



# XDU1350 Coolant Distribution Unit

## **Application and Planning Guide**

XDU1350B

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

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### **Technical Support Site**

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

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

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# 1 Important Safety Instructions

## Save These Instructions

This manual contains important application information pertaining to the Vertiv™ XDU1350.

The information contained in this document must be used in conjunction with the Installation and Commissioning Guide and the Operation and Maintenance Guide for the XDU1350B.



**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, 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 manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



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

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



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



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



**WARNING!** Risk of improper moving. Can cause serious injury or death. Building and equipment damage may also result. Use only lifting equipment that is rated for the unit weight by an OSHA certified rating organization. The center of gravity varies depending on the unit size and selected options. The slings must be equally spaced on either side of the center of gravity indicator. Shipping weights and unit weights are listed in the tables in [General](#) on page 17. Use the center of gravity indicators on the unit to determine the position of the slings.



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



**WARNING!** Risk of unsecured unit falling 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 limits referenced in **Table 4.3** on page 18 Electrical Data. 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. 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.

## 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.

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. See [Technical Data](#) on page 17 for more details.

**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 should only be carried out and/or supervised by personnel trained and qualified to work on this type of equipment by Vertiv. 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 valves 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.



**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.



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### 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.

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 only be used for the application it was designed for as consulted by Vertiv. This product must not be used in a hazardous environment.

The flow sensor is for indication only, it is not used for any control or alarm functions nor should it be depended on for consequential actions. Differential pressure is the principle means of PQ control for both a single unit and in group operation. Instrumentation and reporting in this aspect is accurate and reliable.

## 1.4 Warranty

Failure to comply with the Vertiv's 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.**



**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 manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.**



**WARNING! Risk of 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.**

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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

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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.

## 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

The Application and Planning Guide, Operation and Maintenance Guide, Installation and Commissioning Guide, maintenance and service records must always remain with the unit.

## 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, the Machinery directive 2006/42/EC and the Pressure Equipment directive 2014/68/EU. As manufactured, Vertiv products are designed to comply with an IP21 rating.

This product is in conformance with UL1995.



### 2.2 ROHS 3 Compliance

Vertiv certifies that this product, manufactured and supplied by Vertiv, is 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 performance, possible configurations, application, and specification of the Vertiv™ XDU1350.

The XDU1350 contains a secondary closed loop circuit that provides a supply of cooling fluid to equipment based on differential pressure.

The XDU1350 was designed specifically to cool IT equipment through one of two methods:

1. Indirect such as rack mounted rear door heat exchangers.
2. Direct such as cold plates at chip level.

**NOTE: If using the XDU1350 for applications outside of those specified above please consult Vertiv before use.**

The secondary circuit is a low pressure sealed system that removes heat from the downstream equipment and rejects to an external cooled water source (primary circuit) via low pressure drop plate heat exchangers. If using the XDU1350 for applications outside of those specified above please consult Vertiv before use.

The secondary circuit ensures that the cooling fluid in the secondary fluid network 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/warm 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 [Primary \(Facility\) Circuit](#) on page 20 and [Secondary Circuit](#) on page 21 for more information.

### 3.2 Features and Benefits

- Essential separation of the primary (facility) water from the IT equipment, providing low pressure, clean water to liquid cooled IT equipment.
- Low water volume in secondary loop, reducing leak risk.
- N+1 pumps, inverters, expansion vessels, pressure and temperature sensors for built in redundancy.
- Large pipe diameter and optimal hydraulic design with low pressure drop that provides maximum secondary flow up to 475 gpm (1800 l/m) at external pressure drop of 29 psi (2.0 bar) without filtration and all triple pumps operational. For dual pump operation, maximum secondary flow is provided up to 317 gpm (1200 l/m) at external pressure drop of 36 psi (2.5 bar) without filtration.
- Sanitary flange and clamp design, easy installation, maintenance, and retrofit of pipework parts.
- Connection options available for top or bottom pipe exit and giving application flexibility.
- Large surface area heat exchangers to provide high cooling capacity with low approach temperatures with optional two stage cooling to cater for low heat loads without loss of control.
- Secondary fluid control in differential pressure control mode to suit various application requirements.
- Secondary fluid temperature controlled within  $\pm 1.8$  °F (1 °C), to ensure cooling stability with variable heat load.
- Group control available for multiple XDU1350s via CANbus, enables N+X redundancy design for larger installations.
- Modbus RTU RS485 and TCP/IP
  - SNMPv2/3 (Simple Network Management Protocol)

- HTTP (Web Server)
- FTP (File Server)
- BACnet IP—Ethernet 10/100
- BACnet MSTP—RS485 communication with data center monitoring system for easy integration.
- Full alarm monitoring, providing real time status of the IT equipment and the local environment.
- Data, alarm and system logging over the full product lifetime to onboard SD card (minimum size 4 GB).
- Supports warm water cooling in direct contact liquid cooling applications, very low partial PUE cooling, energy saving, and operating expenses benefits for user.
- Small footprint 35.4 x 47.2 in. (900 x 1200 mm), black textured finish to blend in with computer room environment.
- International service team, to provide professional and all in one service from installation to maintenance and troubleshooting.
- Primary circuit is insulated to prevent condensation. The secondary circuit to the customer connected equipment is not insulated (typically secondary loop is above the ambient dew point).

### 3.3 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	26-29
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	A	480 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) 400 V or 480 V
11	Controller	A	Standard controller
12	Communication	1	Protocol: Modbus, BACnet, SNMP V2 / V3, HTTP(s) Webserver, NTP, SSH-CLI, SFTP
13	Display	7	7 in. touchscreen display



**Table 3.2 Model Number Definitions (continued)**

Digit	Feature	Value	Description
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	0	Standard EMC filter
		2	No EMC filter
17	Primary connection from facility	T	Top connection
		B	Bottom connection
18	Primary filtration	0	None
19	Primary control valve	H	Standard 2-way valve
20	Secondary connection to equipment	T	Top connection
		B	Bottom connection
21	Secondary filtration	0	None
		1	Factory fitted (50 microns)
		2	Factory fitted (25 microns)
22	Pressure relief valve — Secondary circuit to equipment	3	3 bar pressure
		4	4 bar pressure
		5	5 bar pressure
		6	6 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
26	ETO	-	ETO
27, 28, 29	Factory Digits	-	Factory Digits

### 3.4 Product Accessories

For a complete installation solution, any of the following accessories may be ordered as optional extras, if required. Please contact Vertiv for more details.

