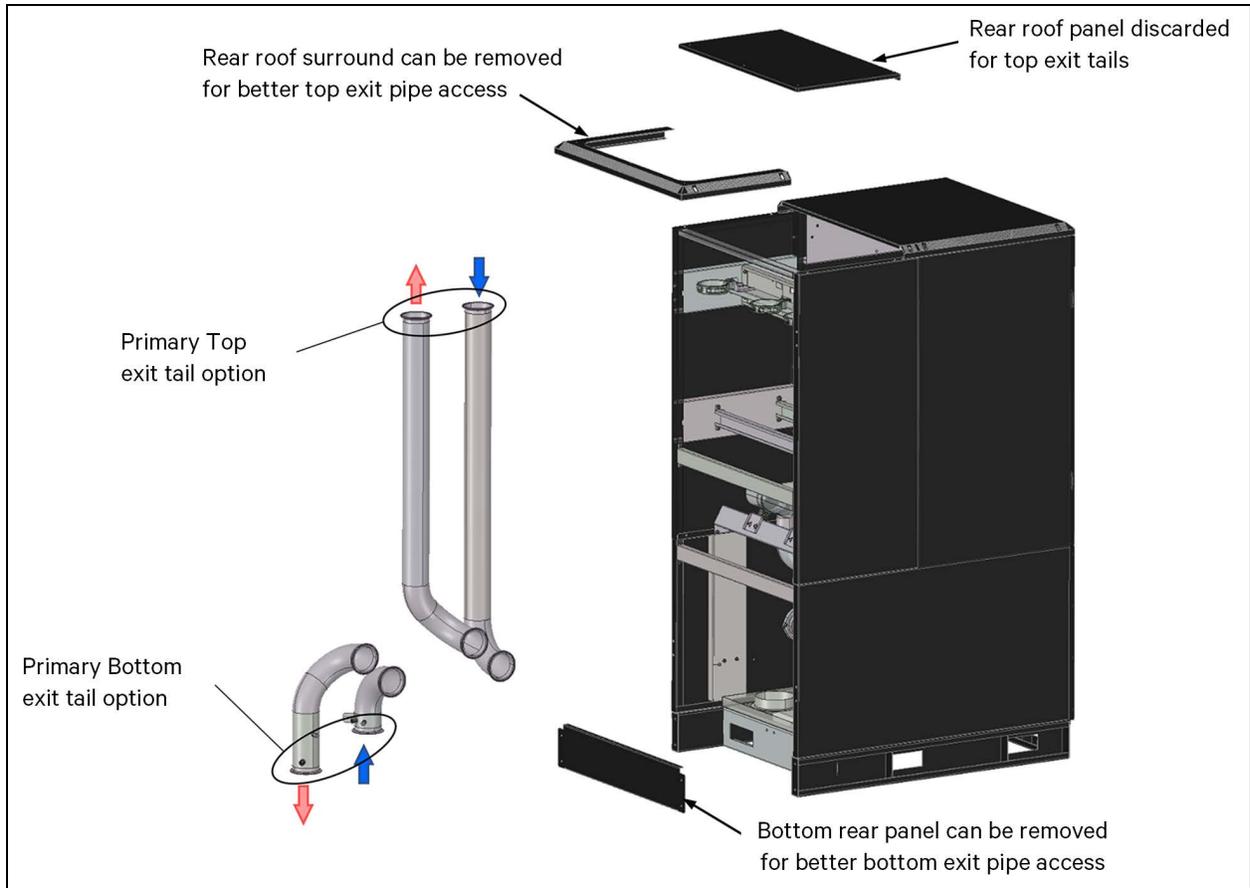
Install an overflow drain pan under the unit with a monitored leak detection system in the pan and shutoff valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shutoff valves should be spring return and must be rated for a close-off pressure that is the same as or higher than the supply water pressure. If it is not possible to install an overflow drain pan, then a monitored leak detection system should be installed in the base of the unit or under the unit to actuate the shutoff valves immediately on a leak detection signal.

The overflow drain pan should have a drain line connected to it that flows to a floor drain or maintenance sink in case of a shutoff valve or leak detection system malfunction.

The Vertiv™ Liebert® XDU1350 Primary connections are 4 inch (DN100) sanitary flanges (to BS4825 Pt.3 or equivalent with 4.7 inch (119 mm) diameter flange). The flanges are fitted with stainless steel blanking caps to ensure pipework remains contaminant free during transit, which will need to be removed for installation. The primary facility chilled water is supplied by the end user.

Optional other types of adaptors can be provided if specified at the time of order. The Liebert® XDU1350 primary connections are located at the rear of the unit and can be configured for bottom or top exit from the cabinet as illustrated, which should be specified at time of order.

**Figure 5.2 Primary Circuit Connections**



External isolation valves should be fitted by the installer to both supply and return pipes, as close as possible to the Vertiv™ Liebert® XDU1350 for maintenance purposes and care should be taken that all inter-connecting pipework to/from the XDU1350 is adequately supported, as the XDU1350 is not designed for any external pipe loads. If the unit is to be installed in a seismic location, then suitable flexible connections should be fitted as determined by engineer of record.

All primary circuit pipework and components should be insulated to protect against condensation.

## 5.2.2 Secondary Circuit Connections



**CAUTION: Risk of improper piping installation, leak checking, fluid chemistry and fluid maintenance can cause equipment damage and personal injury. 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 who are wearing appropriate, OSHA-approved PPE.**

### NOTICE

Risk of leaking chilled water lines. Can cause equipment and building damage.

Lines and joints must be inspected regularly. Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in severe property damage and loss of critical data center equipment. Do not locate unit directly above any equipment that could sustain water damage.

Vertiv recommends installing monitored leak detection equipment for the unit and supply and return lines.

### NOTICE

Risk of a catastrophic water circuit rupture. Can cause expensive building and equipment damage.

Install an overflow drain pan under the unit with a monitored leak detection system in the pan and shutoff valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shutoff valves should be spring return and must be rated for a close-off pressure that is the same as or higher than the supply water pressure. If it is not possible to install an overflow drain pan, then a monitored leak detection system should be installed in the base of the unit or under the unit to actuate the shutoff valves immediately on a leak detection signal.

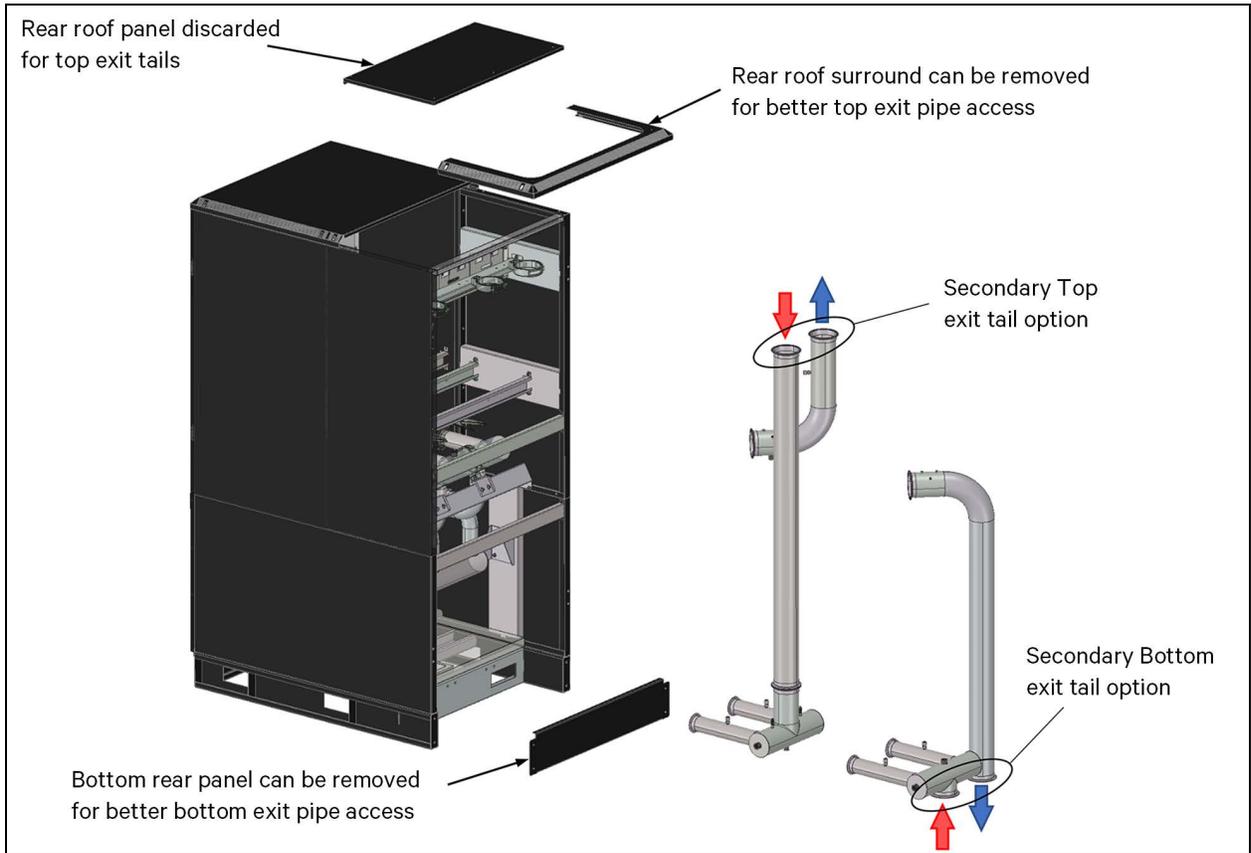
The overflow drain pan should have a drain line connected to it that flows to a floor drain or maintenance sink in case of a shutoff valve or leak detection system malfunction.

The Vertiv™ Liebert® XDU1350 Secondary connections are 4 inch (DN100) sanitary flanges (to BS4825 Pt.3 or equivalent with 4.7 inch (119 mm) diameter flange). The flanges are fitted with stainless steel blanking caps to ensure pipework remains contaminant free during transit, which will need to be removed for installation. Optional other types of adapters can be fitted if specified at the time of order.

The Liebert® XDU1350 Secondary connections are located at the rear of the unit and can be configured for bottom or top exit from the cabinet as illustrated, which should be specified at time of order.

