



XDU1350 Coolant Distribution Unit

Installation and Commissioning Guide

XDU1350B

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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.

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1 Important Safety Instructions

Save These Instructions

This manual contains important instructions that should be followed during operation and maintenance of the Vertiv™ 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 controller does not isolate power from the unit, even in the Unit Off mode. Some internal components still require and receive power even during the Unit Off mode of the controller. The factory supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.

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 controller does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the unit off mode of the controller.

Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturer 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 backup generator systems) for startup, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power source voltages should be stabilized and regulated to within $\pm 5\%$ 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 startup 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 startup 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 startup 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, which 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 coolant fluid 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 and 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 controller does not isolate power from the unit, even in the Unit Off mode. Some internal components still require and receive power even during the Unit Off mode of the controller. The factory supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.

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 cULus listed for the appropriate voltage models and certificates will be made available on request (cULus certificate pending).



2.2 ROHS 3 Compliance

Vertiv certifies that all products manufactured and supplied by Vertiv are fully RoHS compliant in accordance with EU RoHS Directives EU 2015/863.



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3 Product Description

3.1 General

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

The XDU1350 contains a secondary closed loop circuit that provides a supply of cooling fluid to IT equipment, either through indirect cooling (such as rack mounted rear door heat exchangers), or direct cooling (such as 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 **Vertiv™ XDU1350 Coolant Distribution Unit Application and Planning Guide SL-71309** for more information).

3.2 Model Number Nomenclature

The XDU1350 can be configured for voltage options to suit most global locations, secondary filtration, primary top/bottom connections and secondary top/bottom connections. **Table 3.1** below is an example of the XDU1350 model number, fully configured. **Table 3.2** below describes each digit of the model number.

Table 3.1 Standard 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	B	A	1	A	1	7	0	3	2	T	0	H	T	1	3	K	S	0

Table 3.2 Model Number Definitions

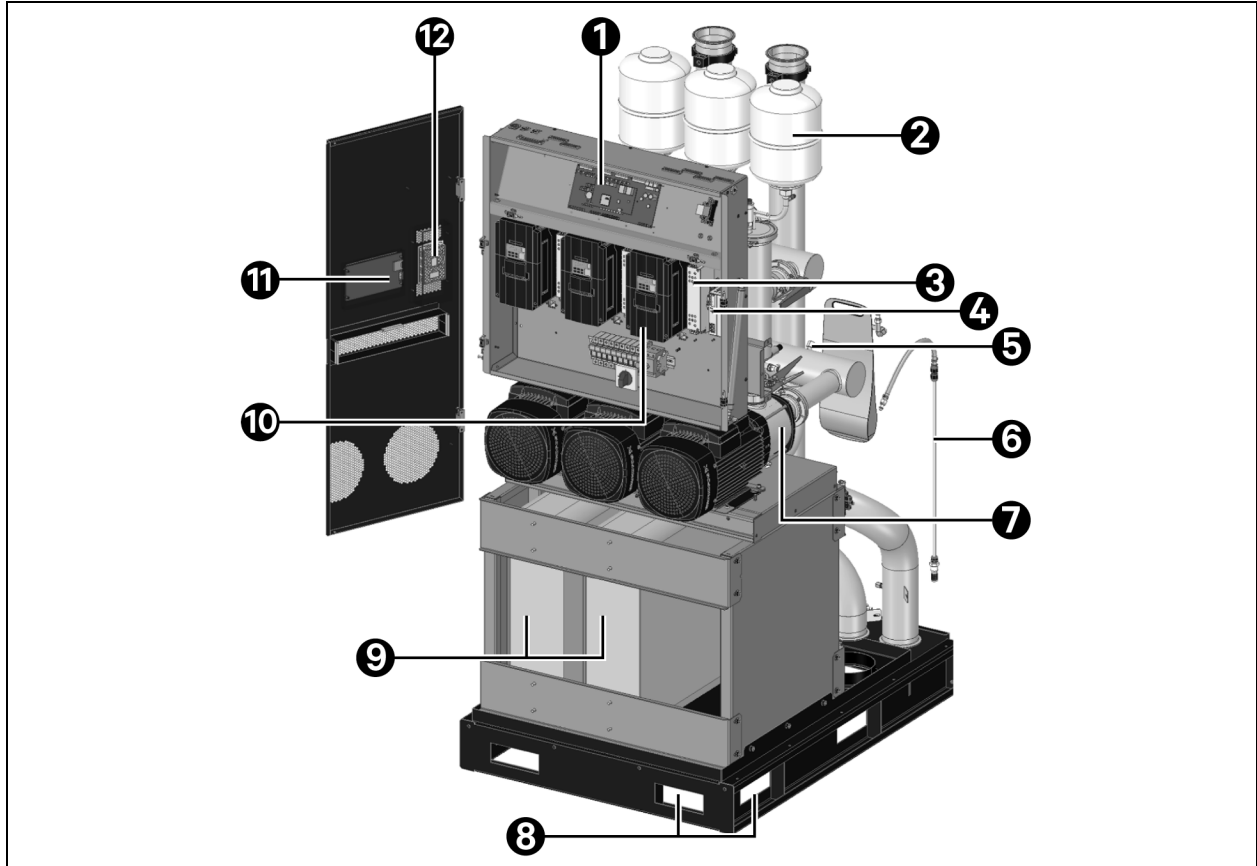
Digit	Feature	Value	Description
1,2,3	Family name	XDU	Product family
4,5,6,7	Unit model	1350	Model
8	Revision	B	Product revision
9	Voltage	U	400 V for EMEA
		A	460 V - 3 PH - 60 Hz
		Q	400 V - 3 PH - 50/60 Hz
10	ATS	0	Standard power termination enclosure
		1	Power termination enclosure with automatic transfer switch (ATS) 400V or 480V nominal

Table 3.2 Model Number Definitions (continued)

Digit	Feature	Value	Description
11	Controller	A	Standard controller
12	Communication	0	None
		1	Protocol: Modbus, BACnet, SNMP V2 / V3, HTTP(s) Webserver, NTP, SSH-CLI, SFTP
13	Display	7	7 in. touchscreen display
14	Secondary circuit fluid monitoring	0	None
		A	PH + Conductivity (0-10,000 us/cm range) + Turbidity (0-100 NTU)
15	Pump configuration	3	3 Pumps
16	EMC filter	2	No EMC filter
		0	Standard EMC filter
17	Primary connection from facility	T	Top connection
		B	Bottom connection
18	Primary filtration	0	None
19	Primary control valve — Chilled water	H	Standard valve
		L	Alternative low flow valve
20	Secondary connection to equipment	T	Top connection
		B	Bottom connection
21	Secondary filtration	0	None
		1	Factory fitted (50 μ)
		2	Factory fitted (25 μ)
22	Pressure relief valve—Secondary circuit to equipment	3	3 bar pressure
		4	4 bar pressure
		5	5 bar pressure
		6	6 bar pressure
		7	7 bar pressure
23	Reservoir	N	SS Reservoir w/ 3-stage fluid level detection
		K	Flexible makeup container
24	Packaging	S	Seaworthy
25	SCCR	L	5 kA
		0	65 kA

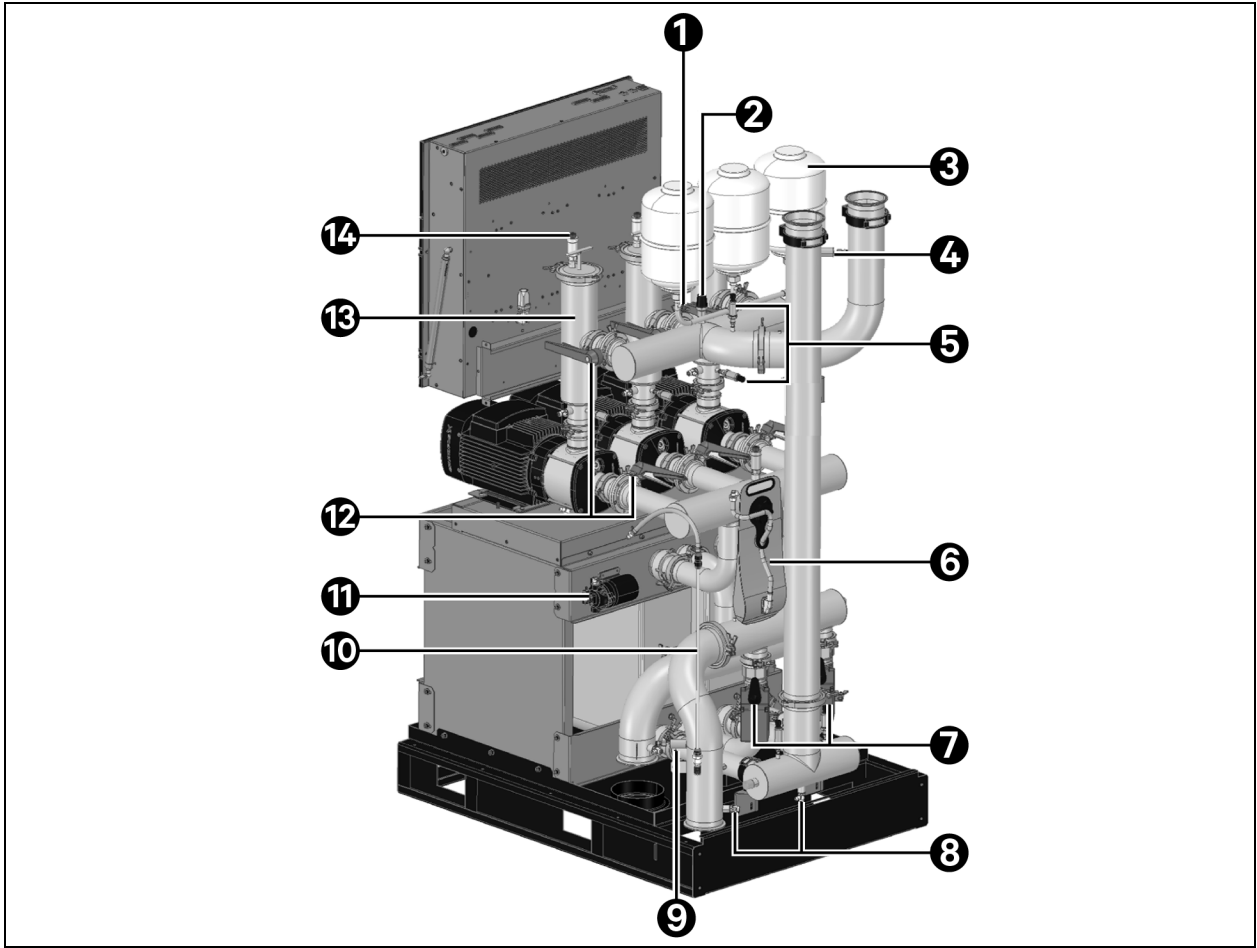
3.3 Product Views

Figure 3.1 Front View of Vertiv™ XDU1350 (Without Panels) With Top Secondary Connection, Bottom Primary Connection and Flexible Makeup Container