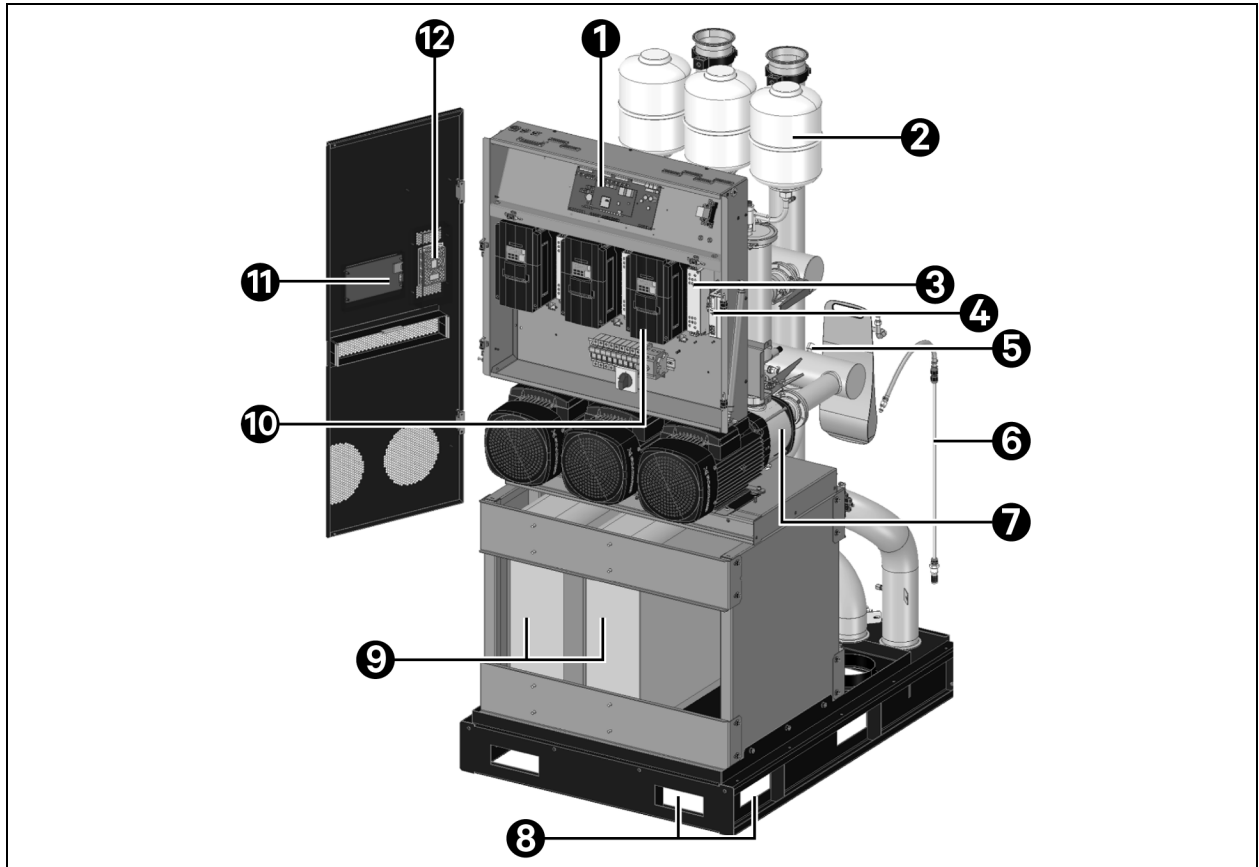
**Table 3.3 Ship Loose Accessories**

Description
Leak Detection Tape
4 in. Stainless Steel Connection Hose Set

### 3.5 Product Views

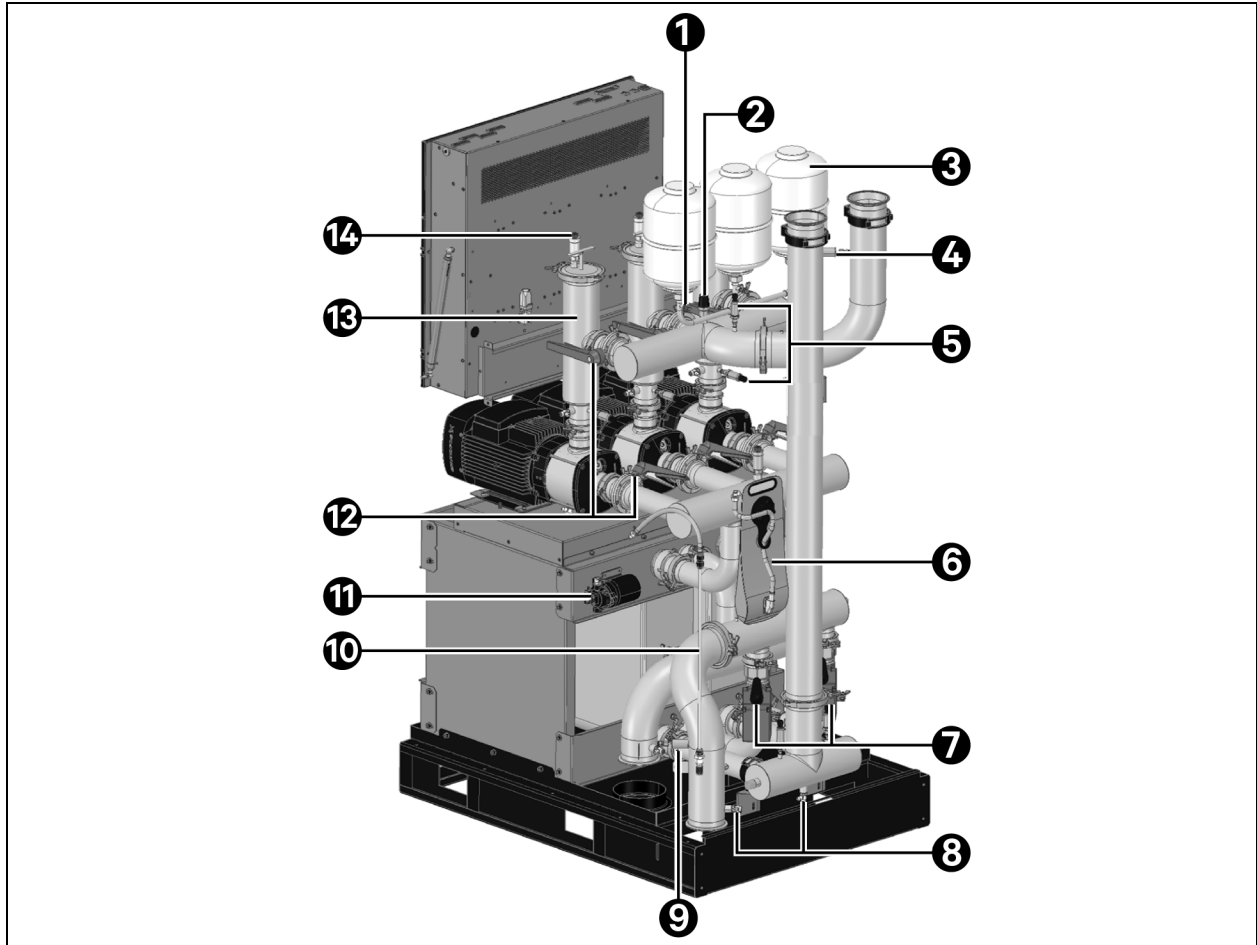
**NOTE:** These model images are provided for reference only.

Figure 3.1 Front View of Vertiv™ XDU1350 (without Panels) With Top Secondary Connection, Bottom Primary Connection and Flexible Make-up Container