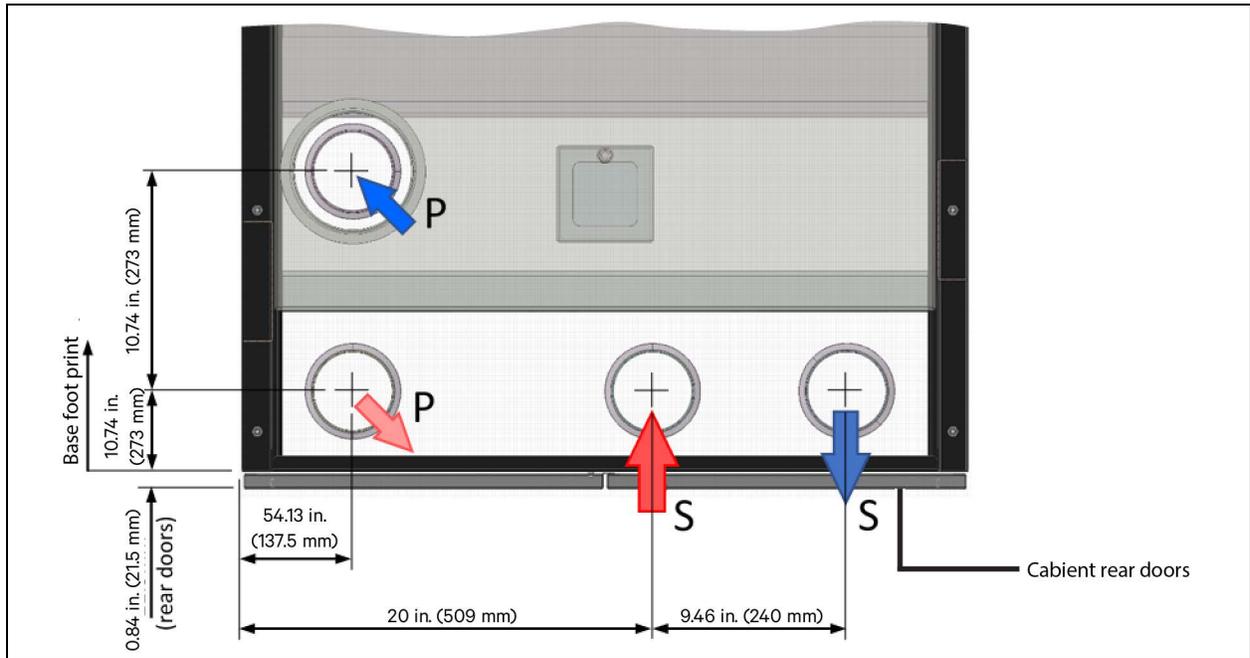
External isolation valves should be fitted by the installer to both supply and return pipes, as close as possible to the Liebert®XDU1350 for maintenance purposes and care should be taken that all inter-connecting pipework to/from the XDU1350 is adequately supported, as the XDU1350 is not designed for any external pipe loads. If the unit is to be installed in a seismic location, then suitable flexible joints should be fitted as determined by engineer of record.

Figure 5.3 Secondary Circuit Connections



**NOTE: Install manual shut-off valves at the primary and secondary lines to each unit to permit routine service and emergency isolation of the unit.**

Figure 5.4 Rear Section Showing Primary and Secondary Pipe Connection Locations

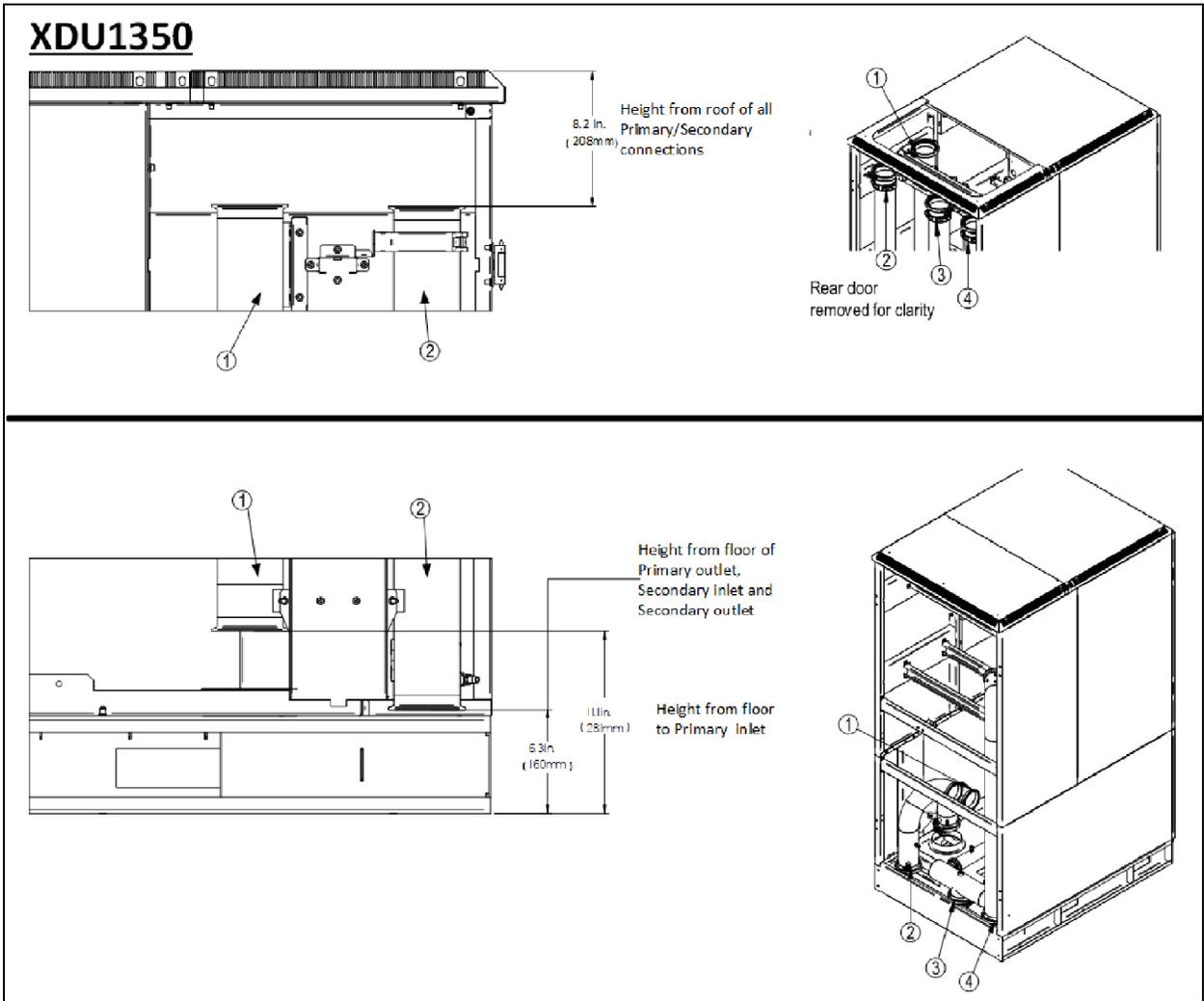


Plan view of Vertiv™ Liebert® XDU1350 rear section showing Primary and Secondary circuit pipe connection locations. Positions will be the same for both Top and Bottom Exit pipework.

- S = Secondary Circuit
- P = Primary Facility Circuit Connections

**5.2.2** on page 27 and **5.2.2** on page 27 side views of Liebert® XDU1350 rear section, show the Primary and Secondary circuit pipe connection locations for both Top and Bottom Exit pipework.

Figure 5.5 Internal Piping Detail



Item	Description	Size
1	Facility supply fluid to CDU	4 inch (DN100) sanitary fitting
2	Facility return fluid to heat rejection	4 inch (DN100) sanitary fitting
3	Secondary circuit return from heat load	4 inch (DN100) sanitary fitting
4	Secondary circuit supply to heat load	4 inch (DN100) sanitary fitting

## 5.3 Electrical

### 5.3.1 Power Wiring



**WARNING!** Arc flash and electric shock hazard. Can cause serious injury or death. Building and equipment damage may also result. 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.

Verify with a voltmeter that power is Off. Vertiv™ Liebert® iCOM™ 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 Liebert® iCOM™ 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.

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. Building and equipment damage may also result. 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 Liebert® iCOM™ 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 Liebert® iCOM™ controller.

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 short circuits and electric shock. Can cause serious injury or death. Building and equipment damage can result from cut insulation or damaged wires. Can cause overheated wiring, smoke, fire, activation of fire suppression systems and EMS personnel, and loss of power to fans. Verify that all wiring connections are tight and that all wiring is contained within the junction box prior to closing and securing the cover.

Insert CSA-certified or UL-listed bushings into holes and/or knockouts used to route wiring through metal panels to protect the wire insulation from contact with sheet metal edges.



**WARNING!** Risk of improper wire sizing/rating and loose electrical connections causing overheated wire and electrical connection terminals resulting in smoke or fire. Can cause serious injury or death. Building and equipment damage may also result. 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.



**WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. 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 who are wearing appropriate, OSHA-approved PPE.**

## 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 +/- 5% of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

See transformer label for primary tap connections. Installer will need to change transformer primary taps if applied unit voltage is other than pre-wired tap voltage.

## NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward pump rotation and unit damage. Service technicians should use a gauge set on the system during the initial start up to verify that the three-phase power is connected properly. Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that the pump rotates in the proper direction. Incoming power must be properly phased to prevent pump from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that the power connections were made correctly. We also recommend verifying discharge and suction pressures during start up to ensure that the pumps are running in the correct direction.

The incoming power cable can be routed into the unit via the floor void or through the cabinet roof panel. Sufficient slack should be allowed in the cable run so as to not impede the hinging up of the electrical panel.

The electrical panel is divided into two compartments - the upper section is dedicated to extra-low voltage for controls, while the lower section is for power mains and has a door interlocked disconnect/isolator to remove power prior to opening. Both sections require an 0.31 inch (8 mm) triangular key to open (unit is provided with cabinet keys).

A 1.25 inch (32 mm) cable gland is provided on the back face of the electrical panel, at the lower right-hand corner, to accept a 0.625 inch - 1 inch (14 - 25 mm) diameter power cable. The cable termination point is at the main electrical panel disconnect (isolator) and adjacent ground (earth) terminal. Upstream protection must be provided by the end user in the form of fuses or breakers in accordance with the maximum loads stipulated on the wiring diagram and in accordance to local regulations.