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

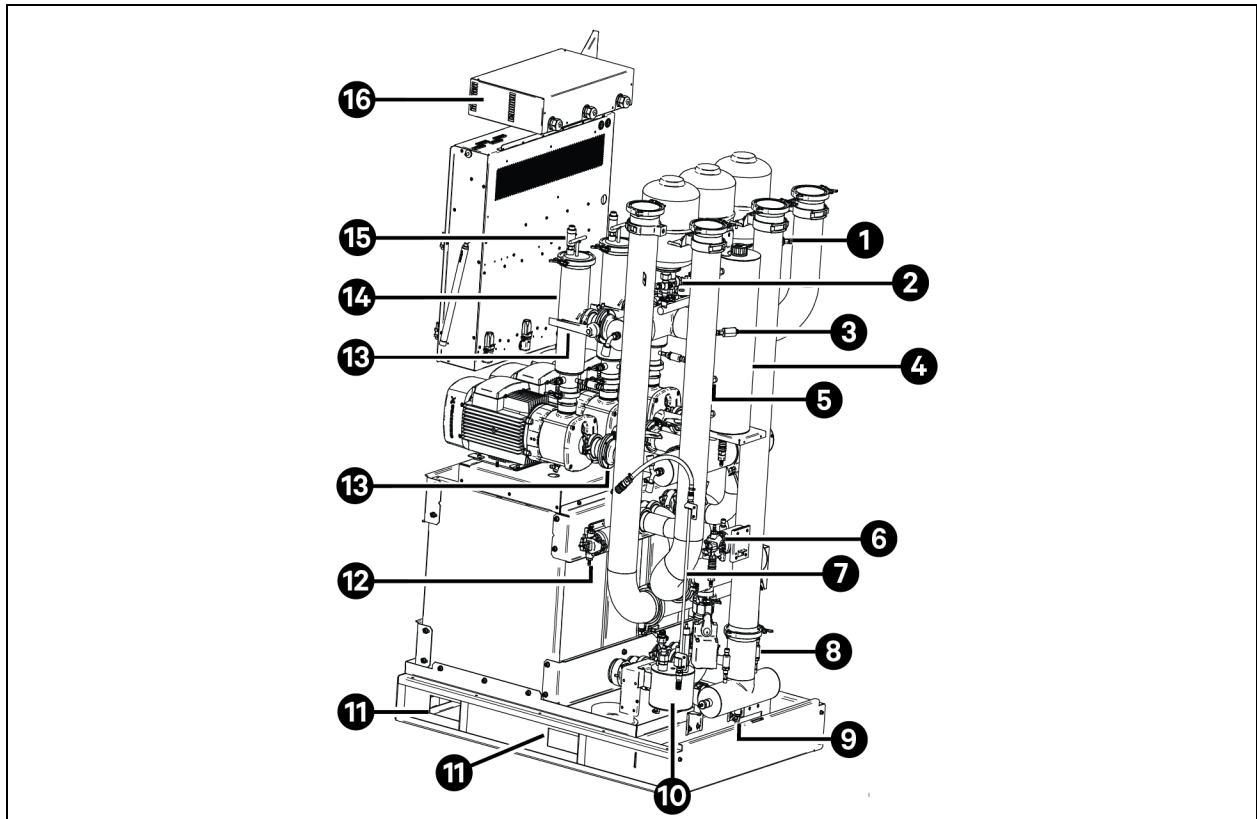
Figure 3.2 Rear View of Vertiv™ XDU1350 (With Panels) With Top Secondary Connection, Bottom Primary Connection and Flexible Makeup Container



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 makeup container
7	Primary cooling valves (2-way with manual override)
8	Drain valves
9	Primary flow meter
10	Filling wand
11	Fill pump

Item	Description
12	Filter/pump isolation valves
13	Secondary filters
14	Auto air vent (fitted to each filter housing and pump inlet manifold)

Figure 3.3 Rear View of Vertiv™ XDU1350 (Without Panels) With Top Secondary and Primary Connection, Stainless Steel Reservoir, Secondary Fluid Quality Monitoring and an ATS



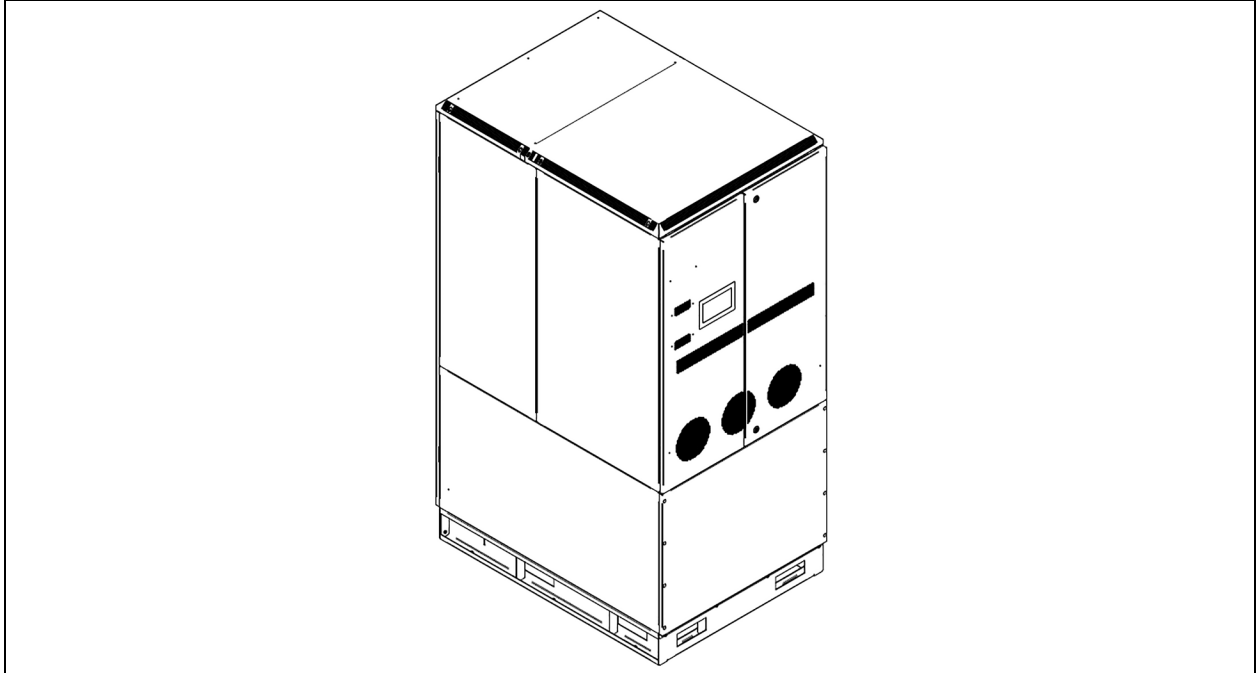
Item	Description
1	Secondary flowmeter
2	Pressure relief valve
3	Primary flowmeter
4	Reservoir tank
5	Level sensor
6	Reservoir fill pump P5
7	Filling wand
8	Pressure sensor
9	Drain valve

Item	Description
10	Secondary fluid monitoring system (optional)
11	Side forklift access
12	System fill pump P4
13	Filter/pump isolation valves
14	Secondary filters
15	Automatic air vents
16	Power termination enclosure/ATS(optional)

4 Technical Data

4.1 General

Figure 4.1 Vertiv™ XDU1350 (With or Without Factory Installed ATS Inside Unit)



Dimensions	Height		Width		Depth	
	in.	mm	in.	mm	in.	mm
Standard Cabinet	83.50	2122	35.40	900	47.20	1200
Shipping						
Standard Cabinet	89.92	2284	40.90	1040	54.61	1387
Weight	Dry		Operating		Shipping	
	lbs.	kg	lbs.	kg	lbs.	kg
Standard Cabinet	1929	875	2350	1066	2273	1031

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 startup 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 4.1 Sanitary Flanges

Circuits	Details
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.

Circuits	Details
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

Circuits	Details
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

Unit Voltage Rating		Vertiv™ XDU1350 Without ATS 3 Pumps	Vertiv™ XDU1350 With ATS 3 Pumps	Vertiv™ XDU1350 Without ATS 2 Pumps	Vertiv™ XDU1350 With ATS 2 Pumps
400 V 3 PH 50/60 Hz	FLA	38.5	39	26	26.5
	WSA	41	42	29	30
	OPD	50	50	40	40
480 V 3 PH 60 Hz	FLA	37	37.5	25	25.5
	WSA	41	42	29	30
	OPD	50	50	40	40

4.5 Noise

Sound power level at 3 m is less than 55dBA.

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™ XDU1350 crate should be placed on a level solid surface to safely unload the unit from the crate.

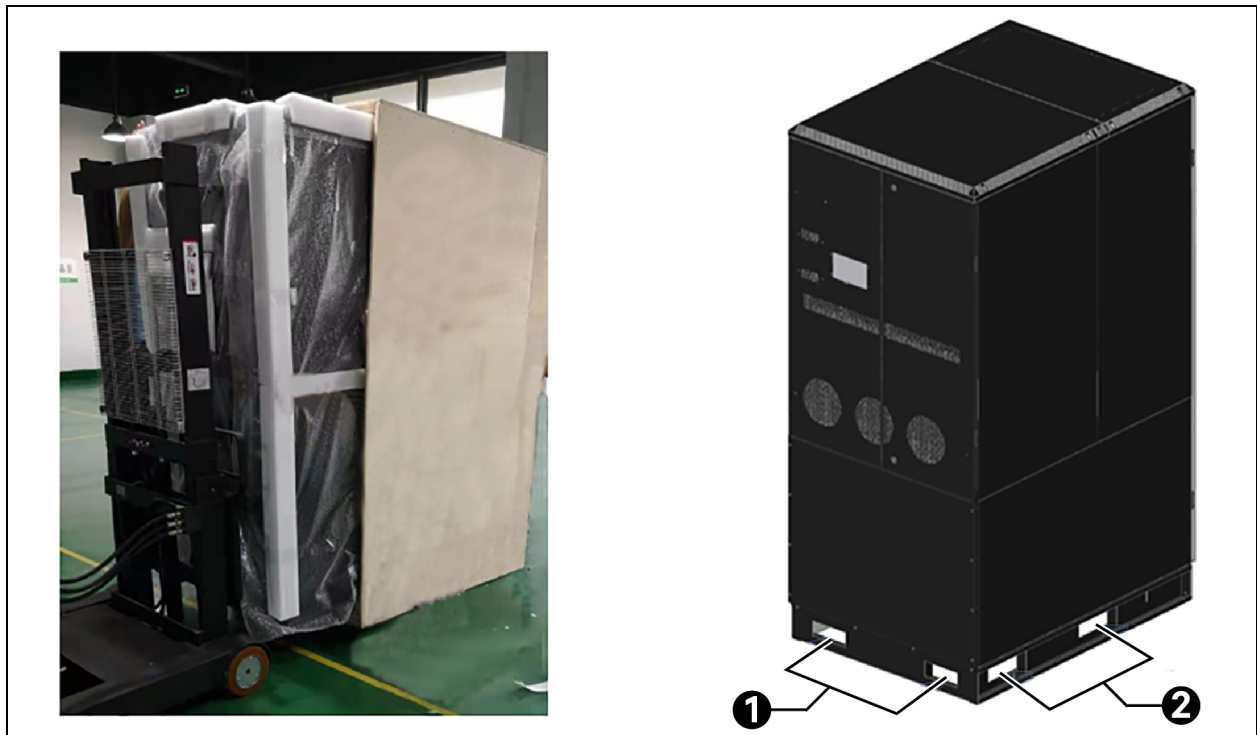
Check crate for any signs of external transit damage (any serious damage must be reported to manufacturer and shipper immediately, prior to unpacking).

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 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 XDU1350 Unit from Crate



Item	Description
1	Front access when unloading from crate
2	Alternative access from either side, after unloading access when unloading from crate

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

The Vertiv™ 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 36 in. (913.4 mm) should be allowed at the front and rear of the unit to allow the access doors to be fully opened. Ensure 36 in. (913.4 mm) clearance above unit for service to the power termination enclosure.

5.2 Piping

The XDU1350 is intended to be positioned on a smooth, level floor, ideally a raised floor (if bottom exit pipework) with at least 20 in. (500 mm) clear under floor space for a manifold system to IT equipment. If the 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 filling 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 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.