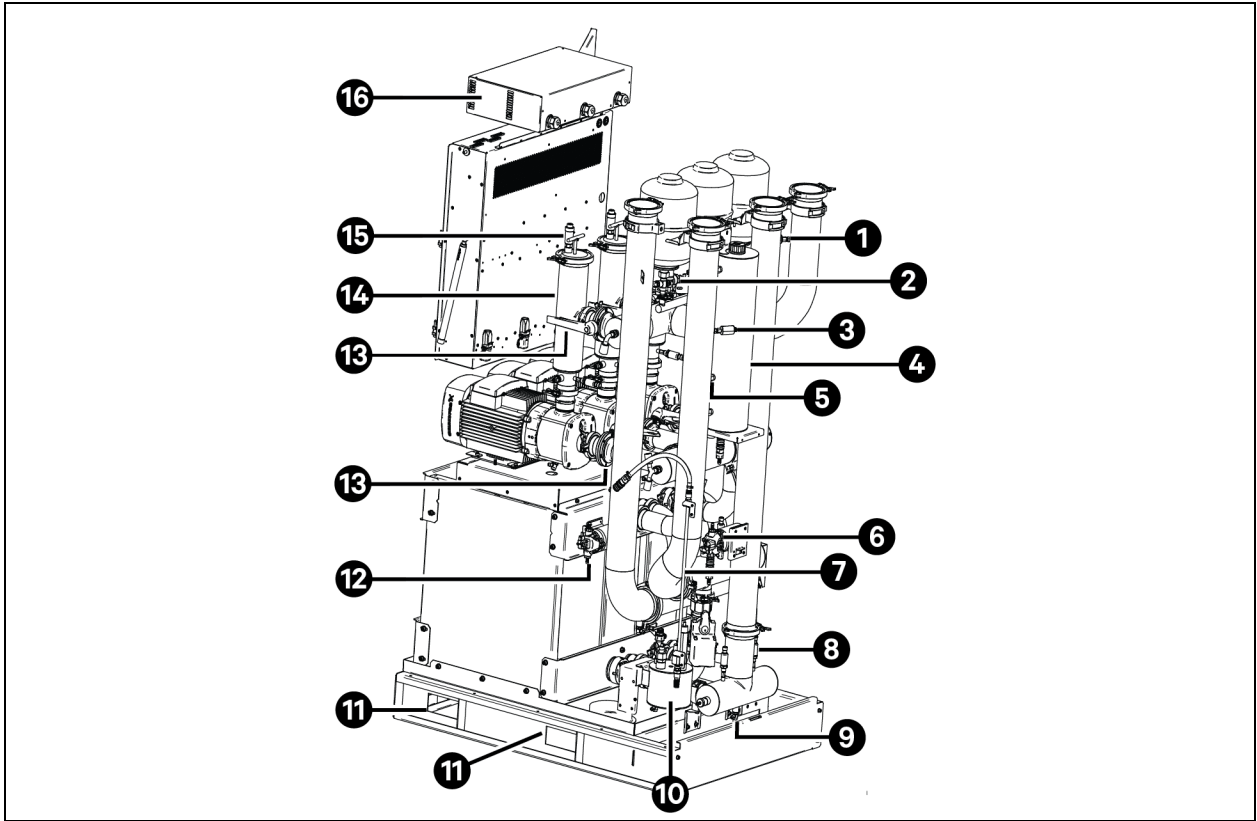
Item	Description	Item	Description
1	Controller/processor board	7	Secondary pumps
2	Expansion vessels	8	Front and side forklift access
3	EMC filters	9	Plate heat exchangers
4	Power supply	10	Pump inverter drivers
5	Level sensors	11	Controller touch screen (mounted to front door)
6	Filling wand	12	Room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