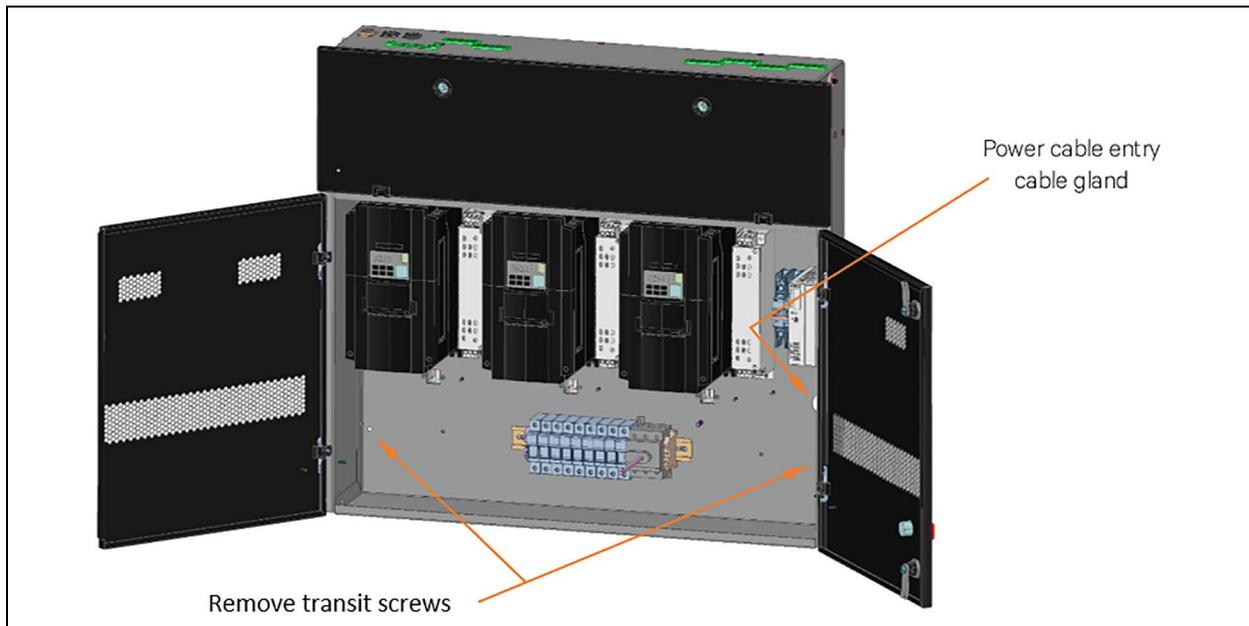
Once the power cable is installed, the two M6 transit screws should be removed from the back face of the chassis, as indicated in **Figure 5.6** on the facing page. This will allow the electrical panel to hinge up on gas struts for maintenance access in future to the Secondary circuit filters.

RF Earth Connection – For EMC compliance, two M6 earth studs are provided at the rear of the cabinet (one at the top and one at the bottom) for connection of a braided EMC earth strap at either point.

The Vertiv™ Liebert® XDU1350 units are supplied configured for the required voltage option stated in [Electrical Data](#) on page 21. This will have been specified at the time of order. Check data plate information for compatibility prior to installation.

The Liebert® XDU1350 can accept A and B power supplies if an ATS (Automatic Transfer Switch) has been specified at time of order.

Figure 5.6 Cable Entry Point and Transit Screw Removal



### 5.3.2 Controls Wiring

#### NOTICE

Risk of improper control circuits. Can cause equipment damage. When using jumpers for troubleshooting, always remove jumpers when maintenance is complete. Jumpers left connected could override controls and cause equipment damage.

If required, terminals 11 and 12 of connector SK9 on top of the electrical panel (see **Figure 5.7** on the next page ) can be wired to a field supplied normally closed switch for remote start/stop of the unit. Breaking this circuit will stop the unit and re-making will allow the unit to automatically re-start - this can be configured as normally open or normally closed (default) if required. Terminals 1 and 2 on SK10 is a dry contact for remote indication of unit alarms – configurable as normally open (default) or normally closed.

A single room temperature and RH sensor is provided as standard on the Vertiv™ Liebert® XDU1350, fitted to the cabinet front door panel behind a ventilation grille to monitor the room temperature and humidity. The temperature and humidity sensor must be installed in areas where conditions are representative of the space conditioned by the Liebert® XDU . Vertiv recommends installing the sensor in different areas near the heat load by the Liebert® XDU. The temperature and humidity sensor may be mounted remotely up to 200 feet using field supplied Beldon 3106A, or equivalent cable. Do not install the sensors where ambient air might cause false readings, for example, near unsealed doors or windows, or areas with stagnant air.

A leak detection tape (optional) can be connected to terminals 9 and 10 on SK9 for leak detection under the floor.

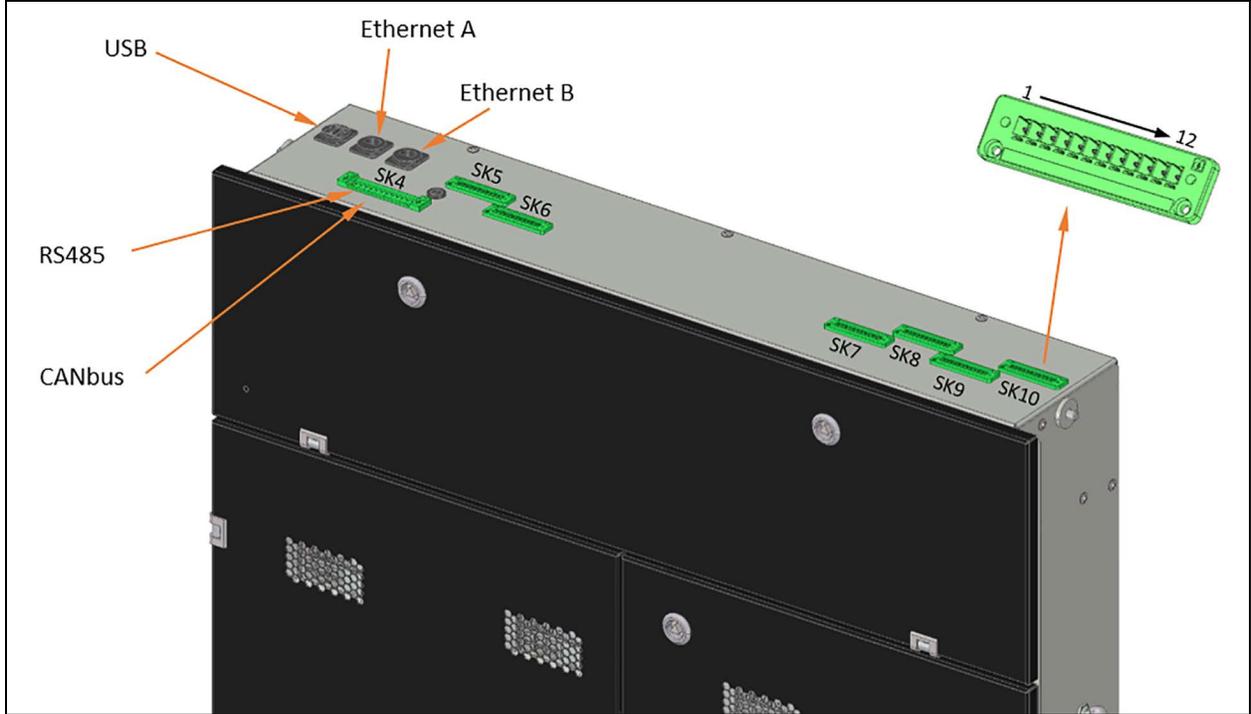
### 5.3.3 Communications Wiring

Several alternative communications options are provided on the Vertiv™ Liebert® XDU1350 CDU.

1. RS485 Modbus (terminals 1, 2, and 3 on connector SK4) – use Beldon 3106A, or equivalent (1 pair +1, shielded 22 AWG).

2. CANbus IN and OUT (terminals 4, 5, and 6 and 7, 8, and 9 on connector SK4) – use Beldon 3106A, or equivalent (1 pair +1, shielded 22 AWG). CANbus is used for communication between Liebert® XDU1350s for “Group Control”.
3. 2 x Ethernet ports (RJ45) - Cat5e shielded cable.

**Figure 5.7 Communication Options and Locations**



Optional BACnet communications is also available if specified.

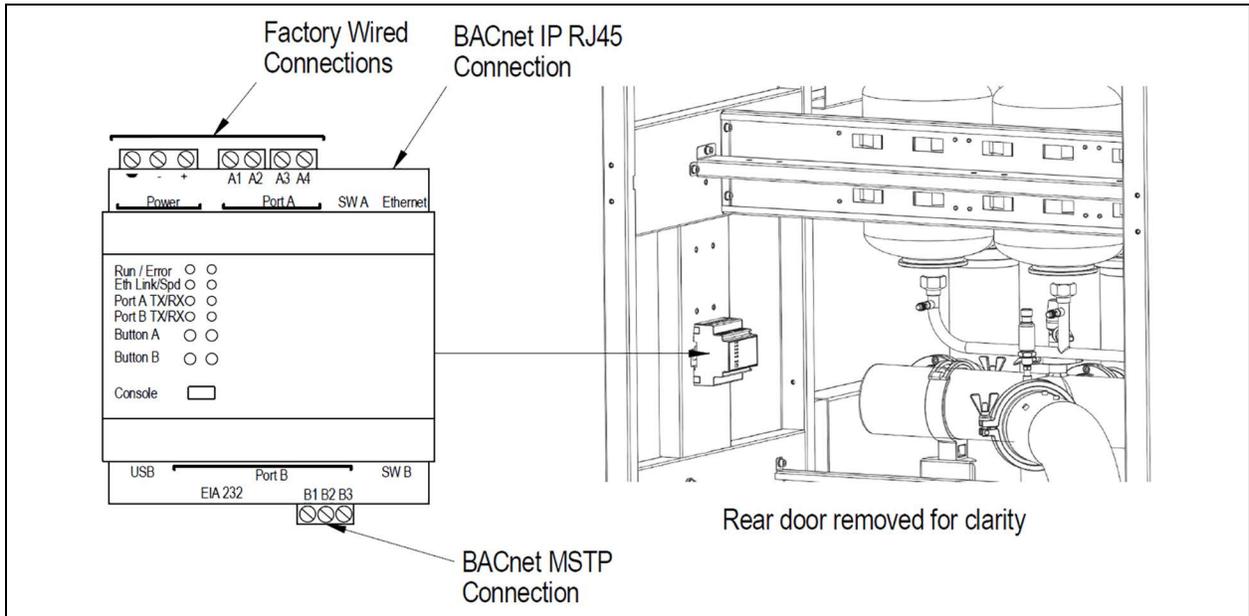
**BACnet IP– Ethernet 10/100**

- Ethernet RJ45 connection on unit mounted BACnet gateway
- Cable provided by others for connection to the BMS. No special considerations are required when using Cat5e/Cat6 for connection between the unit and BMS which is not greater than 328ft (100m).