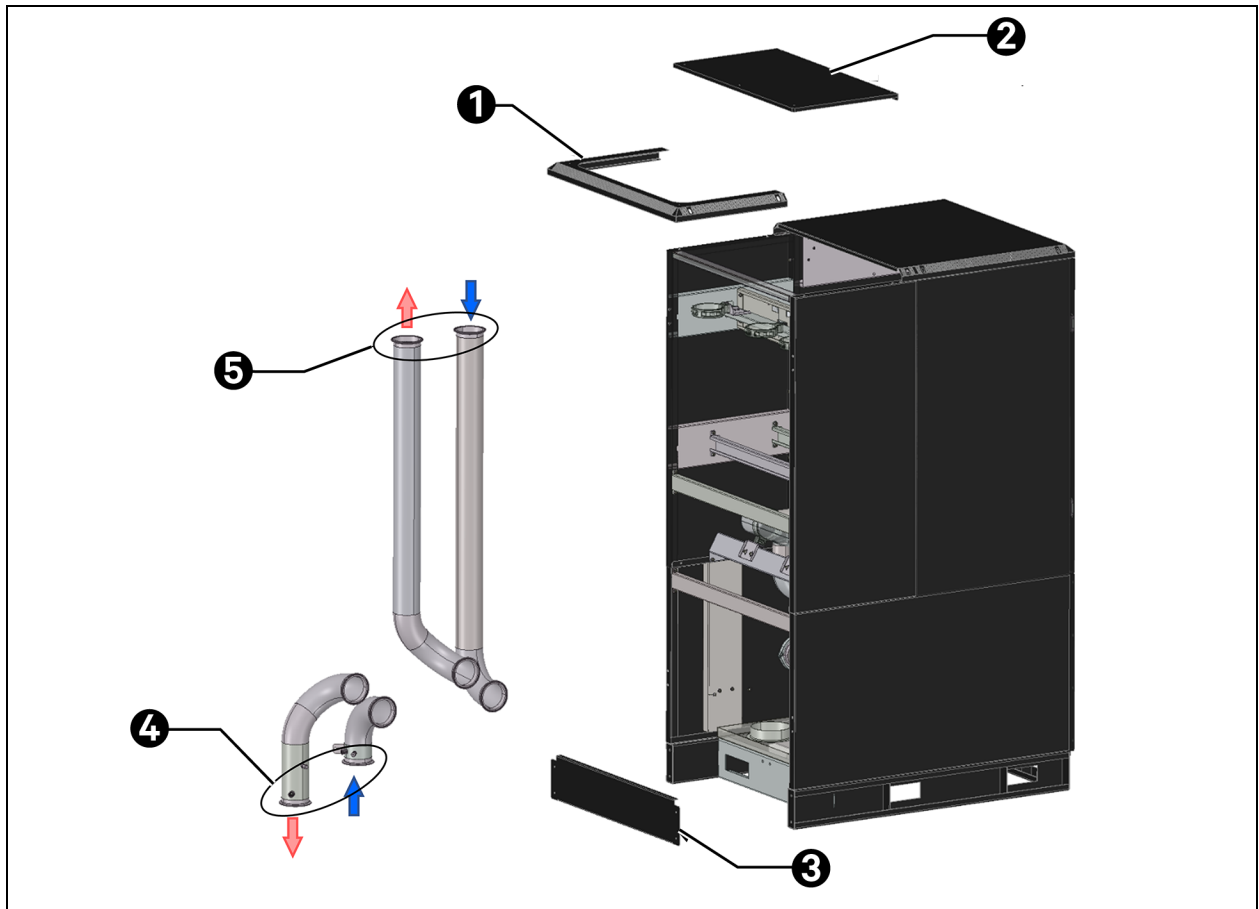
Install an overflow drain pan under the unit with a monitored leak detection system in the pan and shutoff valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shutoff valves should be spring return and must be rated for a close off 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™ XDU1350 primary connections are 4 in. (DN100) sanitary flanges (to BS4825 Pt.3 or equivalent with 4.7 in. (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 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



Item	Description
1	Rear roof surround can be removed for better top exit pipe access
2	Rear roof panel discarded for top exit tails
3	Bottom rear panel can be removed for better bottom exit pipe access
4	Primary bottom exit tail option
5	Primary top exit tail option

External isolation valves should be fitted by the installer to both supply and return pipes, as close as possible to the Vertiv™ 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.

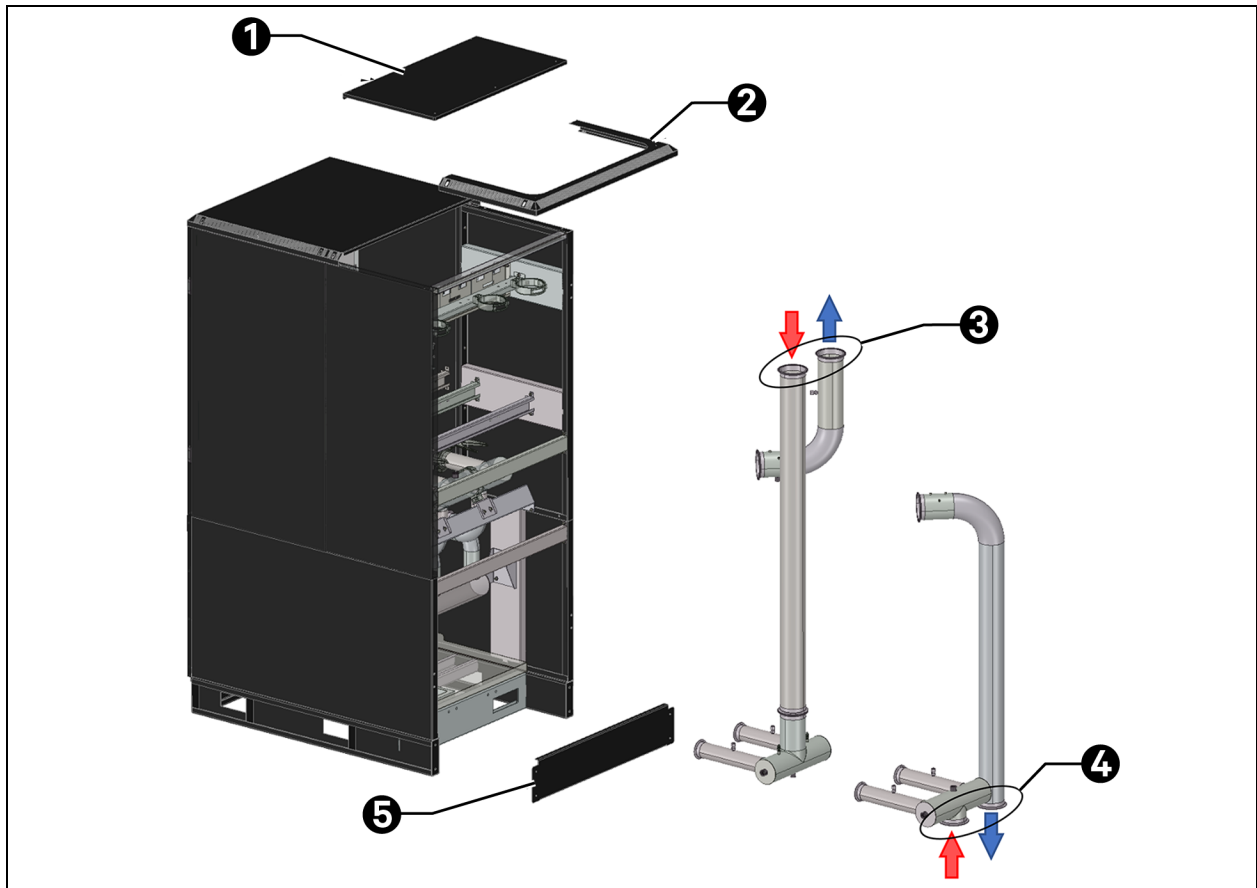
The overflow drain pan should have a drain line connected to it that flows to a floor drain or maintenance sink in case of a shutoff valve or leak detection system malfunction.

The XDU1350 secondary connections are 4 in. (DN100) sanitary flanges (to BS4825 Pt.3 or equivalent with 4.7 in. (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 Vertiv™ 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 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.

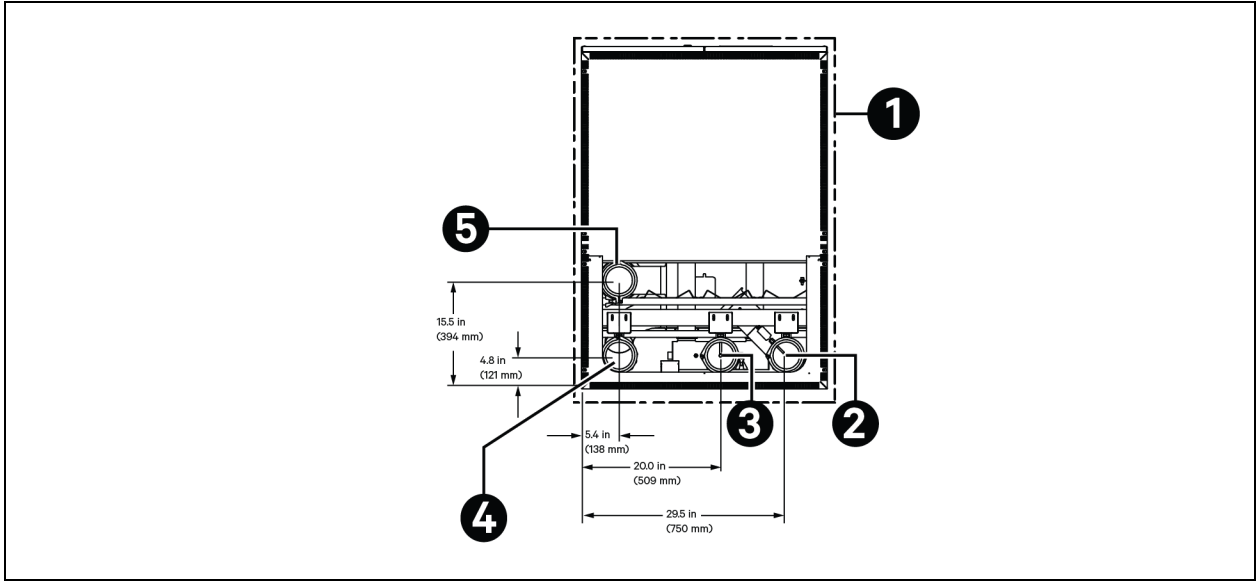
Figure 5.3 Secondary Circuit Connections



Item	Description
1	Rear roof panel discarded for top exit tails
2	Rear roof surrounded can be removed for better top exit pipe access
3	Secondary top exit tail option
4	Secondary bottom exit tail option
5	Bottom rear panel can be removed for better bottom exit pipe access

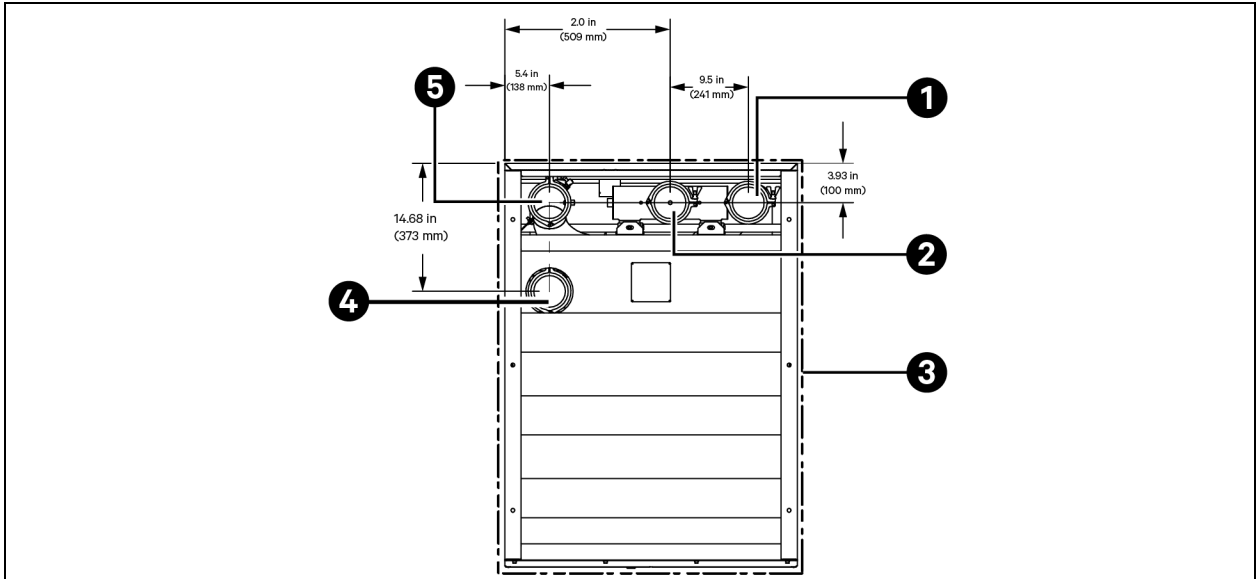
NOTE: Install manual shut off valves at the primary and secondary lines to each unit to permit routine service and emergency isolation of the unit.