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



Item	Description	Item	Description
1	Manual air vents (fitted below each expansion vessel)	8	Drain valves
2	Pressure relief valve (3 bar standard)	9	Primary flow meter
3	Expansion vessels	10	Filling wand
4	Secondary flow meter	11	Fill pump
5	Pressure sensors	12	Filter/pump isolation valves
6	Flexible make up container	13	Secondary filters (includes 3 bar pressure relief valve in place of standard 6 bar) (optional)
7	Primary cooling valves (2-way with manual override)	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	Item	Description
1	Secondary flowmeter	9	Drain valve
2	Pressure relief valve	10	Secondary fluid monitoring system (Optional)
3	Primary flowmeter	11	Side forklift access
4	Reservoir tank	12	System fill pump P4
5	Level sensor	13	Filter/pump isolation valves
6	Reservoir fill pump P5	14	Secondary filters
7	Filling wand	15	Automatic air vents
8	Pressure sensor	16	Power termination enclosure/ATS (optional)

## 4 Technical Data

### 4.1 General

Table 4.1 Vertiv™ XDU1350 Specifications

XDU1350 Specifications						
Maximum Flow – Dual Pump Operation	317 gpm (1200 l/m) at 35.4 psi (2.44 bar) External Differential Pressure to XDU (DP)					
Maximum Flow – Three Pump Operation	475.5 gpm (1800 l/m) at 28.7 psi (1.98 bar) External Differential Pressure to XDU (DP)					
Coolant Type	Water, water/glycol					
Primary Coolant Type	Water, water/glycol					
Secondary Coolant Temperature Range	50 to 126 °F (10 to 52 °C) with dew point control standard					
Maximum Power Consumption - Dual Pump Operation	13.7 kW at maximum flow					
Maximum Power Consumption – Three Pump Operation	20.5 kW at maximum flow					
Storage Environment	Keep the unit vertically upright, completely covered (Preferred in original packaging) in an Indoor environment, conditioned warehouse, protected against dampness and freezing temperatures. Keep clean (no dust), well ventilated, and non-condensing.					
Storage Time	Up to 6 months. If storing longer than 6 months, please consult Vertiv.					
Operating Conditions	5 to 40 °C (ambient), 10 to 80 % RH (non-condensing)					
Storage Conditions	2 to 65 °C, 5 to 95 % RH (non-condensing)					
Dimensions	Height		Width		Depth	
Unit	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	
Unit	lbs.	kg	lbs.	kg	lbs.	kg
Standard Cabinet	1929	875	2350	1066	2273	1031
Circuit Fluid Volume						
Primary	Gallons			Liters		
Base Unit	16.19			61.29		
Bottom Connection Piping	1.87			7.08		
Top Connection Piping	5.70			21.58		

**Table 4.1 Vertiv™ XDU1350 Specifications (continued)**

XDU1350 Specifications		
Circuit Fluid Volume (continued)		
Secondary	Gallons	Liters
Base Unit	21.50	81.39
Filters	1.32	5.00
Bottom Connection Piping	4.12	15.60
Top Connection Piping	5.60	21.20

**Table 4.2 Noise Level**

Height	Sound Pressure
3m (10ft)	<54 dBA

## 4.2 Electrical Data

**Table 4.3 Unit Voltage Rating**

Unit voltage rating		XDU1350 rev B without ATS 3 pumps	XDU1350 rev B with ATS 3 pumps	XDU1350 rev B without ATS 2 pumps	XDU1350 rev B with ATS 2 pumps
400 V ±10%, 3 ph, 50/60 Hz	FLA	38.5	39	26	26.5
	WSA	41	42	29	30
	OPD	50	50	40	40
480 V ±5%, 3 ph, 60 Hz	FLA	37	37.5	25	25.5
	WSA	41	42	29	30
	OPD	50	50	40	40

Definitions:

- FLA: Full load ampere
- WSA: Wire sizing ampere
- OPD: Overcurrent protection device

**NOTE:** It is expected that the XDU1350B is connected to a UPS for backup power in case of a power outage. Please speak with your Vertiv representative to ensure that the UPS is sized properly.

## 4.3 Pressure Limitations

Table 4.4 Pressure Limitations

Circuits	Details
Primary (facility) circuit	145 psi (10 bar) maximum working pressure
Secondary circuit	43 psi to 101 psi (3-6 bar) maximum working pressure (depending on rating of pressure relief valve installed)

## 4.4 Piping 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. 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.

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.

## 4.5 Primary (Facility) Circuit

To ensure responsive control of secondary supply temperature, the XDU must be supplied with the primary flow rate and temperature appropriate to the heat load and level of glycol.

Excess primary flow reduces the effective range of movement of the control valve, potentially restricting fine control, and possibly leading to instability of the secondary supply temperature. An external means of restricting or bypassing excessive primary flow should be customer provided in the external pipework.

**NOTE: Contact a Vertiv representative regarding specific application performance calculations.**

Arrangements should be made at time of installation to ensure that the primary (facility) water supply is adequately filtered to 500 microns/35 mesh, as a minimum.

The primary circuit of Vertiv™ XDU1350 is rated for a maximum working pressure of 145 psi (10 bar). If the pressure at installation exceeds this, then arrangements should be made to fit a pressure reducing valve.

**NOTE: Both primary inlet and return connections should be fitted with full port isolation valves at point of installation, for maintenance purposes.**



## 4.6 Secondary Circuit

Secondary pipework components must be clean and free of organic matter and debris down to the level of filtration required by the application. Clean treated fluid must be used in assembly operations, and any residual water blown out and the pipework dried before filling with the secondary fluid to be used.

If load banks are to be used in commissioning and site acceptance tests, the load banks must be clean and free of debris and organic matter. The fluid circuit can be protected by use of:

- a. A required 50 micron filter on the secondary return to the CDU for direct to chip applications (recommended for rear door applications).
- b. An external heat exchanger to separate the load bank circuit from the secondary pipework.

Threaded joints must not be sealed with polytetrafluoroethylene tape as particles from the tape may enter the fluid stream and cause clogging. Instead, a thread sealant must be used to seal threaded fittings.