**BACnet MSTP– RS485**

- Terminals B1, 2 & 3 on unit mounted BACnet gateway
- Cable provided by others for connection to the BMS. No special considerations are required when using Cat5e/Cat6 for connection between the unit and BMS which is not greater than 4000 ft (1220 m).
- Use Beldon 89207 (plenum rated), or Alpha Wire 6454 or equivalent (1 pair +1, shielded 22AWG).

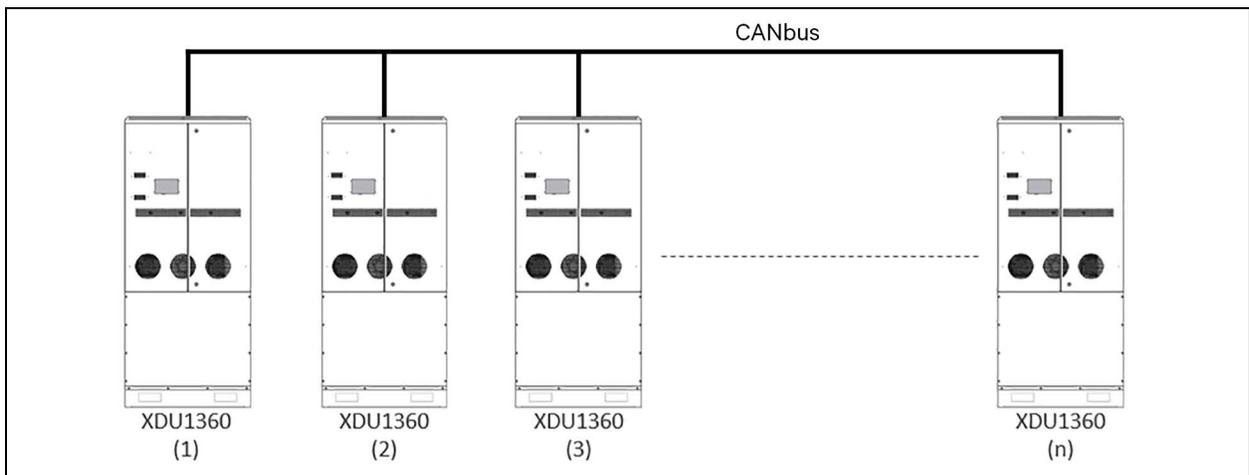
Figure 5.8 BACnet Wiring



**NOTE:** Some Building Management Systems can be configured to send continuous updates for device setpoints, usually setting the same value. The BMS should be configured to send, on a sustained average, no more than two writes per second to the device. This will allow the device to catch up after a burst of updates when required while allowing other communication with the device to proceed.

### 5.3.4 Group Control

Figure 5.9 Vertiv™ Liebert® XDU1350 Group Control (max number of units in single group is 8)



For larger and N+x redundancy installations, Liebert® XDU1350s can be connected using CANbus high speed, robust twisted pair.

The units become self-organizing, the master unit is automatically selected which coordinates the running state of each unit in group based on:

- Configured level of redundancy
- System pressure requirements
- Alarm conditions

Changes to settings are automatically synced across the network.

Figure 5.10 Vertiv™ Liebert® XDU1350 Group Control Status Screen

Group Control Status							
CDU	Mode	DP bar	Flow Rate l/m	Pump Speed %	Temp T2 °C	Cooling Demand %	Lead
1	Online (Running)	1.89	230	55	18.2	67	1
2	Online (Running)	1.92	235	55	18.1	73	0
3	Online (Running)	1.97	210	55	18.0	59	0
4	Group Standby	1.76	0	0	18.8	0	0
5	Shutdown	1.23	0	0	19.2	0	0
6	Not In Group	0	0	0	0	0	0
7	Not In Group	0	0	0	0	0	0
8	Not In Group	0	0	0	0	0	0

Average System DP	1.91 bar	Total System Flow Rate	670 l/m
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## 5.4 Pre-Commissioning Checks

### 5.4.1 Site Check

1. Check if the site requires protective equipment such as safety boots, etc.
2. Check that the coolant has been delivered to site.
3. Check any required biocide and corrosion inhibitors have been supplied.
4. Ensure that site contact is aware of the location of Vertiv™ Liebert® XDU1350 power supply fuse board/circuit breakers.
5. Ensure that site contact is aware of the location of the chiller/building services cold water supply and associated isolation valves.

## 5.4.2 Mechanical Installation Check

1. Confirm that Vertiv™ Liebert® XDU1350 has been successfully unloaded from its crate and thoroughly inspected for damage, paying particular attention to external cabinet panels and water circuit pipework.
2. Liebert® XDU1350 has been positioned and secured in correct location.
3. If the unit has bottom exit pipework, or manifold and hoses - confirm that floor tiles have been cut away as required ideally fitted with brush strip grommets to allow hoses or pipes to run neatly into the under-floor void.
4. Check cable baskets/cable trays/drip trays, etc have been installed to provide adequate support for the hoses or manifold.
5. Confirm 24 inches of clearance is available in front and rear of the unit to fully open the access doors.

## 5.4.3 Electrical Installation Check



**WARNING! Arc flash and electric shock hazard. Can cause serious injury or death. Building and equipment damage may also result. 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.**

**Verify with a voltmeter that power is Off. Vertiv™ Liebert® iCOM™ 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 Liebert® iCOM™ 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.**

**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. Building and equipment damage may also result. 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 Liebert® iCOM™ 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 Liebert® iCOM™ controller.**

**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 short circuits and electric shock. Can cause serious injury or death. Building and equipment damage can result from cut insulation or damaged wires. Can cause overheated wiring, smoke, fire, activation of fire suppression systems and EMS personnel, and loss of power to fans. Verify that all wiring connections are tight and that all wiring is contained within the junction box prior to closing and securing the cover.**

**Insert CSA-certified or UL-listed bushings into holes and/or knockouts used to route wiring through metal panels to protect the wire insulation from contact with sheet metal edges.**



**WARNING! Risk of improper wire sizing/rating and loose electrical connections causing overheated wire and electrical connection terminals resulting in smoke or fire. Can cause serious injury or death. Building and equipment damage may also result. 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.**



**WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. 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 who are wearing appropriate, OSHA-approved PPE.**

## 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 +/- 5% of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

See transformer label for primary tap connections. Installer will need to change transformer primary taps if applied unit voltage is other than pre-wired tap voltage.

## NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward pump rotation and unit damage. Service technicians should use a gauge set on the system during the initial start up to verify that the three-phase power is connected properly. Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that the pump rotates in the proper direction. Incoming power must be properly phased to prevent pump from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that the power connections were made correctly. We also recommend verifying discharge and suction pressures during start up to ensure that the pumps are running in the correct direction.

1. Confirm installed Vertiv™ Liebert® XDU1350 model is suitable for site supply voltage.
2. Power wiring connections completed between the remote and unit mounted disconnect switch.
3. Verify that the rating of the circuit breaker/fuses supplying the Liebert® XDU1350 meets specification and rating as dictated by the latest wiring diagram.

4. If rating differs from Liebert® XDU1350 specification, please note spec. and confirm acceptability.
5. Check and record the voltage available across each of the three phases meets Liebert® XDU1350 model requirements.
6. All internal and external high- and low-voltage wiring connections are tight.
7. Confirm that the Liebert® XDU1350 is properly grounded to an earth ground and electrical service conforms to national and local codes.
8. If Liebert® XDU1350 is in a different location to the IT racks, confirm the room Temp/RH sensor(s) have been installed on a wall adjacent to the data racks at a height of approximately 72 in. (1.8 m) using the correct extension cable.
9. Confirm any required external peripheral alarms/sensors are correctly fitted.

**NOTE: Due to international restrictions in the transport of cell batteries by air, the controller PCB may not have a battery fitted and a suitable battery will need to be sourced and fitted locally (type CR2032). The sole purpose of this battery is to maintain the real time clock in the event of power down and its absence will not generally affect the overall operation and running of the unit. Although the touchscreen display also has a receptacle for a battery, there is no requirement to fit one to this PCB.**

**NOTE: The Liebert® XDU1350 unit is shipped without the Class C fuses fitted upstream of the inverter drives (FS4 to FS9). These are shipped separately and will need to be fitted during installation of the unit.**

## 5.4.4 Primary Liquid (Facility) Specification

### NOTICE

Risk of piping-system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Heat exchangers and piping systems are at high risk of freezing and premature piping corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil and piping corrosion. When the cooling unit or piping may be exposed to freezing temperatures, charge the system with coolant fluid based on the coldest ambient design temperature. Automotive antifreeze is unacceptable and must NOT be used in any fluid system. Use only coolant fluid solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

The system coolant fluid must be analyzed by a competent fluid-treatment specialist before start up to establish the inhibitor and antifreeze solution requirement and evaluated at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

The fluid complexity and variants of required treatment programs make it extremely important to obtain the advice of a competent and experienced fluid-treatment specialist and follow a regularly scheduled coolant-fluid system-maintenance program.

Fluid chemistry varies greatly as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components.

The chemistry of the coolant fluid used must be considered, because some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The coolant fluid must be treated and circulating through the system continuously to prevent the buildup of deposits and/or growth of sulfate reducing bacteria. Proper inhibitor maintenance must be performed to prevent corrosion of the system.

Consult fluid manufacturer for testing and maintenance of inhibitors.