Figure 5.4 Rear Section Showing Primary and Secondary Pipe Connection Locations (Top Connections)



Item	Description
1	Top of unit
2	Secondary supply
3	Secondary return
4	Primary return
5	Primary supply

Figure 5.5 Rear Section Showing Primary and Secondary Pipe Connection Locations (Bottom Connections)

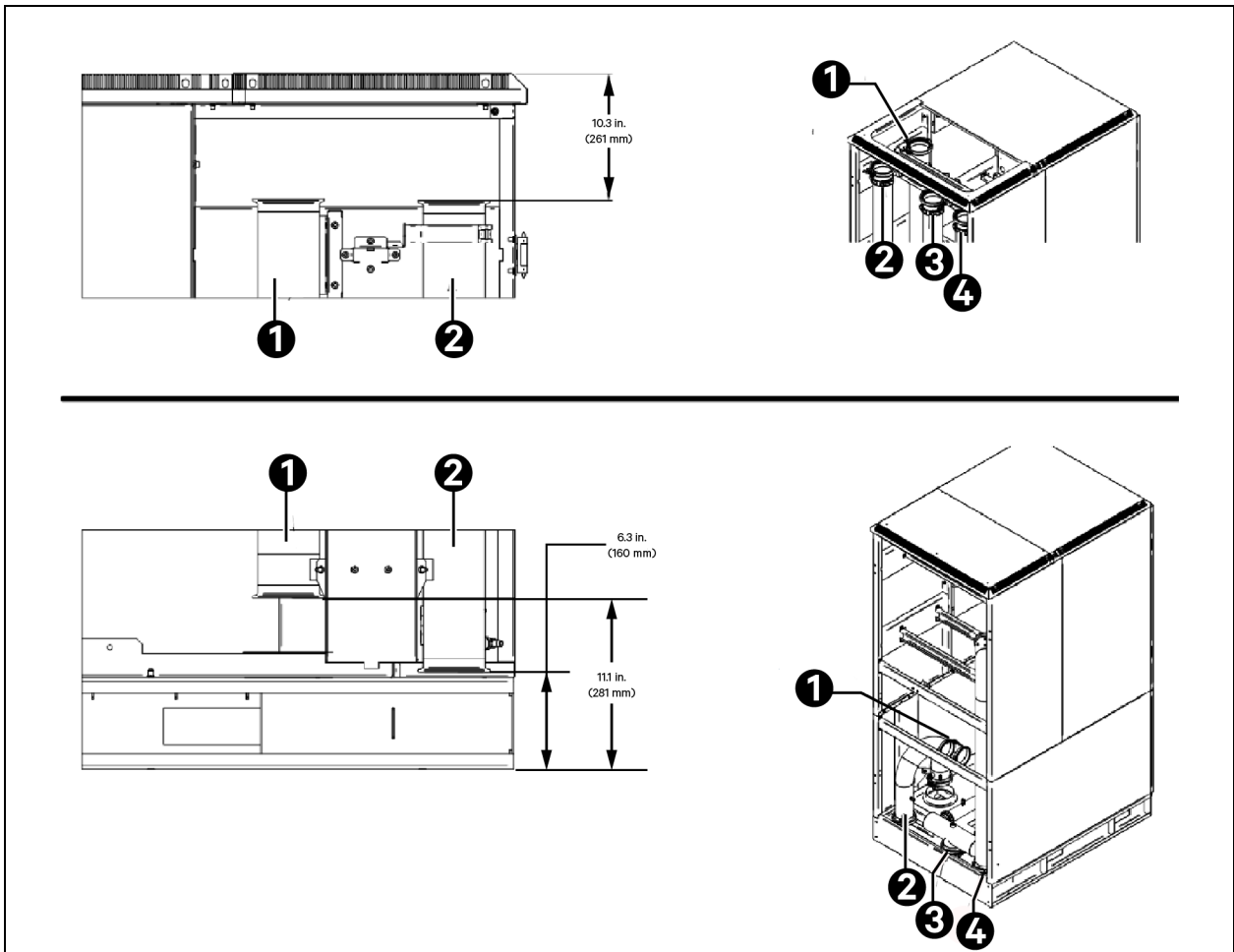


Item	Description
1	Secondary supply
2	Secondary return
3	Bottom of unit
4	Primary supply
5	Primary return

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

Figure 5.4 on the previous page, Figure 5.5 on the previous page and Figure 5.6 below side views of XDU1350 rear section, show the primary and secondary circuit pipe connection locations for both top and bottom exit pipework.

Figure 5.6 Internal Piping Details



Item	Description	Size
1	Primary (facility) supply fluid to CDU	4 in. (DN100) sanitary fitting
2	Primary (facility) return fluid to heat rejection	4 in. (DN100) sanitary flanges
3	Secondary circuit return from heat load	4 in. (DN100) sanitary flanges
4	Secondary circuit supply to heat load	4 in. (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. Controller does not isolate power from the unit, even in the Unit Off mode. Some internal components still require and receive power even during the Unit Off mode of the controller. The factory supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.

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 controller does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the unit off mode of the controller.

Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturer 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 backup generator systems) for startup, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power source voltages should be stabilized and regulated to within $\pm 5\%$ 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.

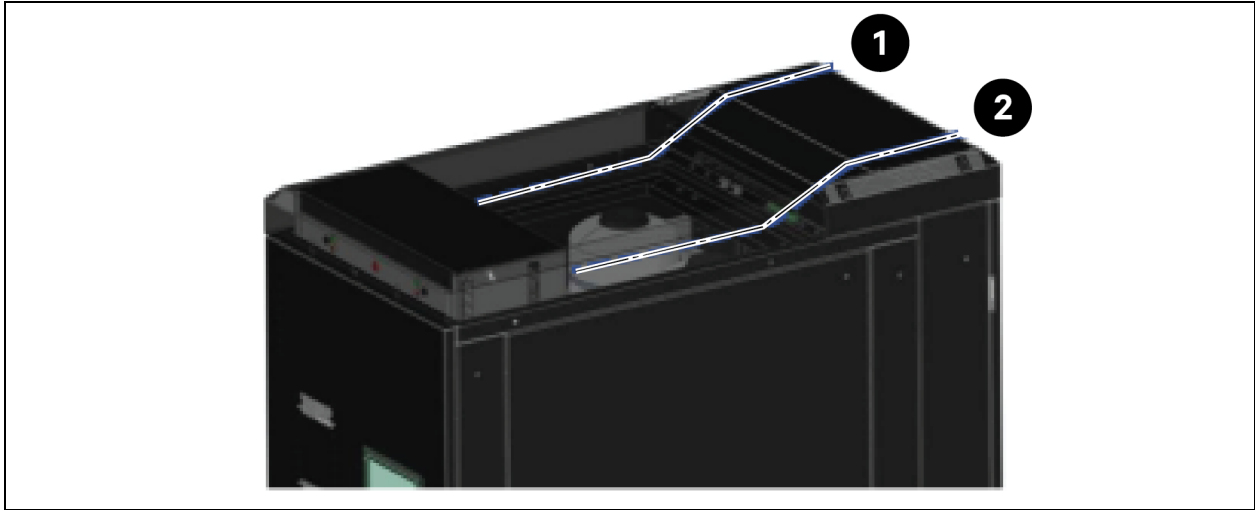
NOTICE

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 startup 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 phasing of the unit with proper instrumentation to ensure that the power connections were made correctly. We also recommend verifying discharge and suction pressures during startup to ensure that the pumps are running in the correct direction.

Single Power Supply

The incoming power cables can be routed into the unit via the floor void or through the cabinet rear roof panel as shown in **Figure 5.7** on the facing page. If no ATS (Automatic Transfer Switch) has been specified, there will be just one power cable, which should follow the route of supply A.

Figure 5.7 Power Cable Route—Top Entry

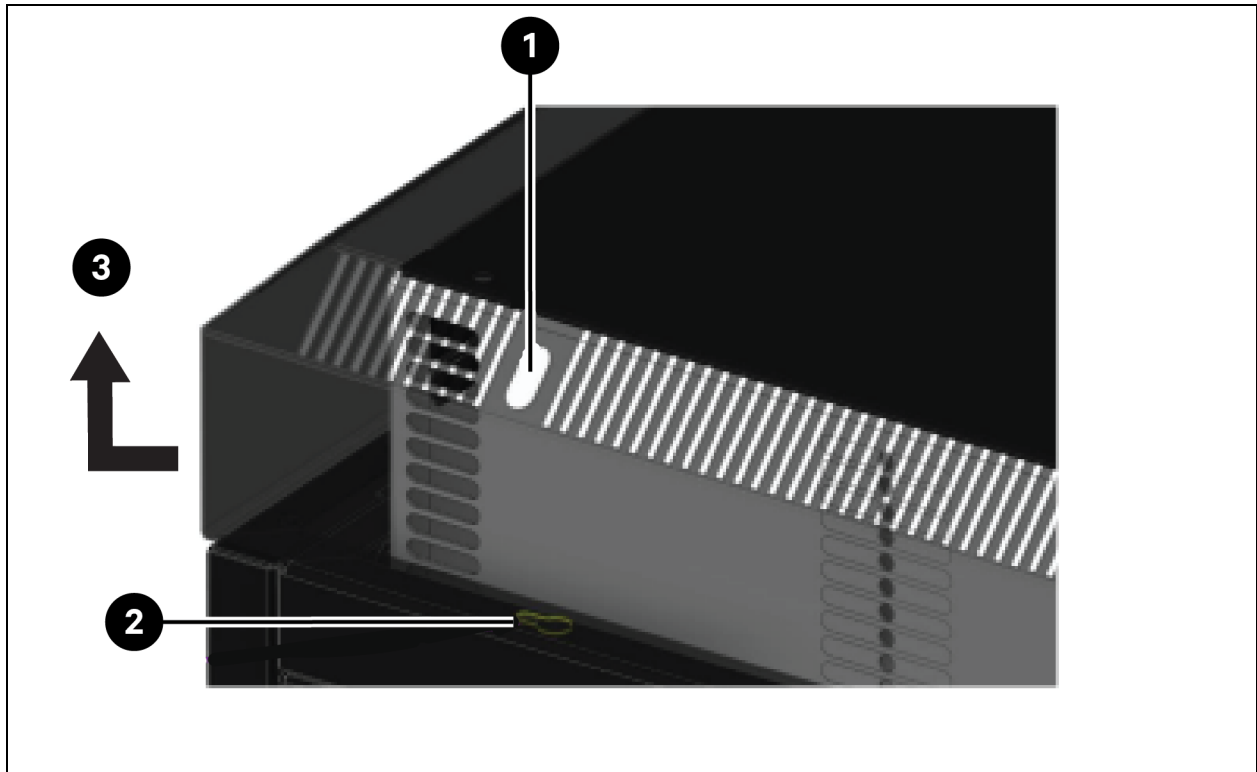


Item	Description
1	Supply A
2	Supply B

The enclosure in the front roof section of the cabinet contains either terminals only for a single incoming power supply (if no ATS has been specified) or terminals for both A and B supplies with additional components if an ATS was specified as part of the overall unit configuration. Upstream protection must be provided by the end user in the form of fuses or breakers in accordance with the electrical load stipulated on the wiring diagram and in accordance with local regulations.

Access to the power cable termination enclosure will require removal of the front roof panel. The front and rear roof panels are held in place with 4 M4 screws. Screwdriver access to these screws is shown in **Figure 5.8** on the next page.

Figure 5.8 Roof Panel Removal



Item	Description
1	Screwdriver access
2	Keyhole slots in bottom face of roof panel
3	When screws are loosened, roof panel can be slid forward and lifted off

NOTICE

It is not necessary to completely remove the roof panel retaining screws. There are keyholes slots in the bottom face of the roof panel, so screws may be loosened, but left in place when removing the 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 mains power and has a door interlocked disconnect/isolator to remove power prior to opening. Both sections require an 0.31 in. (8 mm) triangular key to open (unit is provided with cabinet keys).

A 1.25 in. (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 in. - 1 in. (14 mm - 25 mm) diameter power cable. The cable termination point is at the main electrical panel disconnect (isolator) and adjacent ground (earth) terminal.

The recommended cable size should be 4-core 10.0 mm² (7 AWG) minimum. 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.