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

**NOTE: Both secondary inlet and return connections should be fitted with full bore isolation valves at point of installation, for maintenance purposes.**

## 4.7 Wetted Materials

For fluid compatibility purposes, all component materials in both primary and secondary circuits are listed below:

**Table 4.5 Primary Circuit—Wetted Materials**

Component	Materials
Hygienic fittings	316 Stainless Steel, EPDM seals
Butterfly hygienic valves	316 Stainless Steel, EPDM seals
Pipework	316 Stainless Steel
Machined pipe fittings	304 Stainless Steel
2-way cooling valve	Brass DZR (body), Stainless steel (ball and stem), with PTFE seats and EPDM (O-ring seals)
Plate heat exchanger	316 Stainless Steel, copper brazed
Schrader valves	Brass (body), Stainless Steel (valve insert)
Pressure sensors	17-4PH (630) Stainless Steel
Flow meter	316 Stainless Steel, 316 (compression fitting)
Filter	304 and 316 Stainless steel, EPDM (O-ring seals)
Drain valves	Nickel plated brass, Nylon 6, EPDM (O-ring seal)

**Table 4.6 Secondary Circuit—Wetted Materials**

Component	Materials
Hygienic fittings	316 Stainless steel, EPDM seals
Butterfly hygienic valves	316 Stainless steel, EPDM seals
Pipe work	316 Stainless steel
Machined pipe fittings	304 Stainless steel
Main pump(s)	304 Stainless steel, EPDM (O-ring seals)
Insert non return valve	Acetal (body and valve), EPDM (O-ring seals), Stainless steel (spring)
Fill pump	EPDM (diaphragm), polyamide body
Plate heat exchanger	316 Stainless steel, copper brazed
Schrader valves	Brass (body), Stainless Steel (valve insert)
Pressure sensors	17-4PH (630) Stainless Steel
Flow meter	316 Stainless Steel, 316 (compression fitting)
Filter	304 and 316 Stainless steel, EPDM (O-ring seals)
Drain valves	Nickel plated brass, Nylon 6, EPDM (O-ring seal)
Automatic air vent	Nickel plated brass (body), Stainless steel (spring), Expanded polythene (float), Polyacetal (vacuum breaker), Polyphenylene oxide (leaver, cap), NBR (seals)
Pressure relief valve	Brass (body), Ni-Cr (spring), EPDM (seal)
Expansion vessel	304 Stainless steel (connector), EPDM (membrane)
Expansion vessel hose	EPDM (hose), chrome plated brass (connections)
Fill quick coupler and hose	Acetal (body), Buna-N (seal), 316 Stainless Steel (spring), PVC (hose), Brass (hose tail)
Fill non return valve	Brass chrome plated (shell), Acetal (body and valve), EPDM (O-ring seals), Stainless steel (spring)
Push fitting on fill hose	Nickel Plated Brass (body), NBR (seal), Stainless Steel (tube grip)
Optical level sensor	Polysulfone (body), Viton (O-ring seal)
Flexible make up container	PVC
Stainless steel reservoir	Stainless steel
Temperture sensors	316 Stainless steel

## 5 Communications

### 5.1 Remote Monitoring and Control

The XDU1350 provides a RS-485 and 2 off 10/100 Ethernet communication ports for external and remote monitoring and control via customer BMS and/or DCIM and/or supercomputer control nodes. BACnet is provided as an option for external and remote monitoring and control.

#### 5.1.1 RS-485 Port

MODBUS RTU is supported.

See [Modbus Register Table](#) on page 35 for more details.

#### 5.1.2 10/100 Ethernet Ports

Each port can be configured with its own IP address or both ports can share a single IP address for failover operation in 1+1 LANs (A and B switches). See **XDU1350 Coolant Distribution Unit Operation and Maintenance Manual SL-71310**.

Standard TCP/IPv4 application protocols and services are supported, including:

- SNMPv2/3 (Simple Network Management Protocol)
- HTTP (Web Server)
- FTP (File Server)
- BACnet IP—Ethernet 10/100
- BACnet MSTP—RS485

Refer to [Vertiv™ XDU1350 BACnet Object List](#) on page 41 for further details.