Commercial-grade coolant fluid is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the coolant fluid from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

Vertiv recommends installing a monitored fluid-detection system that is wired to activate the automatic-closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant-fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

The Vertiv™ Liebert® XDU1350 is designed for use with a Primary (facility) supply of plain water or up to 20% glycol/water from a site chilled water ring main or a dedicated chiller. A 20% glycol concentration will give frost protection to approx. 16°F (-9°C). If a higher concentration of glycol is used, then the cooling capacity of the unit may have to be de-rated (contact manufacturer for advice).

It is the responsibility of the installer to make sure the primary water is filtered to a level of at least 500 micron (35 Mesh).

## 5.4.5 Secondary Liquid Specification

### NOTICE

Risk of piping-system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Heat exchangers and piping systems are at high risk of freezing and premature piping corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil and piping corrosion. When the cooling unit or piping may be exposed to freezing temperatures, charge the system with coolant fluid based on the coldest ambient design temperature. Automotive antifreeze is unacceptable and must NOT be used in any fluid system. Use only coolant fluid solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

The system coolant fluid must be analyzed by a competent fluid-treatment specialist before start up to establish the inhibitor and antifreeze solution requirement and evaluated at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

The fluid complexity and variants of required treatment programs make it extremely important to obtain the advice of a competent and experienced fluid-treatment specialist and follow a regularly scheduled coolant-fluid system-maintenance program.

Fluid chemistry varies greatly as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components.

The chemistry of the coolant fluid used must be considered, because some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The coolant fluid must be treated and circulating through the system continuously to prevent the buildup of deposits and/or growth of sulfate reducing bacteria. Proper inhibitor maintenance must be performed to prevent corrosion of the system.

Consult fluid manufacturer for testing and maintenance of inhibitors.

Commercial-grade coolant fluid is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the coolant fluid from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

Vertiv recommends installing a monitored fluid-detection system that is wired to activate the automatic-closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant-fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

The secondary circuit should be filled with particulate free coolant (see suggested specification below) treated with suitable corrosion inhibitors and biocides for the cooling application.

Failure to use proper water treatment can result in decreased system performance and reliability due to corrosion, scaling, fouling, and microbiological growth and may invalidate the unit warranty.

**Table 5.1 Deionized Water Specification**

Property	Value
Conductivity	< 15 $\mu$ S/0.4 in. (1 cm)
pH	6 to 8

**Table 5.2 Mineral Content**

Property	Value
Cadmium (Cd)	< 10 µg/33.8 fl. oz. (1 L)
Copper (Cu)	< 10 µg/33.8 fl. oz. (1 L)
Iron (Fe)	< 10 µg/33.8 fl. oz. (1 L)
Lead (Pb)	< 10 µg/33.8 fl. oz. (1 L)
Manganese (Mn)	< 10 µg/33.8 fl. oz. (1 L)
Nickel (Ni)	< 10 µg/33.8 fl. oz. (1 L)
Zinc (Zn)	< 10 µg/33.8 fl. oz. (1 L)
Chloride (Cl)	< 2 µg/33.8 fl. oz. (1 L)

## 6 Commissioning

### 6.1 Primary Circuit

#### 6.1.1 Primary Pipework Installation

1. Confirm site installed primary pipework has been correctly flushed (especially if any hot works have been carried out).
2. Confirm that the installed primary circuit pipework has been fitted with valves for unit isolation/maintenance.
3. Check supply/return connections are correct: not backwards.
4. Check that all pipe joints are tight.
5. Verify that newly fitted primary pipework and connections have been tested for leaks.

**NOTE: We recommend isolating the unit with field-installed shutoff valves during leak checking of field-installed piping. When the units are included in a leak test, use of fluid for pressure testing is recommended. When pressurized gas is used for leak testing the unit, the maximum recommended pressure is 30 psig (207 kPa) and tightness of the unit should be verified by pressure decay over time, (<2 psig/hour [13.8 kPa/hour]) or sensing a tracer gas with suitable instrumentation. Dry seals in fluid valves and pumps may not hold a high gas pressure.**

6. Check all primary circuit pipework, hoses and valves have been insulated as per installation requirements.
7. Check that the external primary circuit has the means to vent air from the system, either automatically (preferable) or manually.
8. Verify water detection is properly installed around all units (recommended).

#### 6.1.2 Facility Water Supply

1. Confirm Facility/Primary water supply is available prior to Vertiv™ Liebert® XDU1350 installation and commissioning. If a dedicated chiller is to be utilized, ensure this has been fully commissioned at least 24 hours prior to Liebert® XDU1350 commissioning.
2. Check that facility water or chiller has been connected to the Liebert® XDU1350 primary water circuit.
3. Confirm there are no potential issues with low flow switches in the facility water circuit.
4. Confirm correct specification external filter is installed (see [Primary Liquid \(Facility\) Specification](#) on page 40 ), with isolation valves for maintenance (see [Primary Facility Connections](#) on page 25 ).
5. Verify that Facility/Primary water supply is fully operational and will provide sufficient flow rate/temperature at < 10 Bar pressure, as per the original installation specifications.
6. Verify water detection is properly installed around all units (recommended).

#### 6.1.3 Primary Control Valves

1. The Vertiv™ Liebert® XDU1350 is supplied with a two-way modulating cooling valve on each plate heat exchanger. Check that installation has a suitable external by-pass facility should both the control valves be closed.

**NOTE: With two-way valve operation, the flow to/from the chiller will vary 0 to 100% depending on valve position.**

## 6.1.4 Primary Circuit Filling

1. Crack open the supply and return valves fitted in the pipework to the Vertiv™ Liebert® XDU1350 unit to allow the primary circuit within the cabinet to gently fill from the chilled water supply.
2. Check circuit for leaks.

**NOTE: Check that the installed primary chilled water system has an automatic water make-up facility and that filling the Liebert® XDU1350 unit will not result in the chilled water system shutting down due to loss of water.**

## 6.1.5 Primary Flow Setup

**NOTE: Before attempting to monitor and adjust the Primary circuit flow, the operator should be fully knowledgeable of the operation of the Vertiv™ Liebert® XDU1350 – refer to the Operating and Maintenance Guide for more information.**

1. For optimum performance, the primary water flow should be set to match the required heat load transfer and according to the primary inlet temperature and level of glycol (refer to the Application and Planning Guide for more information).
2. If the water flow is below the necessary requirement, there will be insufficient cooling and the load temperatures will start to rise. If there is too much flow, then the temperature control could become unstable.
3. An external means of restricting, or by-passing excessive primary flow should be available in the external pipework.
4. To adjust the primary flow rate: Set the controller to 'Overrides' as described in [Unit Low Speed Circulation](#) on page 46 and adjust 'Cooling Valves' to 100%, this will force the cooling valves to open fully for maximum flow through the heat exchangers. Next go back to the 'Status' screen (second page) or Home screen to view the Primary flow rate.
5. Adjust external valve to regulate the flow through the Liebert® XDU1350 to the required approximate setting.

## 6.2 Secondary Circuit

### 6.2.1 Secondary Pipework Connections

1. Check site installed Secondary pipework and drip tray have been installed in correct location (if applicable).
2. Check the Secondary pipework has been correctly flushed (especially if any hot works have been carried out).
3. Verify that site installed secondary pipework and connections, have been tested for leaks.

**NOTE: We recommend isolating the unit with field-installed shutoff valves during leak checking of field-installed piping. When the units are included in a leak test, use of fluid for pressure testing is recommended. When pressurized gas is used for leak testing the unit, the maximum recommended pressure is 30 psig (207 kPa) and tightness of the unit should be verified by pressure decay over time, (<2 psig/hour [13.8 kPa/hour]) or sensing a tracer gas with suitable instrumentation. Dry seals in fluid valves and pumps may not hold a high gas pressure.**

4. Check the leak detection tape (if applicable) has been installed into drip tray(s).

### 6.2.2 Secondary Circuit Filling

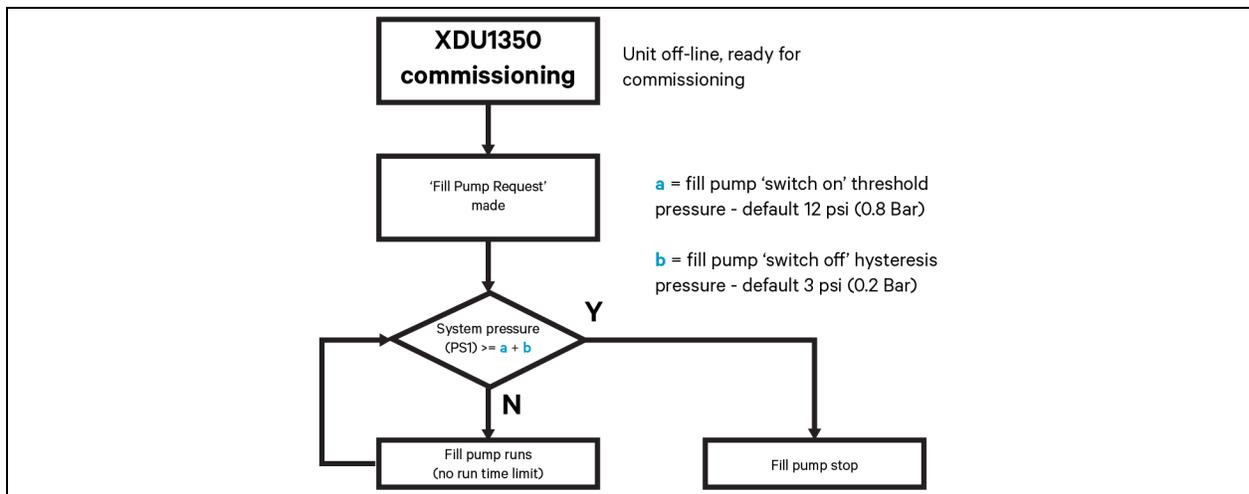
**NOTE: When filling and running the Secondary circuit, the operator should be fully knowledgeable of the operation of the Vertiv™ Liebert® XDU1350 – refer to the Operating and Maintenance Guide for more information.**

1. Position container of pre-treated coolant at the rear of the Liebert® XDU1350.
2. Ensure all automatic air vent bleed screws are loose, but not removed (located at the top of each filter housing and on discharge header)

3. Insert the filling wand into the container, then connect fill wand hose to the fill pump quick release coupling.
4. Log in on the controller with the "Service" access code (5699).
5. Select 'Fill Pump Request', then the fill pump will start pumping the coolant into the system at the rate of approximately 1 gpm (4 l/m).
6. The fill pressure (PS1) can be monitored under the Status screen – Page 3, during filling.
7. Observe the water level of container and stop the fill pump by 'Fill Pump Request' before changing the water container.
8. Repeat the process with more water containers until the fill pump automatically stops.
9. Pump will stop when inlet pressure PS1 reaches the default 15 psi (1 bar).
10. Manually vent air from the expansion vessel pipes by depressing the Schrader valves located beneath each vessel (fill pump may re-start).
11. Leave the filling wand connected and in the container of coolant as more air will be expelled during the initial operation.
12. Check for leaks.