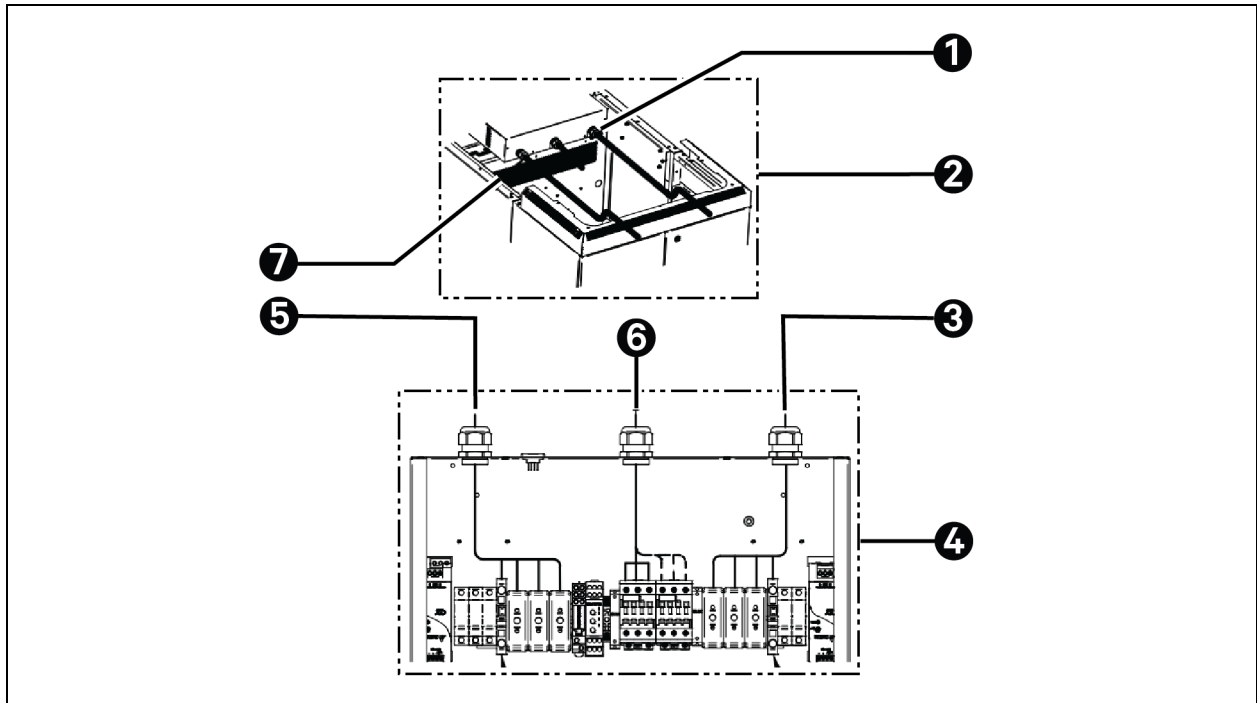
The two M6 transit screws should be removed from the back face of the chassis, as indicated in **Figure 5.10** on page 34. This will allow the electrical panel to hinge up on gas struts for maintenance access in future to the secondary circuit filters.

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™ XDU1350 units are supplied configured for the required voltage option specified. Check data plate information for compatibility prior to installation.

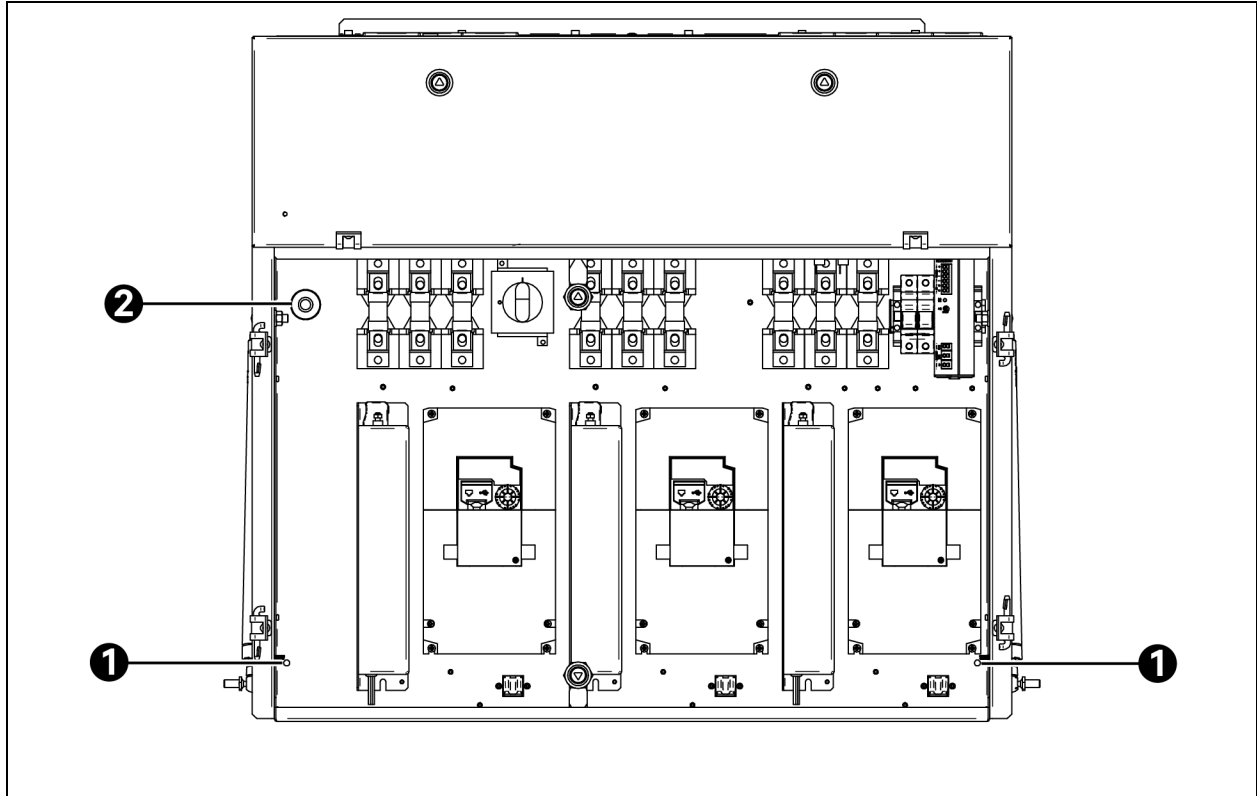
The XDU1350 can accept A and B power supplies if an ATS (Automatic Transfer Switch) has been specified at time of order.

Figure 5.9 Power Termination Enclosure



Item	Description
1	Wire routing for field power supply A
2	Rear of unit
3	Field high voltage connection power supply B
4	Front of unit
5	Field high voltage connection power supply A
6	Cable gland exit for factory wired power feed to XDU
7	Wire routing for field power supply B

Figure 5.10 Cable Entry Point and Transit Screw Removal



Item	Description
1	Remove transit screws
2	Power cable entry gland

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 5.11** on the facing 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™ 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 XDU. Vertiv recommends installing the sensor in different areas near the heat load by the 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.

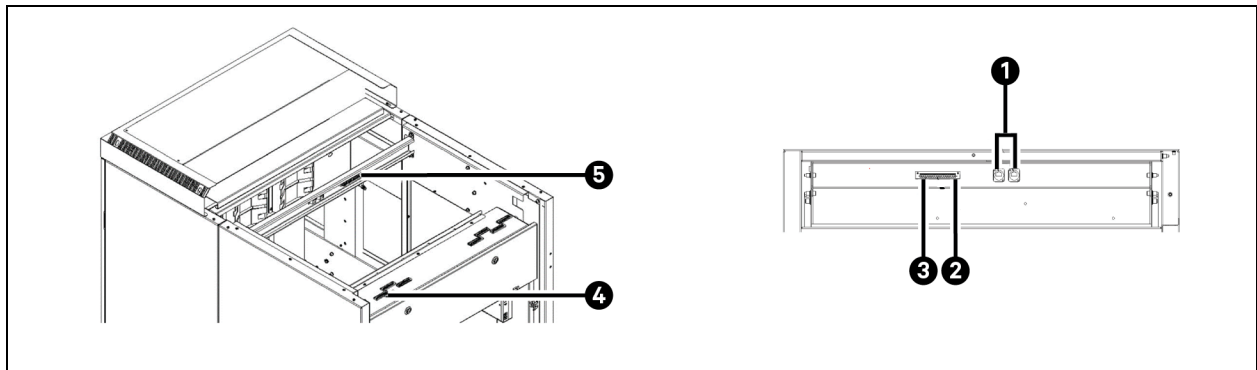
A leak detection tape (optional) can be connected to terminals 15 and 16 on SK11 for leak detection under the floor.

5.3.3 Communications Wiring

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

1. RS485 Modbus (terminals 7, 8 and 9 on connector SK11). Use Beldon 3106A, or equivalent (1 pair +1, shielded 22 AWG).
2. CANbus IN and OUT (IN terminals 1, 2 and 3 and OUT are 4, 5 and 6 on connector SK11). Use Beldon 3106A, or equivalent (1 pair +1, shielded 22 AWG). CANbus is used for communication between XDU1350s for group control.
3. 2 x Ethernet ports (RJ45) - Cat5e shielded cable.

Figure 5.11 Communication Options and Locations

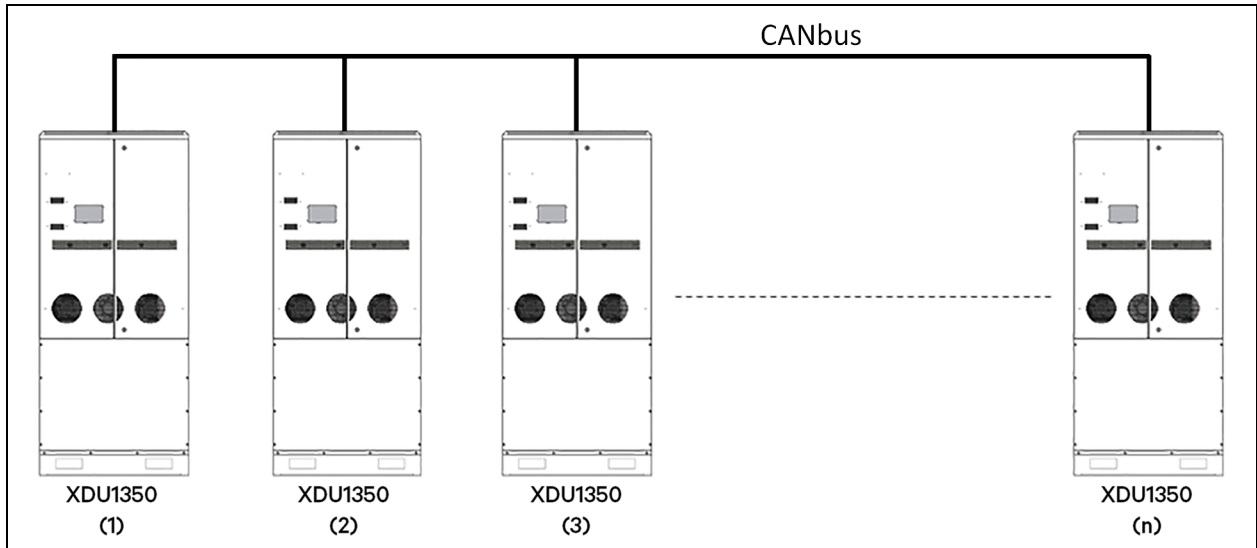


Item	Description
1	Ethernet A and B
2	RS485
3	CANbus
4	SK4
5	SK11

5.3.4 Group Control

For more information refer to **Vertiv™ XDU1350 Coolant Distribution Unit Operation and Maintenance Manual SL-71310**.

Figure 5.12 Vertiv™ XDU1350 Group Control (Maximum Number of Units in Single Group is 8)



For larger and N+x redundancy installations, 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 5.13 Vertiv™ 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



5.4 Pre-Commissioning Checks

5.4.1 Site Check

1. Check if the site requires protective equipment such as safety boots.
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 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™ 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. 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 that cable baskets, cable trays, drip trays, etc. have been installed to provide adequate support for the hoses or manifold.
5. Confirm 36 in. of clearance is available in front and rear of the unit to fully open the access doors.
6. Confirm 36 in. of space above unit for service access.

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

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 controller does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the unit off mode of the controller.

Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturer 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 backup generator systems) for startup, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power source voltages should be stabilized and regulated to within $\pm 5\%$ 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 startup 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 startup to ensure that the pumps are running in the correct direction.