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# Appendices

## Appendix A: Technical Support and Contacts

### A.1 Technical Support/Service in the United States

Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2378

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 Make up Container

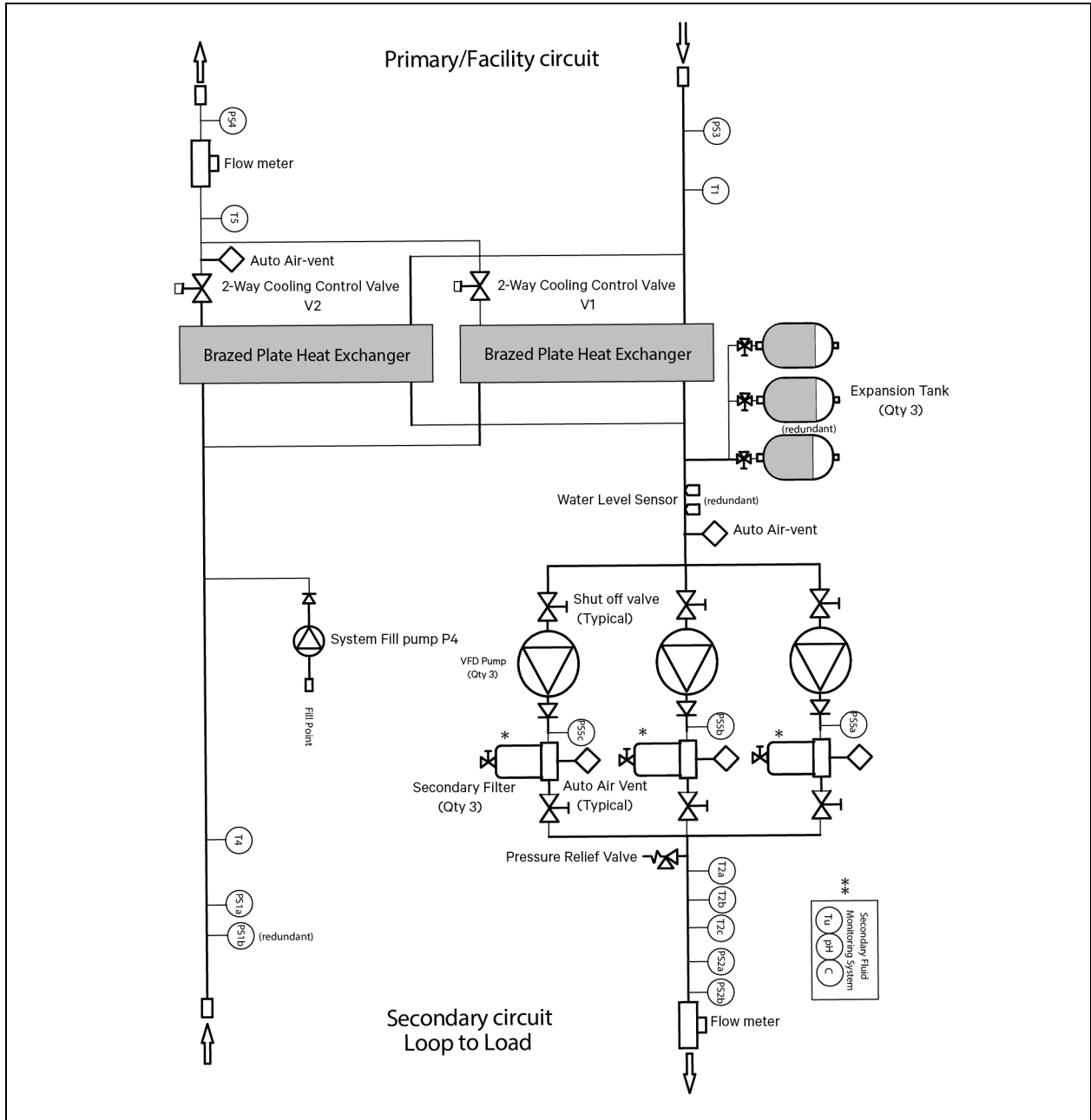
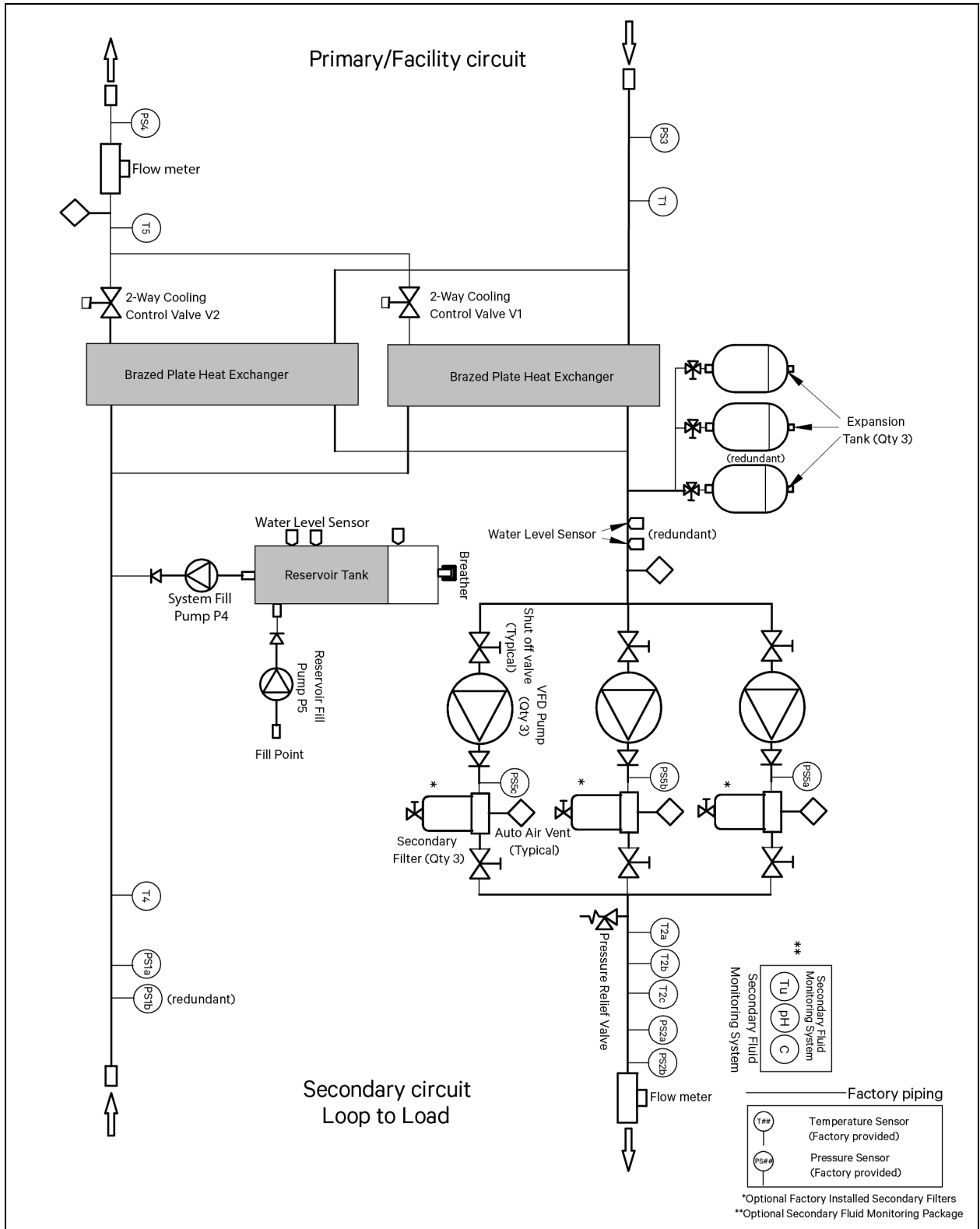