The **Figure 6.1** below shows the unit pressure monitoring and fill pump control during filling operation as part of commissioning (unit off-line).

**Figure 6.1 Pressure Monitoring and Filling Operation**



### 6.3 Unit Configuration

Prior to running the Vertiv™ Liebert® XDU1350, the configuration should be checked to ensure the unit is set up according to the site requirements.

*Flow or DP Control* – See Configuration menu/Pump Control/Flow or DP (P201). This will control the pump speed according to the required flow rate or differential pressure.

*Flow/DP Setpoint* – See Configuration menu/Flow Setpoint (P202) or Differential Setpoint (P203). This will set the required flow or differential pressure to be achieved.

**NOTE: It's best to leave the Flow and DP Setpoints at default values initially, then set at the final stages of commissioning.**

*2x or 3x Pump Operation* – See Configuration menu/Triple Pump Control (P208)/2x or 3x. The 2x pump setting operates the pumps as 2x run and 1x standby (with duty sharing), the 3x pump setting allows all pumps to be run simultaneously.

**NOTE: Twin pump setting requires the Vertiv™ Liebert® XDU1350 power cable to be wired in 4 mm<sup>2</sup> cable.**

*Over Pressure Action* – See Configuration menu/Pump Control/Over Pressure Action (P212)/Alarm, Alarm + Shutdown or Alarm + Back-off. This will determine if the unit should continue to run (with or without back-off control) or shutdown in the event of a system over pressure situation.

*Temperature Control Mode* – See Configuration menu/Temperature Control/Control Mode (P302)/Fixed Setpoint or Fixed Setpoint and Dew Point Override. This will either keep the Secondary supply temperature at a fixed temperature or allow it to rise if there is a danger of condensation.

*Leak Detection* – See Configuration menu/Leak Detection - Flood Tray (P601) and Leak Detection - Underfloor (P602)/Alarm or Shutdown and Alarm. This will determine if the unit should continue to run or shut down in the event of an internal or external leak.

*Power Failure Option* – See Configuration menu/Miscellaneous/Post Power Failure Options (P904)/Run or Standby. This will determine if the unit will automatically re-start or remain in standby after a power outage.

*Communications* – See Setup menu.

## 6.4 Unit Low Speed Circulation

After the initial fill process, it is advisable to run the unit at a reduced pump speed to gently circulate the water - enabling any trapped air to vent out through the auto air vents. If the Flow/DP setpoints have been left at the default values, then this will happen naturally as these values have been deliberately set quite low. Manually vent the expansion vessels at the Schrader points.

**To adjust the pump speed with the Overrides function:**

1. Start the unit in normal automatic mode and allow the pump speed to settle at the default Flow or DP setpoint.

**NOTE: The minimum allowable pump speed is 15%, to enable adequate motor fan cooling and the default Flow/DP may not be achieved if it requires the pump to operate below this speed - will depend on system impedance.**

2. Leave the unit running like this for approx. 30 minutes to allow any trapped air to vent.

**NOTE: While the main pumps are running, the fill pressure at PS1 may drop as air is purged from the system and the fill pump will may automatically re-activate again.**

## 6.5 Overrides and Full Speed Operation

After this period of reduced speed running, the pump speed can be ramped up to full 100% speed to determine full flow/DP maximum performance available. Ideally the system should be a complete installation with all IT load circuits connected.

1. Go to the 'Logon' screen and enter the 'Service' access code (5699) .
2. Go to the Service menu and select 'Overrides'. For 2x operation, select any 2 from 'Pump 1 Speed', 'Pump 2 Speed' and 'Pump 3 Speed' and enter the desired speed as a percentage of full 60 Hz operation, followed by the OK button. If the unit is configured for 'Triple Pump Control'; enter the desired speed for each of the 3 pumps.

The display will show the  icon on the Home screen all the time this function is operational.

**NOTE: If there is no interaction with the touchscreen for 15 minutes (default) or more, the controller will revert to fully automatic mode.**

Once satisfied that all air has been expelled from the system and the Vertiv™ Liebert® XDU1350 maximum performance has been achieved, the pump operation can be set back to automatic control. Go back into Overrides and set the pump speed(s) back to 0%, which will put the control back into automatic mode. The final required flow rate or DP can then be set in the Configuration menu/Pump Control/Flow Setpoint (P202) or Differential Pressure Setpoint (P203).

## 6.6 Pump Rotation



**WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. 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 who are wearing appropriate, OSHA-approved PPE.**

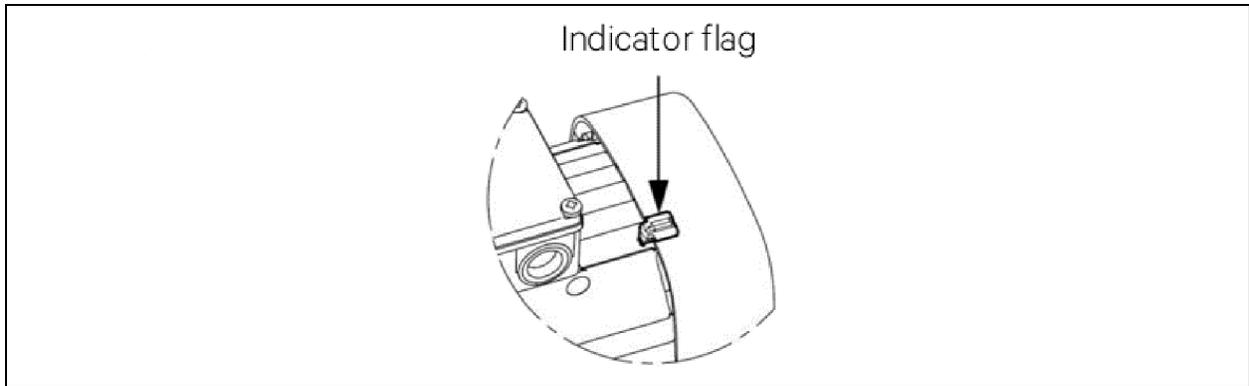
### NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward pump rotation and unit damage. Service technicians should use a gauge set on the system during the initial start up to verify that the three-phase power is connected properly. Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that the pump rotates in the proper direction. Incoming power must be properly phased to prevent pump from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that the power connections were made correctly. We also recommend verifying discharge and suction pressures during start up to ensure that the pumps are running in the correct direction.

Once running, the pump rotation direction should be checked. This should be counterclockwise when viewed on the pump end (fan cowl). The pumps are fitted with a direction indicator flag located on the fan cowl: if the flag is 'black', then rotation is correct, if flag is white, then pump running clockwise/reverse.

If the direction is clockwise then invert 2 – phases on the electrical supply connection.

**Figure 6.2 Indicator Flag Location**



## 6.7 Full Manual Control

The Full Manual Control mode can be accessed from the Service screen (when logged-on at Engineering level) and may be used when just one or more outputs need to be manually controlled in total isolation from the automatic operation of the rest of the unit.

Selection causes the unit to shut down and all outputs will be inactive unless manually set and all alarms will be ignored (see Installation and Commissioning manual for more information).

It's unlikely that this function will be required while commissioning, Full Manual Control is more usually used during fault finding.

**NOTE:** If the unit was previously running in Automatic mode, as soon as Full Manual Control is selected, the unit will shut down completely.

## 6.8 Subsequent Filling



**WARNING!** Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. 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 who are wearing appropriate, OSHA-approved PPE.



**CAUTION:** Risk of contact with extremely hot 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 with 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.



**CAUTION:** Risk of improper piping installation, leak checking, fluid chemistry and fluid maintenance. Can cause injury. Building and equipment damage may also result. 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 who are wearing appropriate, OSHA-approved PPE.

## NOTICE

Risk of piping-system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Heat exchangers and piping systems are at high risk of freezing and premature piping corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil and piping corrosion. When the cooling unit or piping may be exposed to freezing temperatures, charge the system with coolant fluid based on the coldest ambient design temperature. Automotive antifreeze is unacceptable and must NOT be used in any fluid system. Use only coolant fluid solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

The system coolant fluid must be analyzed by a competent fluid-treatment specialist before start up to establish the inhibitor and antifreeze solution requirement and evaluated at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

The fluid complexity and variants of required treatment programs make it extremely important to obtain the advice of a competent and experienced fluid-treatment specialist and follow a regularly scheduled coolant-fluid system-maintenance program.

Fluid chemistry varies greatly as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components.

The chemistry of the coolant fluid used must be considered, because some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The coolant fluid must be treated and circulating through the system continuously to prevent the buildup of deposits and/or growth of sulfate reducing bacteria. Proper inhibitor maintenance must be performed to prevent corrosion of the system.

Consult fluid manufacturer for testing and maintenance of inhibitors.

Commercial-grade coolant fluid is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the coolant fluid from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

Vertiv recommends installing a monitored fluid-detection system that is wired to activate the automatic-closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant-fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

## NOTICE

Risk of leaking chilled water lines. Can cause equipment and building damage.

Lines and joints must be inspected regularly. Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in severe property damage and loss of critical data center equipment. Do not locate unit directly above any equipment that could sustain water damage.

Vertiv recommends installing monitored leak detection equipment for the unit and supply and return lines.

**NOTICE**

Risk of a catastrophic water circuit rupture. Can cause expensive building and equipment damage.

Install an overflow drain pan under the unit with a monitored leak detection system in the pan and shutoff valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shutoff valves should be spring return and must be rated for a close-off pressure that is the same as or higher than the supply water pressure. If it is not possible to install an overflow drain pan, then a monitored leak detection system should be installed in the base of the unit or under the unit to actuate the shutoff valves immediately on a leak detection signal.

The overflow drain pan should have a drain line connected to it that flows to a floor drain or maintenance sink in case of a shutoff valve or leak detection system malfunction.