1. Confirm installed Vertiv™ 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 XDU1350 meets specification and rating as dictated by the latest wiring diagram.

4. If rating differs from Vertiv™ XDU1350 specification, please note specification and confirm acceptability.
5. Check and record the voltage available across each of the three phases meets XDU1350 model requirements.
6. All internal and external high and low voltage wiring connections are tight.
7. Confirm that the XDU1350 is properly grounded to an earth ground and electrical service conforms to national and local codes.
8. If 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 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 startup 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™ 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 startup 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 μ 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)

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6 Commissioning

6.1 Unit Configuration

Prior to running the Vertiv™ 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: Its 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 XDU1350 power cable to be wired in 4 mm² cable.

Over Pressure Action – See Configuration menu/Pump Control/Over Pressure Action (P212)/Alarm, Alarm + Shutdown or Alarm + Backoff. This will determine if the unit should continue to run (with or without backoff 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 shutdown 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.

6.2 Primary Circuit

6.2.1 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, (less than 2 psig per hour/13.8 kPa per 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 that the water detection is properly installed around all units.

6.2.2 Facility Water Supply

1. Confirm facility/primary water supply is available prior to Vertiv™ XDU1350 installation and commissioning. If a dedicated chiller is to be utilized, ensure this has been fully commissioned at least 24 hours prior to XDU1350 commissioning.
2. Check that facility water or chiller has been connected to the 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 23).
5. Verify that facility/primary water supply is fully operational and will provide sufficient flow rate/temperature at less than 10 bar pressure, as per the original installation specifications.
6. Verify water detection is properly installed around all units (recommended).

6.2.3 Primary Control Valves

1. The 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.

6.2.4 Primary Circuit Filling

1. Crack open the supply and return valves fitted in the pipework to the Vertiv™ 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 makeup facility and that filling the XDU1350 unit will not result in the chilled water system shutting down due to loss of water.

6.2.5 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 XDU1350. Refer to [Vertiv™ XDU1350 Cooling Distribution Unit Operating and Maintenance Guide SL-71310](#) 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 [Vertiv™ XDU1350 Coolant Distribution Unit Application and Planning Guide SL-71309](#) 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 bypassing excessive primary flow should be available in the external pipework.
4. Adjust the primary flow rate by following the steps below:
 - a. Set the controller to overrides as described in [Unit Low Speed Circulation](#) on page 52.
 - b. Adjust the cooling valves to 100%. This forces the cooling valves to open fully for maximum flow through the heat exchangers.
 - c. Return 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 XDU1350 to the required approximate setting.

6.3 Secondary Circuit

6.3.1 Secondary Pipework Connections

1. Check that the 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, (less than 2 psig per hour/13.8 kPa per 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).

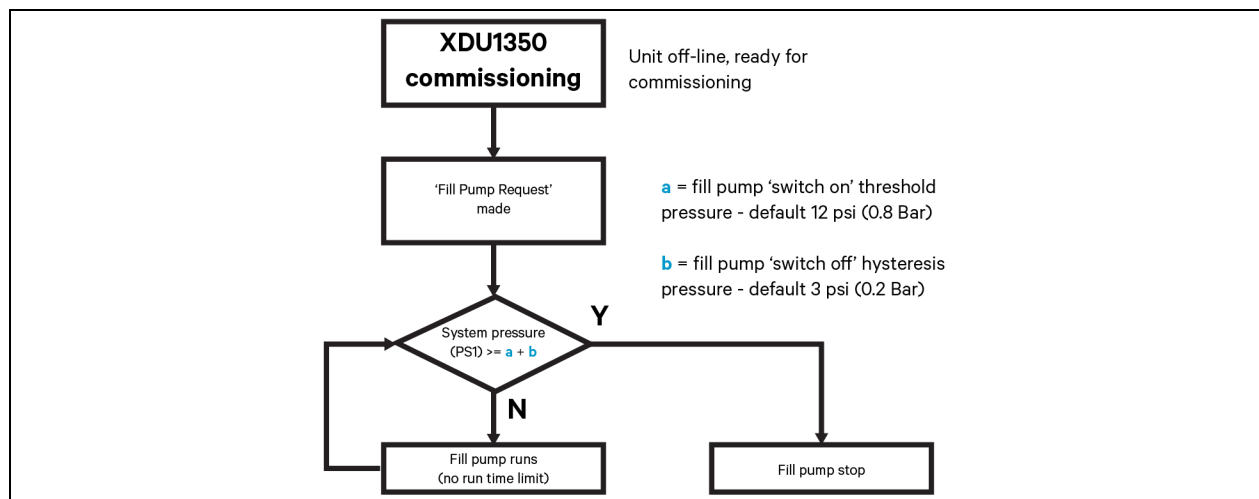
6.3.2 Secondary Circuit Filling—For Unit With Flexible Makeup Container

NOTE: When filling and running the secondary circuit, the operator should be fully knowledgeable of the operation of the Vertiv™ XDU1350. Refer to the XDU1350 Coolant Distribution Unit Operating and Maintenance Guide SL-71310 for more information.

1. Position container of pre-treated coolant at the rear of the XDU1350.
2. Ensure all automatic air vent bleed screws are loose, but not removed. Air vent bleed screws are located at the top of each filter housing and on discharge header.
3. Insert the filling wand into the container then the 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

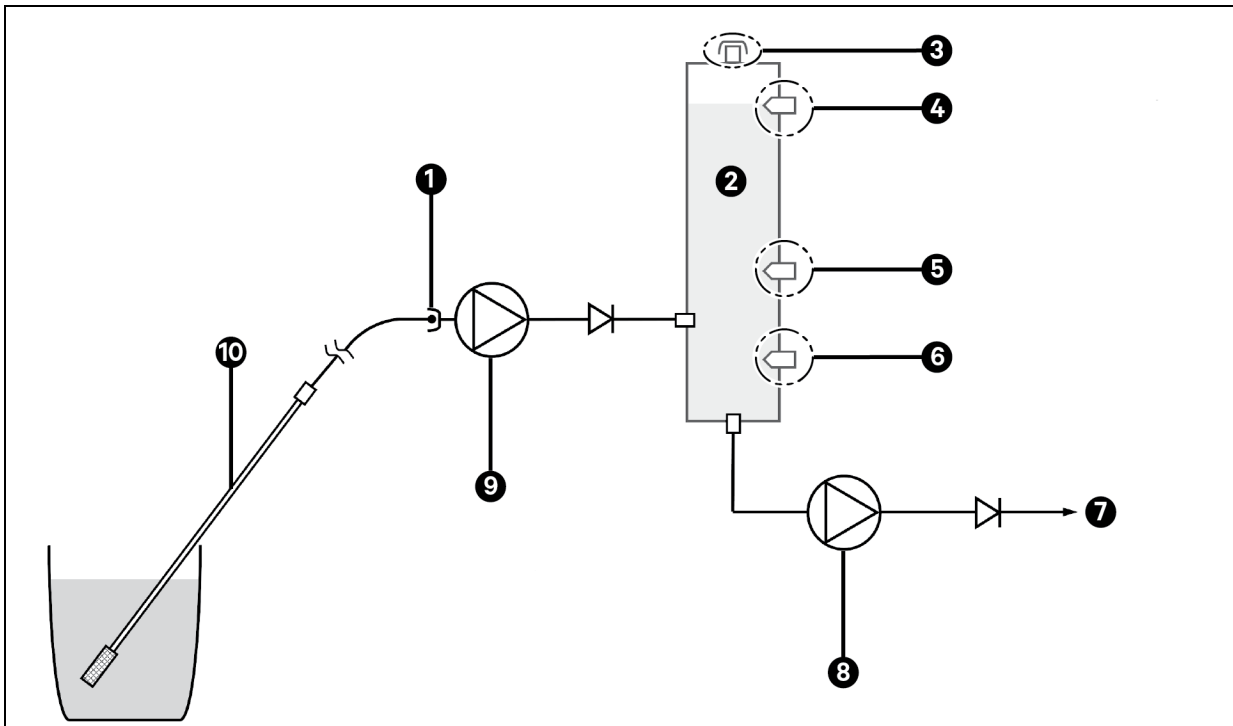


6.3.3 Secondary Circuit Filling—For Unit With Stainless Steel Reservoir Tank

1. Position container of pre-treated deionized water in front of the 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. Ensure all drain valves are closed.
4. Insert the filling wand into the container, then connect fill wand hose to the fill pump quick release coupling.
5. Log on to the controller with the service access code (5699).
6. Select fill pump P5 followed by ON. The fill pump will then start pumping the fluid into the unit reservoir tank at a rate of approximately 4 l/m.
7. The reservoir level sensors can be monitored during the filling process while in the Fill Pump Control screen (see **Figure 6.3** on the next page) – the sensor condition will change from white to green as fluid reaches each sensor level. Reservoir working capacity is 9.25 liters.
8. Ensure the fluid container with the filling wand does not run dry during this process. Fill pump P5 will switch OFF automatically when reservoir tank is full or can be manually switched OFF at any time using the OFF command.

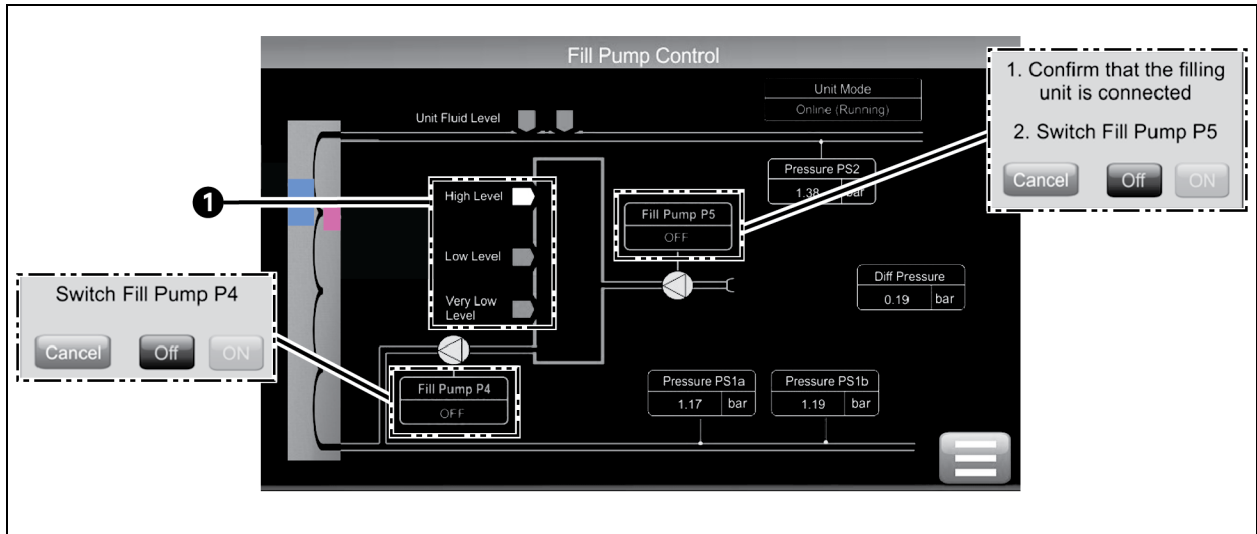
Figure 6.2 Secondary Circuit Filling



Item	Description	Item	Description
1	Self sealing quick connect	6	Very low level (empty) - alarm A55 Reservoir Tank Empty and fill pump P4 disabled
2	10 liters reservoir tank	7	XDU1350 Secondary Circuit
3	Breather	8	Fill Pump P4 Automatic start/stop to maintain system pressure set point
4	High level (full) - fill pump P5 disabled when wet and enabled when dry	9	Fill Pump P5 Manual start/stop + automatic stop when reservoir tank full
5	Low level (water required) - alarm A54 Reservoir Tank Fluid Required	10	Filling wand - connected to fill pump P5 when reservoir tank needs to be replenished.

NOTE: Fill pumps P4 and P5 interlocked to prevent both running at the same time.