Figure B.2 Pipe Schematic with Stainless Steel Reservoir Tank





## **Appendix C: Warranty Details**

### **C.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 E: Disposal Information

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

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

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

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

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## Appendix F: Modbus Register Table

Table F.1 Discrete Inputs

Register Number	Register Description	Vertiv™ XDU1350 Alarm Code
1	Critical Alarm (0 means Inactive, 1 means Active)	-
2	Non-Critical Alarm (0 means Inactive, 1 means Active)	-
3	Alarm : T1 Primary Temperature Sensor Fault	A01
4	Alarm : T2a Secondary Supply Temperature Sensor Fault	A02
5	Alarm : T2b Secondary Supply Temperature Sensor Fault	A03
6	Alarm : T2c Secondary Supply Temperature Sensor Fault	A04
7	Alarm : T3 Temperature Sensor Fault	A05
8	Alarm : T4 Secondary Return Temperature Sensor Fault	A06
9	Alarm : T5 Primary Return Temperature Sensor Fault	A07
10	Alarm : RH Relative Humidity Sensor Fault	A08
11	Alarm : PS1a Secondary Return Pressure Sensor Fault	A09
12	Alarm : PS1b Secondary Return Pressure Sensor Fault	A10
13	Alarm : PS2a Secondary Supply Pressure Sensor Fault	A11
14	Alarm : PS2b Secondary Supply Pressure Sensor Fault	A12
15	Alarm : PS3 Primary Supply Pressure Sensor Fault	A13
16	Alarm : PS4 Primary Return Pressure Sensor Fault	A14
17	Alarm : PS5a Secondary Filter Inlet Pump 1 Pressure Sensor Fault	A15
18	Alarm : PS5b Secondary Filter Inlet Pump 2 Pressure Sensor Fault	A16
19	Alarm : PS5c Secondary Filter Inlet Pump 3 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

Table F.1 Discrete Inputs (continued)

Register Number	Register Description	Vertiv™ XDU1350 Alarm Code
31	Alarm: Valve 2 Fault	A29
32	Alarm: Primary Fluid Low Flow	A30
33	Alarm: Primary Fluid No Flow	A31
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 F.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 F.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 10 = not used 11 = not used 12 = tank filling	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

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

Register Number	Description	Units	Scaling	Data Type
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
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	n/a	0.01	Unsigned

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

Register Number	Description	Units	Scaling	Data Type
	Format is x.yy where x means major version number, yy means minor version number			
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
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 means no ATS 1 means On A, B available 2 means On A, B not available 3 means 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 F.3 Coils**

Register Number	Description
1	Remote Shutdown To switch <b>ON</b> the CDU write <b>OFF</b> . To switch <b>OFF</b> the CDU write <b>ON</b> .

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 F.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

**Table F.5 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.

## Appendix G: Vertiv™ XDU1350 BACnet Object List

### G.1 Binary Values

Table G.1 Binary Values

Instance Number	Object Name	Access
200	Critical Alarm	RO
201	Non-critical Alarm	RO
202	Alarm A01: T1 Temperature Sensor Fault	RO
203	Alarm A02: T2a Temperature Sensor Fault	RO
204	Alarm A03: T2b Temperature Sensor Fault	RO
205	Alarm A04: T2c Temperature Sensor Fault	RO
206	Alarm A05: T3 Temperature Sensor Fault	RO
207	Alarm A06: T4 Temperature Sensor Fault	RO
208	Alarm A07: T5 Temperature Sensor Fault	RO
209	Alarm A08: RH Relative Humidity Sensor Fault	RO
210	Alarm A09: PS1a Pressure Sensor Fault	RO
211	Alarm A10: PS1b Pressure Sensor Fault	RO
212	Alarm A11: PS2a Pressure Sensor Fault	RO
213	Alarm A12: PS2b Pressure Sensor Fault	RO
214	Alarm A13: PS3 Pressure Sensor Fault	RO
215	Alarm A14: PS4 Pressure Sensor Fault	RO
216	Alarm A15: PS5a Pressure Sensor Fault	RO
217	Alarm A16: PS5b Pressure Sensor Fault	RO
218	Alarm A17: PS5c Pressure Sensor Fault	RO
219	Alarm A18: Secondary Flow Meter Sensor Fault	RO
220	Alarm A19: Primary Flow Meter Sensor Fault	RO
221	Alarm A20: microSD Card Fault	RO
222	Alarm A21: P1 Inverter Fault	RO
223	Alarm A22: P2 Inverter Fault	RO
224	Alarm A23: P3 Inverter Fault	RO
225	Alarm A24: Inverter 1 Communications Error	RO
226	Alarm A25: Inverter 2 Communications Error	RO
227	Alarm A26: Inverter 3 Communications Error	RO
228	Alarm A27: Pump Low Flow	RO

**Table G.1 Binary Values (continued)**

Instance Number	Object Name	Access
229	Alarm A28: Valve 1 Fault	RO
230	Alarm A29: Valve 2 Fault	RO
231	Alarm A30: Primary Fluid Low Flow	RO
232	Alarm A31: Primary Fluid No Flow	RO
233	Alarm A32: Primary Filter Dirty	RO
234	Alarm A33: Primary Fluid Low Temp	RO
235	Alarm A34: Primary Fluid High Temp	RO
236	Alarm A35: Secondary Fluid Low Temp	RO
237	Alarm A36: Secondary Fluid High Temp	RO
238	Alarm A37: Leak - Unit	RO
239	Alarm A38: Leak - Under floor	RO
240	Alarm A39: PS1 Difference Out Of Limits	RO
241	Alarm A40: PS2 Difference Out Of Limits	RO
242	Alarm A41: Secondary Over pressure	RO
243	Alarm A42: System Low Pressure	RO
244	Alarm A43: Insufficient Fluid Level	RO
245	Alarm A44: Level Sensor – No Fluid Detected	RO
246	Alarm A45: Illegal Fluid Sensor Condition	RO
247	Alarm A46: Group Control Network Fault	RO
248	Alarm A47: Group Control Insufficient Units Available	RO
249	Alarm A48: Secondary Filter 1 Dirty	RO
250	Alarm A49: Secondary Filter 2 Dirty	RO
251	Alarm A50: Secondary Filter 3 Dirty	RO
252	Alarm A51: Secondary Temperature T2a Diff Fault	RO
253	Alarm A52: Secondary Temperature T2b Diff Fault	RO
254	Alarm A53: Secondary Temperature T2c Diff Fault	RO
255	Alarm A54: Reservoir Tank Fluid Required	RO
256	Alarm A55: Reservoir Tank Empty	RO
257	Alarm A56: Below Dewpoint	RO
258	Alarm A57: Auxiliary Input Module Communications Fault	RO
259	Alarm A58: Secondary Fluid Quality – PH Sensor Fault	RO
260	Alarm A59: Secondary Fluid Quality – Conductivity Sensor Fault	RO