**NOTICE**

Risk of no-flow condition. Can cause equipment damage. Do not leave the water/coolant fluid-supply circuit in a no-flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of the tubes. Keep unit switched On and water/ coolant fluid-supply circuit system operating continuously.

Once the unit is commissioned - the filling wand may be disconnected and the flexible make-up container (approximately 0.5 gal. (2 L) capacity, filled with treated water) may be connected in its place, which will allow the unit to self-fill while unattended, in the event of minor water loss or when any remaining trapped air is purged out of the system.

The container should be regularly inspected during service visits and refilled if required, although any fill pump activity after commissioning greater than 5 seconds duration will be raised as an 'A38 – Check Water Make-up Level' alarm, as a reminder for investigation.

Before connecting the make-up container, the air in the container hose should be purged. Fill the container with water, screw on the fill cap and then squeeze the bag while depressing the valve on the end of the quick release coupling until air is expelled and hose is full of water.

If there is already pressure in system and air is introduced into the fill pump suction line, then the fill pump may cease to pump. To rectify; leave the unit running while opening a drain valve to relieve pressure, until fill pump starts to pump again.

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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 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

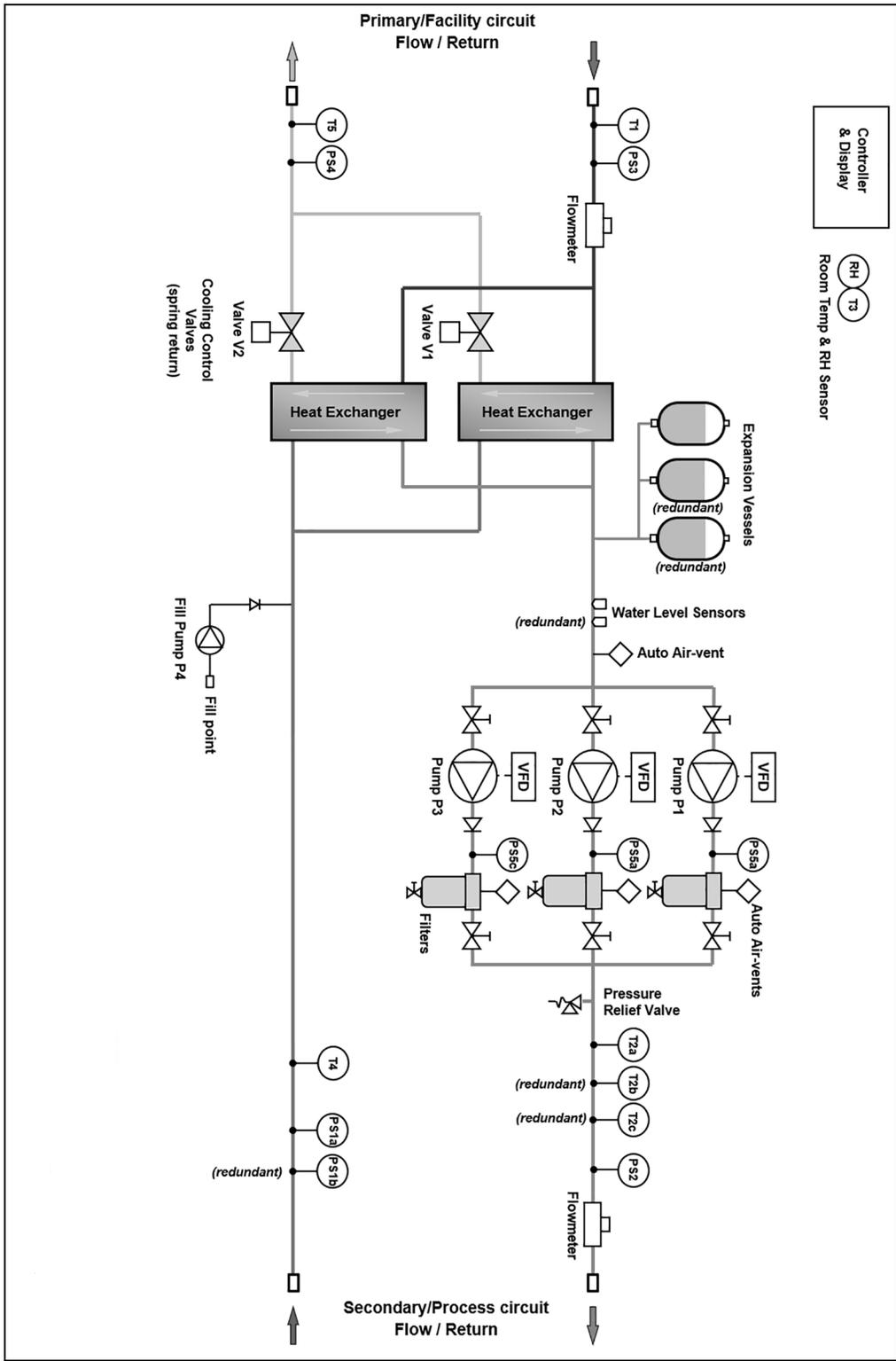
7/F, Dah Sing Financial Centre

3108 Gloucester Road, Wanchai

Hong Kong

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## Appendix B: Pipe Schematic Vertiv™ Liebert® XDU1350



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## Appendix C: Modbus Register Table

Table C.1 Discrete Inputs

Register Number	Register Description	Liebert® XDU1350 Alarm Code
1	Critical Alarm (0 = Inactive, 1 = Active)	-
2	Non-Critical Alarm (0 = Inactive, 1 = Active)	-
3	Alarm : T1 Temperature Sensor Fault	A01
4	Alarm : T2a Temperature Sensor Fault	A02
5	Alarm : T2b Temperature Sensor Fault	A03
6	Alarm : T2c Temperature Sensor Fault	A04
7	Alarm : T3 Temperature Sensor Fault	A05
8	Alarm : T4 Temperature Sensor Fault	A06
9	Alarm : T5 Temperature Sensor Fault	A07
10	Alarm : RH Relative Humidity Sensor Fault	A08
11	Alarm : PS1a Pressure Sensor Fault	A09
12	Alarm : PS1b Pressure Sensor Fault	A10
13	Alarm : PS2 Pressure Sensor Fault	A11
14	Alarm : PS3 Pressure Sensor Fault	A12
15	Alarm : PS4 Pressure Sensor Fault	A13
16	Alarm : PS5a Pressure Sensor Fault	A14
17	Alarm : PS5b Pressure Sensor Fault	A15
18	Alarm : PS5c Pressure Sensor Fault	A16
19	Alarm : Secondary Flow Meter Sensor Fault	A17
20	Alarm : Primary Flow Meter Sensor Fault	A18
21	Alarm : microSD Card Fault	A19
22	Alarm : Leak Fault / Water make-up empty	A20
23	Alarm : Leak Shutdown/Insufficient Water Level	A21
24	Alarm : P1 Inverter Fault	A22
25	Alarm : P2 Inverter Fault	A23
26	Alarm : P3 Inverter Fault	A24
27	Alarm : Sec Low Flow	A25
28	Alarm : Sec Pump Flow Shutdown	A26
29	Alarm : Valve 1 Fault	A27
30	Alarm : Valve 2 Fault	A28
31	Alarm : Primary Water Low Flow	A29
32	Alarm : Primary Water Low Temp	A30

**Table C.1 Discrete Inputs (continued)**

Register Number	Register Description	Liebert® XDU1350 Alarm Code
33	Alarm : Primary Water High Temp	A31
34	Alarm : Secondary Water Low Temp	A32
35	Alarm : Secondary Water High Temp	A33
36	Alarm : Flood Unit	A34
37	Alarm : PS1 Diff Out Of Limits	A35
38	Alarm : Sec Over Pressure	A36
39	Alarm : Flood Under floor	A37
40	Alarm : Check Water Make-up Level	A38
41	Alarm : System Low Pressure	A39
42	Alarm : Secondary Over-pressure Shutdown	A40
43	Alarm : Primary Water No Flow	A41
44	Alarm : Level Sensor – No Water Detected	A42
45	Alarm : Illegal Water Sensor Condition	A43
46	Alarm : Inverter 1 Communications Error	A44
47	Alarm : Inverter 2 Communications Error	A45
48	Alarm : Inverter 3 Communications Error	A46
49	Alarm : Secondary Filter 1 Dirty	A47
50	Alarm : Secondary Filter 2 Dirty	A48
51	Alarm : Secondary Filter 3 Dirty	A49
52	Alarm : Secondary Temperature T2a Diff Fault	A50
53	Alarm : Secondary Temperature T2b Diff Fault	A51
54	Alarm : Secondary Temperature T2c Diff Fault	A52
55	Alarm : Group Control Network Fault	A53
56	Alarm : Group Control Insufficient Units Available	A54
57	Alarm : Restricted Pump Performance	A55
58	Alarm : Pump 1 Fault	A56
59	Alarm : Pump 2 Fault	A57
60	Alarm : Pump 3 Fault	A58

Access to the Discrete Inputs table is provided by MODBUS function code 02 – Read Input Status.  
For all discrete input registers which contain an alarm status, a value of 1 indicates the presence of the alarm condition, whilst a value of 0 indicates the healthy (no alarm) condition.