Figure 6.3 Fill Pump Control



Item	Description
1	Level indicators change from white to green when wet

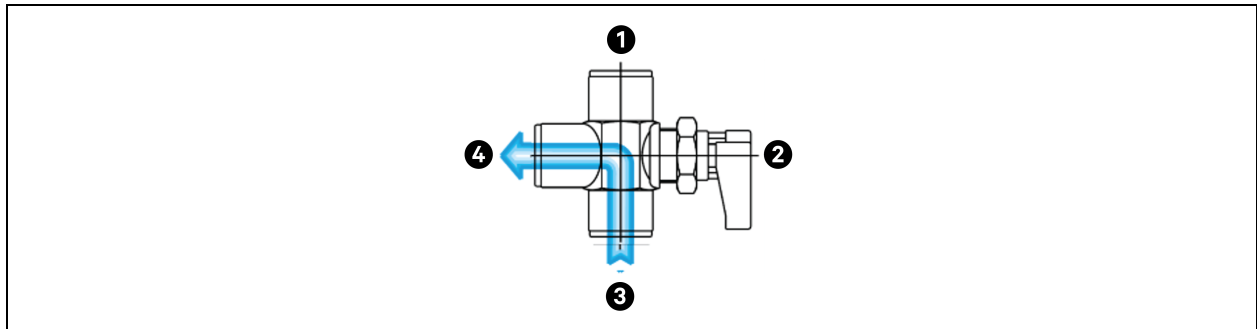
9. Once reservoir tank is full, it can be emptied into the Vertiv™ XDU1350 system using fill pump P4. Select fill pump P4 followed by ON.
10. Fill pump P4 will switch OFF automatically when reservoir tank reaches the very low level sensor or can be manually switched OFF at any time using the OFF command.
11. Repeat the process of filling the reservoir tank with pump P5 then pumping reservoir contents into system with pump P4 until fill pump P4 stops automatically when system static fill pressure is ≥ 1.0 Bar. The system pressure (PS1a and PS1b) can be monitored on the fill pump control screen shown in **Figure 6.3** above, or on the Home screen.
12. Once the system is at the required static fill pressure, go back to fill pump P5 and ensure the reservoir tank is fully topped up.
13. Leave the filling wand connected and in the container as more fluid will be required as air is expelled from the system during the initial operation.
14. Check for leaks.

6.3.4 Expansion Vessel Venting

While the system is filling, the common feed hose and pipework leading to the expansion vessels should be manually vented.

1. Set the handle on the three-way valves located under each expansion vessels as shown in **Figure 6.4** on the facing page and **Figure 6.5** on the facing page.
2. Crack open the vent valves in turn (using key provided – see **Figure 6.6** on page 52) to allow trapped air to vent. Close the drain valves as soon as fluid starts to emerge (the hose provided may be used to avoid fluid spillage in the unit, it is recommended that during venting, the drain valve is swivelled so that hose barb connection is pointing upwards to ensure all air is purged).

Figure 6.4 Vent Valve Handles—Commissioning Position

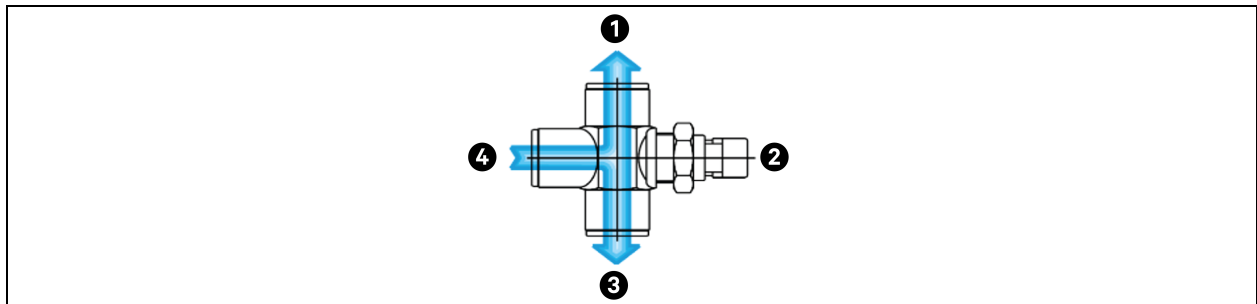


Item	Description
1	Expansion vessel
2	Commissioning position
3	System
4	Drain valve

Commissioning Position: Valve handles set to connect system to drain valves, allowing trapped air in system to be vented out during the filling process.

- Once venting has been completed, set valve handles to the centre position for normal operation.

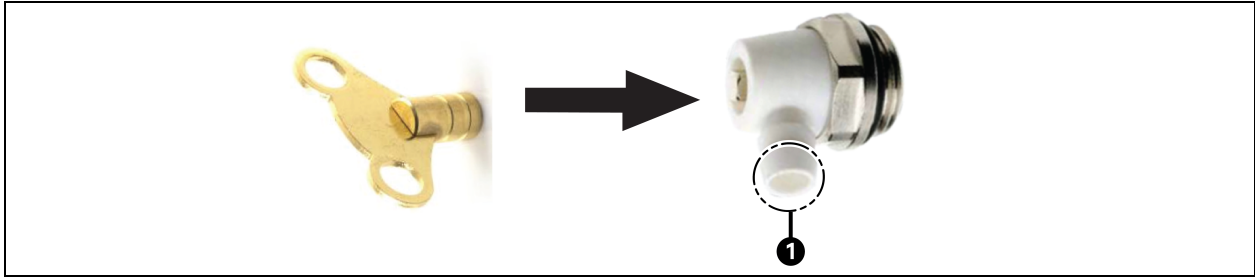
Figure 6.5 Vent Valve Handles—Normal Operating Position



Item	Description
1	Expansion vessel
2	Normal operating position
3	System
4	Drain valve

Normal Operating Position: Valve handles in central position set to connect expansion vessels to system pressure.

Figure 6.6 Vent Valve (Located under each Expansion Tank)



Item	Description
1	3/8 in. (9.525 mm) bore hose may be used to prevent spillage.

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% in order to enable adequate motor fan cooling and default Flow/DP. The default Flow/DP may not be achieved if the pump is required to operate below 15% depending 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 50/60 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™ 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.

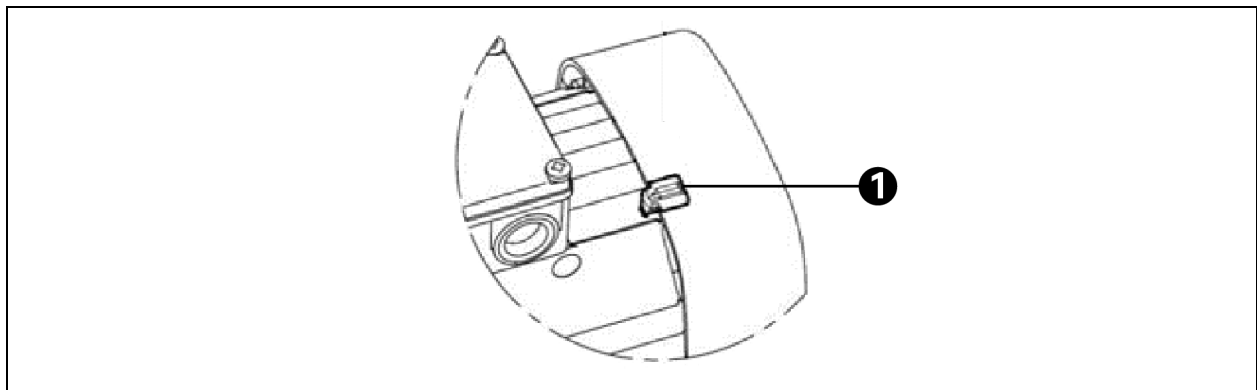
NOTICE

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 startup 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 startup 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 6.7 Indicator Flag Location



Item	Description
1	Indicator flag

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 shutdown and all outputs will be inactive unless manually set and all alarms will be ignored (see Installation and Commissioning manual for more information).

It is 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 shutdown 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 startup 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.

6.8.1 Units With Flexible MakeUp Container

Once the unit is commissioned the filling wand may be disconnected and the flexible makeup 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 makeup Level alarm, as a reminder for investigation.

Before connecting the makeup 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.

6.8.2 Units with Stainless Steel Reservoir Tank

Once the unit is commissioned, ensure that the reservoir tank is filled to the maximum level. Then disconnect the filling wand and return to the storage location on the left hand cabinet corner post. The reservoir tank contains approx. 9.25 liters of fluid, 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 reservoir tank status should be regularly inspected during service visits and refilled if required as described in section [Secondary Circuit Filling—For Unit With Flexible Makeup Container](#) on page 48 through manual activation of fill pump P5. When reservoir fluid level drops to the middle level sensor, a low level an A54 – reservoir fluid tank fluid required alarm will be raised. If fluid level drops further to the lowest level sensor, an A55 – reservoir tank empty alarm will be raised and system fill pump P4 will be inhibited until reservoir is refilled.