**Table G.1 Binary Values (continued)**

Instance Number	Object Name	Access
261	Alarm A60: Secondary Fluid Quality – Turbidity Sensor Fault	RO
262	Alarm A61: Secondary Fluid Quality – PH Out of Limits	RO
263	Alarm A62: Secondary Fluid Quality – Conductivity Out of Limits	RO
264	Alarm A63: Secondary Fluid Quality – Turbidity Out of Limits	RO
265	CDU enable/disable	RW
266	Alarm Reset	RW

For all binary value objects the present value conveys an alarm status - a value of 1 indicates the presence of the alarm condition, whilst a value of 0 indicates the healthy (no alarm) condition.

## G.2 Multi-State Values

**Table G.2 Multi-State Values**

Instance Number	Object Name	Data Values
100	Unit Mode	0 = not configured/not used 1 = not used 2 = shutdown - network 3 = full manual control 4 = standby 5 = online (running) 6 = online (filling) 7 = filling 8 = shutdown – fault 9 = group standby 10 = not used 11 = not used 12 = tank filling
101	Group Control Mode	1 = standalone 2 = master 3 = slave
102	Automatic Transfer Switch (ATS) Status	1 = no ATS 2 = On A, B available 3 = On A, B not available 4 = On B (A not available)
103	Pump 1 Inverter/VFD Status	1 = off 2 = on 3 = fault
104	Pump 2 Inverter/VFD Status	1 = off 2 = on 3 = fault
105	Pump 3 Inverter/VFD Status	1 = off 2 = on 3 = fault

### G.3 Analogue Values

**NOTE:** Units of measurement (SI or Imperial) are configurable via *Setup->MODBUS and BACnet->BACnet->P079 Units*.

**NOTE:** Access: RO is Read-Only, RW is Read-Write.

**Table G.3 Analogue Values**

Instance Number	Object Name	Units	Access
0	Pump 1 Speed	%	RO
1	Pump 2 Speed	%	RO
2	Pump 3 Speed	%	RO
3	Cooling Demand	%	RO
4	Control Valve 1 Demand	%	RO
5	Control Valve 1 Feedback	%	RO
6	Control Valve 2 Demand	%	RO
7	Control Valve 2 Feedback	%	RO
8	Primary Supply Temperature T1	°C/°F	RO
9	Secondary Supply Temperature T2a	°C/°F	RO
10	Secondary Supply Temperature T2b	°C/°F	RO
11	Secondary Supply Temperature T2c	°C/°F	RO
12	Secondary Supply Temperature T2	°C/°F	RO
13	Room Temperature T3	°C/°F	RO
14	Room Relative Humidity RH	% RH	RO
15	Dew Point DW	°C/°F	RO
16	Secondary Return Temperature T4	°C/°F	RO
17	Primary Return Temperature T5	°C/°F	RO
18	Secondary Return Pressure PS1a	bar/psi	RO
19	Secondary Return Pressure PS1b	bar/psi	RO
20	Secondary Return Pressure PS1	bar/psi	RO
21	Secondary Supply Pressure PS2a	bar/psi	RO
22	Secondary Supply Pressure PS2b	bar/psi	RO
23	Secondary Supply Pressure PS2	bar/psi	RO
24	Secondary Differential Pressure (PS2 – PS1)	bar/psi	RO
25	Primary Inlet Pressure PS3	bar/psi	RO
26	Primary Outlet Pressure PS4	bar/psi	RO
27	Primary Filter Differential Pressure (PS3 – PS4)	bar/psi	RO
28	Primary Flow Rate	lpm/US gpm	RO



**Table G.3 Analogue Values (continued)**

Instance Number	Object Name	Units	Access
29	Secondary Flow Rate	lpm/US gpm	RO
30	Secondary Duty	kW	RO
31	Primary Duty	kW	RO
32	Temperature Setpoint	°C/°F	RO
33	Secondary Filter 1 Inlet Pressure PS5a	bar/psi	RO
34	Secondary Filter 2 Inlet Pressure PS5b	bar/psi	RO
35	Secondary Filter 3 Inlet Pressure PS5c	bar/psi	RO
36	Secondary Filter 1 Differential Pressure (PS5a – PS2)	bar/psi	RO
37	Secondary Filter 2 Differential Pressure (PS5b – PS2)	bar/psi	RO
38	Secondary Filter 3 Differential Pressure (PS5c – PS2)	bar/psi	RO
39	System (Group) Average Secondary Differential Pressure	bar/psi	RO
40	System (Group) Total Secondary Flow Rate	lpm/US gpm	RO
41	Pump 1 Input Power	kW	RO
42	Pump 2 Input Power	kW	RO
43	Pump 3 Input Power	kW	RO
44	Number of Active Alarms	-	RO
45	P301 Cooling Setpoint	°C/°F	RW
46	P203 DP Setpoint	bar/psi	RW
47	P202 Flow Setpoint	lpm/US gpm	RW
48	CDU Input Power	kW	RO
49	Secondary Fluid Quality - Turbidity	NTU	RO
50	Secondary Fluid Quality - PH	PH	RO
51	Secondary Fluid Quality - Conductivity	uS/cm	RO

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