Table C.2 Input Registers

Register Number	Description	Units	Scaling	Data Type
1	Mode 0 = Not configured 1 = Shutdown – remote start/stop, 2 = shutdown - network, 3 = Full manual control 4 = standby 5 = Online (running) 6 = online (filling) 7 = Filling 8 = Shutdown – fault 9 = group standby	n/a	1	Unsigned
2	Group Control Mode 0 = Standalone 1 = Primary 2 = Secondary 3 = Independent (due to network fault)	n/a	1	Unsigned
3	Pump 1 Speed	%	1	Unsigned
4	Pump 2 Speed	%	1	Unsigned
5	Pump 3 Speed	%	1	Unsigned
6	Control Valve 1 Demand	%	1	Unsigned
7	Control Valve 1 Feedback	%	1	Unsigned
8	Control Valve 2 Demand	%	1	Unsigned
9	Control Valve 2 Feedback	%	1	Unsigned
10	Cooling Demand	%	1	Unsigned
11	Primary Supply Temperature T1	°C	0.1	Signed
12	Primary Return Temperature T5	°C	0.1	Signed
13	Primary Duty	kW	1	Unsigned
14	Secondary Supply Temperature T2a	°C	0.1	Signed
15	Secondary Supply Temperature T2b	°C	0.1	Signed
16	Secondary Supply Temperature T2c	°C	0.1	Signed
17	Secondary Supply Temperature T2	°C	0.1	Signed
18	Room Temperature T3	°C	0.1	Signed
19	Room Relative Humidity RH	% RH	0.1	Unsigned
20	Dew Point DW	°C	0.1	Signed
21	Secondary Return Temperature T4	°C	0.1	Signed
22	Secondary Return Pressure PS1a	Bar	0.01	Signed
23	Secondary Return Pressure PS1b	Bar	0.01	Signed
24	Secondary Return Pressure PS1	Bar	0.01	Signed

**Table C.2 Input Registers (continued)**

Register Number	Description	Units	Scaling	Data Type
25	Secondary Supply Pressure PS2	Bar	0.01	Signed
26	Secondary Differential Pressure (PS2–PS1)	Bar	0.01	Signed
27	Primary Inlet Pressure PS3	Bar	0.01	Signed
28	Primary Outlet Pressure PS4	Bar	0.01	Signed
29	Primary Flow Rate	L/m	1	Unsigned
30	Secondary Flow Rate	L/m	1	Unsigned
31	Secondary Duty	kW	1	Unsigned
32	Temperature Setpoint	°C	0.1	Signed
33	Pump 1 Runtime	Hours	1	Unsigned
34	Pump 2 Runtime	Hours	1	Unsigned
35	Pump 3 Runtime	Hours	1	Unsigned
36	Secondary Filter 1 Inlet Pressure PS5a	Bar	0.01	Signed
37	Secondary Filter 2 Inlet Pressure PS5b	Bar	0.01	Signed
38	Secondary Filter 3 Inlet Pressure PS5c	Bar	0.01	Signed
39	Secondary Filter 1 Differential Pressure (PS5a–PS2)	Bar	0.01	Signed
40	Secondary Filter 2 Differential Pressure (PS5b–PS2)	Bar	0.01	Signed
41	Secondary Filter 3 Differential Pressure (PS5c–PS2)	Bar	0.01	Signed
42	Controller Software Version Number Format is x.yy where x = major version number, yy = minor version number	n/a	0.01	Unsigned
43	Controller Up-time	Mins	1	Unsigned
44	System (Group) Average Secondary Differential Pressure	Bar	0.01	Signed
45	System (Group) Total Secondary Flow Rate	L/m	1	Unsigned

Access to the Input Register table is provided by MODBUS function code 04 – Read Input Registers.

**Table C.3 Coils**

Register Number	Description
1	Remote Shutdown To switch on the CDU write OFF. To switch off the CDU write ON.

Read access to the Coil table is provided by MODBUS function code 01–Read Coil Status. Write Access to the Coil table is provided by MODBUS function code 05–Write Single Coil.

## **Appendix D: Warranty Details**

### **D.1 Limited Product and Service Warranty**

Extended warranties, service and maintenance programs are available in most locations, details available upon request. To obtain further details of limited warranty, also after sales service offerings, contact your local sales representative or technical support if you have any questions or problems during unit installation.

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## Appendix F: Disposal Information

**NOTE: Waste materials must be disposed of in a responsible manner in line with environmental regulations.**

The de-commissioning and disposal of this product should be undertaken by qualified personnel in adherence to local and national safety regulations, particularly for protection of lungs, eyes, and skin from chemicals, dust, etc. Approved lifting gear and power tools should be used and access to the work area must be restricted to authorized personnel.

The following steps are a guide only and should be adjusted to take into account local site conditions:

1. Disconnect unit from electrical supply.
2. Drain and dispose of any heat transfer fluid through an approved recycling facility.
3. Remove unit to approved recycling facilities only.

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## Appendix G: Vertiv™ Liebert® XDU1350 BACnet Points List

Name	Type	Instance
Comm Error Device 0	3: BI	0
Alarm	5: BV	1
Alarm A01: T1 Temperature Sensor Fault	5: BV	2
Alarm A02: T2a Temperature Sensor Fault	5: BV	3
Alarm A03: T2b Temperature Sensor Fault	5: BV	4
Alarm A04: T2c Temperature Sensor Fault	5: BV	5
Alarm A05: T3 Temperature Sensor Fault	5: BV	6
Alarm A06: T4 Temperature Sensor Fault	5: BV	7
Alarm A07: T5 Temperature Sensor Fault	5: BV	8
Alarm A08: RH Relative Humidity Sensor Fault	5: BV	9
Alarm A09: PS1a Pressure Sensor Fault	5: BV	10
Alarm A10: PS1b Pressure Sensor Fault	5: BV	11
Alarm A11: PS2 Pressure Sensor Fault	5: BV	12
Alarm A12: PS3 Pressure Sensor Fault	5: BV	13
Alarm A13: PS4 Pressure Sensor Fault	5: BV	14
Alarm A14: PS5a Pressure Sensor Fault	5: BV	15
Alarm A15: PS5b Pressure Sensor Fault	5: BV	16
Alarm A16: PS5c Pressure Sensor Fault	5: BV	17
Alarm A17: Secondary Flow Meter Sensor Fault	5: BV	18
Alarm A18: Primary Flow Meter Sensor Fault	5: BV	19
Alarm A19: microSD Card Fault	5: BV	20
Alarm A20: Leak Fault / Water make-up empty	5: BV	21
Alarm A21: Leak Shutdown / Insufficient Water Level	5: BV	22
Alarm A22: P1 Inverter Fault	5: BV	23
Alarm A23: P2 Inverter Fault	5: BV	24
Alarm A24: P3 Inverter Fault	5: BV	25
Alarm A25: Sec Low Flow	5: BV	26
Alarm A26: Sec Pump Flow Shutdown	5: BV	27
Alarm A27: Valve 1 Fault	5: BV	28
Alarm A28: Valve 2 Fault	5: BV	29
Alarm A29: Primary Water Low Flow	5: BV	30
Alarm A30: Primary Water Low Temp	5: BV	31

Name	Type	Instance
Alarm A31 : Primary Water High Temp	5: BV	32
Alarm A32 : Secondary Water Low Temp	5: BV	33
Alarm A33 : Secondary Water High Temp	5: BV	34
Alarm A34 : Flood Unit	5: BV	35
Alarm A35 : PS1 Diff Out Of Limits	5: BV	36
Alarm A36 : Sec Over Pressure	5: BV	37
Alarm A37 : Flood Under floor	5: BV	38
Alarm A38 : Check Water Make-up Level	5: BV	39
Alarm A39 : System Low Pressure	5: BV	40
Alarm A40 : Secondary Over-pressure	5: BV	41
Alarm A41 : Primary Water No Flow	5: BV	42
Alarm A42 : Level Sensor – No Water Detected	5: BV	43
Alarm A43 : Illegal Water Sensor Condition	5: BV	44
Alarm A44 : Inverter 1 Communications Error	5: BV	45
Alarm A45 : Inverter 2 Communications Error	5: BV	46
Alarm A46 : Inverter 3 Communications Error	5: BV	47
Alarm A47 : Secondary Filter 1 Dirty	5: BV	48
Alarm A48 : Secondary Filter 2 Dirty	5: BV	49
Alarm A49 : Secondary Filter 3 Dirty	5: BV	50
Alarm A50 : Secondary Temperature T2a Diff Fault	5: BV	51
Alarm A51: Secondary Temperature T2b Diff Fault	5: BV	52
Alarm A52 : Secondary Temperature T2c Diff Fault	5: BV	53
Alarm A53 : Group Control Network Fault	5: BV	54
Alarm A54 : Group Control Insufficient Units Available	5: BV	55
Alarm A55 : Restricted Pump Performance	5: BV	56
Alarm A56 : Pump 1 Fault	5: BV	57
Alarm A57 : Pump 2 Fault	5: BV	58
Alarm A58 : Pump 3 Fault	5: BV	59
Mode	2: AV	60
Group Control Mode	2: AV	61
Pump 1 Speed	2: AV	62
Pump 2 Speed	2: AV	63
Pump 3 Speed	2: AV	64
Control Valve 1 Demand	2: AV	65

Name	Type	Instance
Control Valve 1 Feedback	2: AV	66
Control Valve 2 Demand	2: AV	67
Control Valve 2 Feedback	2: AV	68
Primary Supply Temperature T1	2: AV	69
Primary Return Temperature T5	2: AV	70
Primary Duty	2: AV	71
Secondary Supply Temperature T2a	2: AV	72
Secondary Supply Temperature T2b	2: AV	73
Secondary Supply Temperature T2c	2: AV	74
Secondary Supply Temperature T2	2: AV	75
Room Temperature T3	2: AV	76
Room Relative Humidity RH	2: AV	77
Dew Point DW	2: AV	78
Secondary Return Temperature T4	2: AV	79
Secondary Return Pressure PS1a	2: AV	80
Secondary Return Pressure PS1b	2: AV	81
Secondary Return Pressure PS1	2: AV	82
Secondary Supply Pressure PS2	2: AV	83
Secondary Differential Pressure	2: AV	84
Primary Inlet Pressure PS3	2: AV	85
Primary Outlet Pressure PS4	2: AV	86
Primary Flow Rate	2: AV	87
Secondary Flow Rate	2: AV	88
Secondary Duty	2: AV	89
Temperature Setpoint	2: AV	90
Pump P1 Runtime	2: AV	91
Pump P2 Runtime	2: AV	92
Pump P3 Runtime	2: AV	93
Secondary Filter 1 Inlet Pressure PS5a	2: AV	94
Secondary Filter 2 Inlet Pressure PS5b	2: AV	95
Secondary Filter 3 Inlet Pressure PS5c	2: AV	96
Secondary Filter 1 Differential Pressure (PS5a – PS2)	2: AV	97
Secondary Filter 2 Differential Pressure (PS5b – PS2)	2: AV	98
Secondary Filter 3 Differential Pressure (PS5c – PS2)	2: AV	99

Name	Type	Instance
Controller Up-time	2: AV	100
System (Group) Average Secondary Differential Pressure	2: AV	101
System (Group) Total Secondary Flow Rate	2: AV	102
Pump 1 Input Power	2: AV	103
Pump 2 Input Power	2: AV	104
Pump 3 Input Power	2: AV	105

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SL-70625\_REVC\_07-22