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

505 N Cleveland Ave

Westerville, OH 43082

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™ XDU1350

Figure B.1 Pipe Schematic with Flexible Makeup Container

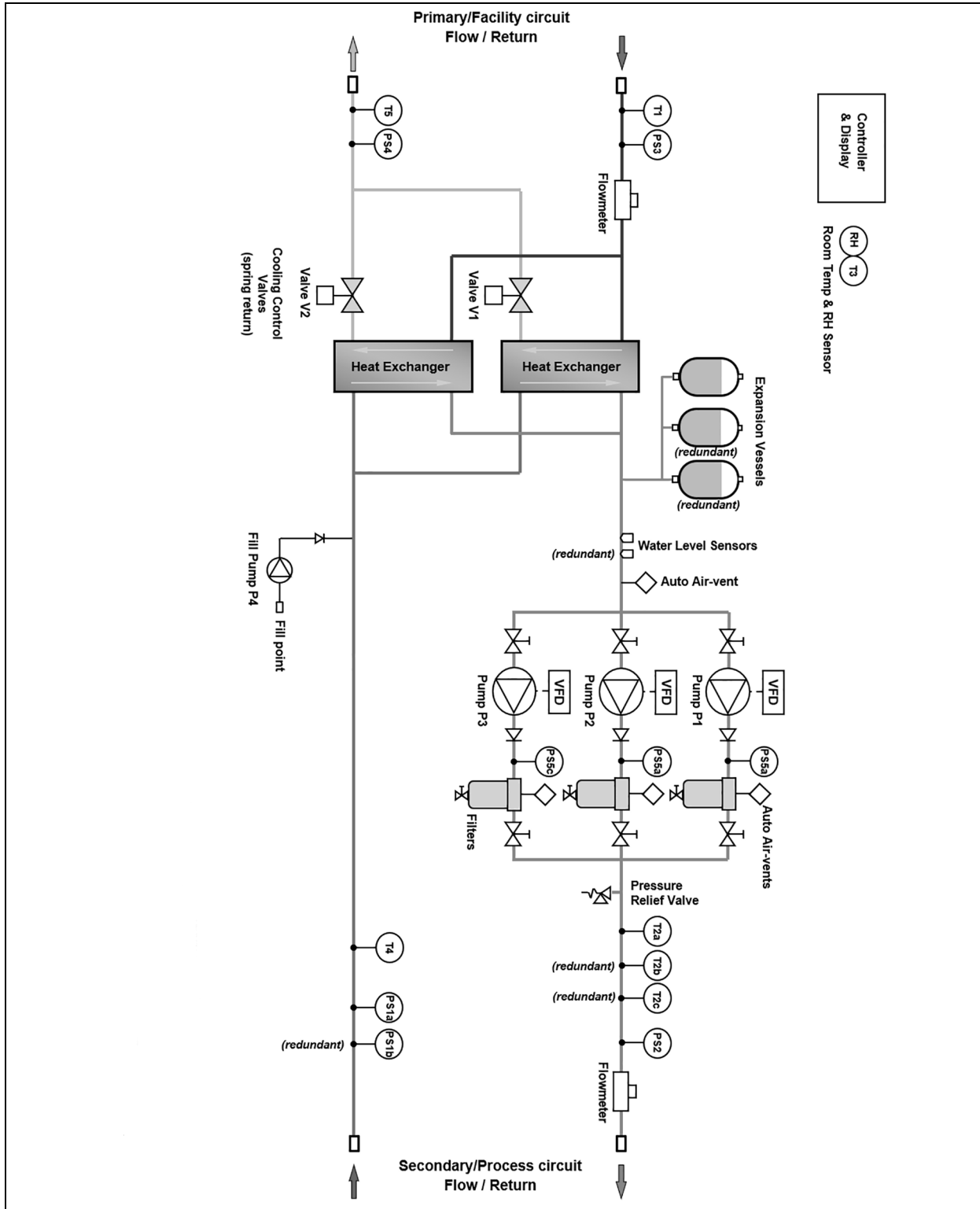
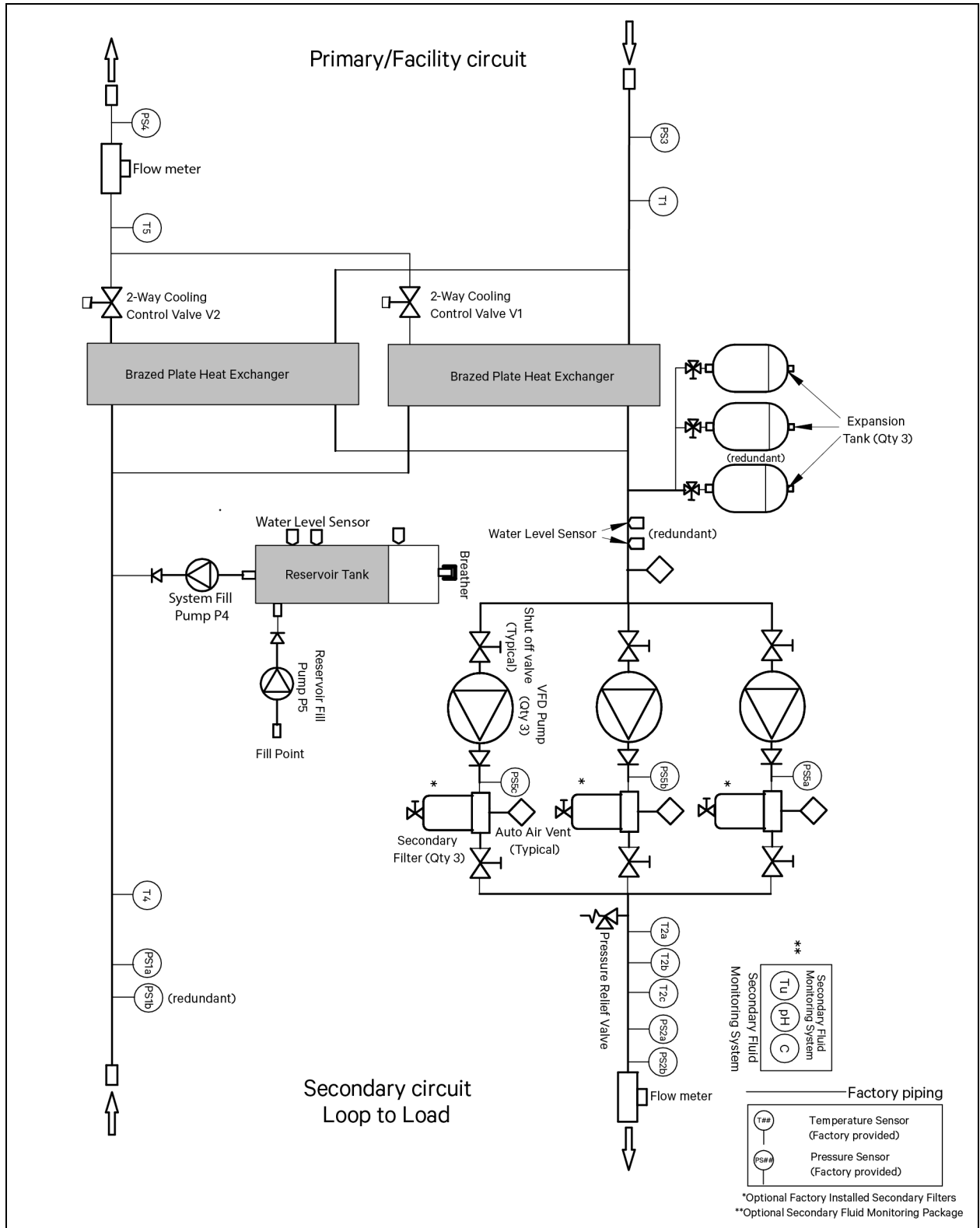


Figure B.2 Pipe Schematic with Stainless Steel Reservoir Tank



Appendix C: Modbus Register Table

Table B.1 Discrete Inputs

Register Number	Register Description	Vertiv™ 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 : PS2a Pressure Sensor Fault	A11
14	Alarm : PS2b Pressure Sensor Fault	A12
15	Alarm : PS3 Pressure Sensor Fault	A13
16	Alarm : PS4 Pressure Sensor Fault	A14
17	Alarm : PS5a Pressure Sensor Fault	A15
18	Alarm : PS5b Pressure Sensor Fault	A16
19	Alarm : PS5c Pressure Sensor Fault	A17
20	Alarm : Secondary Flow Meter Sensor Fault	A18
21	Alarm : Primary Flow Meter Sensor Fault	A19
22	Alarm : microSD Card Fault	A20
23	Alarm : P1 Inverter Fault	A21
24	Alarm : P2 Inverter Fault	A22
25	Alarm : P3 Inverter Fault	A23
26	Alarm : Inverter 1 Communications Error	A24
27	Alarm : Inverter 2 Communications Error	A25
28	Alarm : Inverter 3 Communications Error	A26
29	Alarm : Pump Low Flow	A27
30	Alarm : Valve 1 Fault	A28
31	Alarm : Valve 2 Fault	A29

Table B.1 Discrete Inputs (continued)

Register Number	Register Description	Vertiv™ XDU1350 Alarm Code
32	Alarm : Primary Fluid Low Flow	A30
33	Alarm : Primary Fluid No Flow	A31
34	Alarm : Primary Filter Dirty	A32
35	Alarm : Primary Fluid Low Temp	A33
36	Alarm : Primary Fluid High Temp	A34
37	Alarm : Secondary Fluid Low Temp	A35
38	Alarm : Secondary Fluid High Temp	A36
39	Alarm : Leak - Unit	A37
40	Alarm : Leak - Under floor	A38
41	Alarm : PS1 Difference Out Of Limits	A39
42	Alarm : PS2 Difference Out Of Limits	A40
43	Alarm : Secondary Over pressure	A41
44	Alarm : System Low Pressure	A42
45	Alarm : Insufficient Fluid Level	A43
46	Alarm : Level Sensor – No Fluid Detected	A44
47	Alarm : Illegal Fluid Sensor Condition	A45
48	Alarm : Group Control Network Fault	A46
49	Alarm : Group Control Insufficient Units Available	A47
50	Alarm : Secondary Filter 1 Dirty	A48
51	Alarm : Secondary Filter 2 Dirty	A49
52	Alarm : Secondary Filter 3 Dirty	A50
53	Alarm : Secondary Temperature T2a Diff Fault	A51
54	Alarm : Secondary Temperature T2b Diff Fault	A52
55	Alarm : Secondary Temperature T2c Diff Fault	A53
56	Alarm : Reservoir Tank Fluid Required	A54
57	Alarm : Reservoir Tank Empty	A55
58	Alarm : Below Dewpoint	A56
59	Alarm : Auxiliary Input Module Communications Fault	A57
60	Alarm : Secondary Fluid Quality – PH Sensor Fault	A58
61	Alarm : Secondary Fluid Quality – Conductivity Sensor Fault	A59
62	Alarm : Secondary Fluid Quality – Turbidity Sensor Fault	A60

Table B.1 Discrete Inputs (continued)

Register Number	Register Description	Vertiv™ XDU1350 Alarm Code
63	Alarm : Secondary Fluid Quality – PH Out of Limits	A61
64	Alarm : Secondary Fluid Quality – Conductivity Out of Limits	A62
65	Alarm : Secondary Fluid Quality – Turbidity Out of Limits	A63

Table B.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	Cooling Demand	%	1	Unsigned
7	Control Valve 1 (Cooling) Demand	%	1	Unsigned
8	Control Valve 1 Feedback	%	1	Unsigned
9	Control Valve 2 Demand	-	1	Unsigned
10	Control Valve 2 Feedback	%	1	Unsigned
11	Primary Supply Temperature T1	°C	0.1	Signed
12	Secondary Supply Temperature T2a	°C	0.1	Signed
13	Secondary Supply Temperature T2b	°C	0.1	Signed
14	Secondary Supply Temperature T2c	°C	0.1	Signed
15	Secondary Supply Temperature T2	°C	0.1	Signed

Table B.2 Input Registers (continued)

Register Number	Description	Units	Scaling	Data Type
16	Room Temperature T3	°C	0.1	Signed
17	Room Relative Humidity RH	% RH	0.1	Unsigned
18	Dew Point DW	°C	0.1	Signed
19	Secondary Return Temperature T4	°C	0.1	Signed
20	Primary Return Temperature T5	°C	0.1	Signed
21	Secondary Return Pressure PS1a	Bar	0.01	Signed
22	Secondary Return Pressure PS1b	Bar	0.01	Signed
23	Secondary Return Pressure PS1	Bar	0.01	Signed
24	Secondary Supply Pressure PS2a	Bar	0.01	Signed
25	Secondary Supply Pressure PS2b	Bar	0.01	Signed
26	Secondary Supply Pressure PS2	Bar	0.01	Signed
27	Secondary Differential Pressure (PS2 – PS1)	Bar	0.01	Signed
28	Primary Inlet/Filter Inlet Pressure PS3	Bar	0.01	Signed
29	Primary Inlet/Filter Outlet Pressure PS4	Bar	0.01	Signed
30	Primary Filter Differential Pressure (PS3 – PS4)	Bar	0.01	Signed
31	Primary Flow Rate	L/m	1	Unsigned
32	Secondary Flow Rate	L/m	1	Unsigned
33	Secondary Duty	kW	1	Unsigned
34	Temperature Setpoint	°C	0.1	Signed
35	Pump P1 Runtime	Hours	1	Unsigned
36	Pump P2 Runtime	Hours	1	Unsigned
37	Pump P3 Runtime	Hours	1	Unsigned
38	Secondary Filter 1 Inlet Pressure PS5a	Bar	0.01	Signed
39	Secondary Filter 2 Inlet Pressure PS5b	Bar	0.01	Signed
40	Secondary Filter 3 Inlet Pressure PS5c	Bar	0.01	Signed
41	Secondary Filter 1 Differential Pressure (PS5a – PS2)	Bar	0.01	Signed
42	Secondary Filter 2 Differential Pressure (PS5b – PS2)	Bar	0.01	Signed
43	Secondary Filter 3 Differential Pressure (PS5c – PS2)	Bar	0.01	Signed
44	Controller Software Version Number Format is x.yy where x = major version number, yy = minor version number	n/a	0.01	Unsigned
45	Controller Up-time	Mins	1	Unsigned
46	System (Group) Average secondary Differential Pressure	Bar	0.01	Signed
47	System (Group) Total secondary Flow Rate	L/m	1	Unsigned

Table B.2 Input Registers (continued)

Register Number	Description	Units	Scaling	Data Type
48	Primary Duty	kW	1	Unsigned
49	Pump 1 Input Power	kW	0.1	Unsigned
50	Pump 2 Input Power	kW	0.1	Unsigned
51	Pump 3 Input Power	kW	0.1	Unsigned
52	Automatic Transfer Switch (ATS) Status 0 = no ATS 1 = On A, B available 2 = On A, B not available 3 = On B (A not available)	n/a	1	Unsigned
53	Secondary Fluid Quality - Turbidity	NTU	1	Unsigned
54	Secondary Fluid Quality - PH	PH	0.01	Unsigned
55	Secondary Fluid Quality - Conductivity	uS/cm	1	Unsigned

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

Table B.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.

Table B.4 Holding Registers

Register Number	Description	Units	Scaling	Data Type
1	Secondary Temperature Setpoint (P301)	°C	0.1	unsigned
2	Secondary DP Setpoint (P203)	Bar	0.1	unsigned
3	Secondary Flow Setpoint (P202)	l/m	1	unsigned

By default, the holding register table is read-only. Read-write access may be enabled via the P072 Write Access parameter, accessible via the touchscreen UI.

Read access to the Holding Register table is provided by MODBUS function **code 03** – Read Holding Registers.

For write access, MODBUS function **code 06** - Preset Single Register is supported.

An attempt to write a holding register value when read-only access is active will result in an exception code being returned.

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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 the unit from the 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™ 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 makeup 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 makeup 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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