



XDU1350 Coolant Distribution Unit

Operation and Maintenance Manual

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.

TABLE OF CONTENTS

1 Important Safety Instructions	1
1.1 General	4
1.2 Installation/Handling	5
1.3 Application	6
1.4 Warranty	6
1.5 Electrical Connection	6
1.6 Replacement Parts	7
1.7 Waste Disposal	7
1.8 Documentation	7
2 Agency	9
2.1 Product Standards and Approvals	9
2.2 ROHS 3 Compliance	9
3 Product Description	11
3.1 General	11
3.2 Model Number Nomenclature	11
3.3 Product Views	13
4 Operation	17
4.1 Controller Overview	17
4.2 User Interface	17
4.2.1 Home Screen	17
4.2.2 Main Menu Screen	18
4.2.3 Status Screen	19
4.2.4 Data Curves Screen (Real Time Update)	23
4.2.5 Alarm Screen	24
4.2.6 Login Screen	25
4.2.7 Setup Screen	26
4.2.8 Configuration Screen	30
4.2.9 Service Screen	35
4.2.10 Diagnostics Screen	38
4.2.11 Calibration Screen	40
4.3 Automatic Operation	40
4.3.1 Primary Circuit Operation	41
4.3.2 Secondary Circuit Operation	42
4.4 Temperature Control Loop Adjustment	49
4.4.1 PI Control	50
4.4.2 PID Control	50
4.5 Alarm Management	50
4.6 Troubleshooting (Alarms)	53

- 4.7 Temperature Sensor Graph62
- 4.8 Manual Operation of Cooling Valve 62
- 4.9 Group Control63
 - 4.9.1 Group Control—Network Cabling 64
 - 4.9.2 Group Control—Network Termination Resistors 65
 - 4.9.3 Group Control—Network Addresses 67
 - 4.9.4 Group Control—Start Sequence from Power Up67
 - 4.9.5 Group Control—Controls 67
 - 4.9.6 Group Control—Unit Rotation and Standby Units 67
 - 4.9.7 Group Control—Failover Offset 68
 - 4.9.8 Group Control—Failure Modes 68
- 5 Maintenance 71**
- 5.1 General 71
- 5.2 Fluid Specifications 72
- 5.3 Planned Preventative Maintenance 74
- 5.4 Secondary Filter Service (if fitted) 76
- 5.5 Unit Draining 78
- 5.6 Spare Parts80
- Appendices 81**
- Appendix A: Technical Support and Contacts 81
- Appendix B: Pipe Schematic Vertiv™ XDU1350 83
- Appendix C: Warranty Details85
- Appendix D: Notes 87
- Appendix E: Disposal Information89

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 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 specified in the Vertiv™ XDU1350 Application and Planning Guide SL- 71309. 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 the Vertiv™ XDU1350 Application and Planning Guide SL- 71309.



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 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 piping corrosion. When the cooling unit or piping may be exposed to freezing temperatures, charge the system with coolant fluid based on the coldest ambient design temperature. Automotive antifreeze is unacceptable and must NOT be used in any fluid system. Use only coolant fluid solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

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

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

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

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

Consult fluid manufacturer for testing and maintenance of inhibitors.

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

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

NOTICE

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

NOTICE

Risk of leaking 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 shut off valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shut off 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 shut off 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 shut off valve or leak detection system malfunction.

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

Before any maintenance work being carried out, ensure:

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

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

1.2 Installation/Handling



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



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 specified in the Vertiv™ XDU1350 Application and Planning Guide SL- 71309.



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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.

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. 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.



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.

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 units 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.

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

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 operation, alarm management, and maintenance of the Vertiv™ XDU1350.

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 exchanger.

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 primary circuit and the secondary circuit of the **Vertiv™ XDU1350 Application and Planning Guide SL- 71309** for more information).

3.2 Model Number Nomenclature

The XDU1350 can be operated 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** on the next page describes each digit of the model number.

Table 3.1 XDU1350 Model Number

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

Table 3.2 XDU1350 Standard 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	460 V - 3PH - 60 Hz
		Q	400 V - 3PH - 50/60 Hz
		U	400 V for EMEA
10	ATS	0	Standard Power Termination Enclosure
		1	Power Termination Enclosure with Automatic Transfer Switch (ATS) 400 V or 480 V Nominal
11	Controller	A	Standard controller

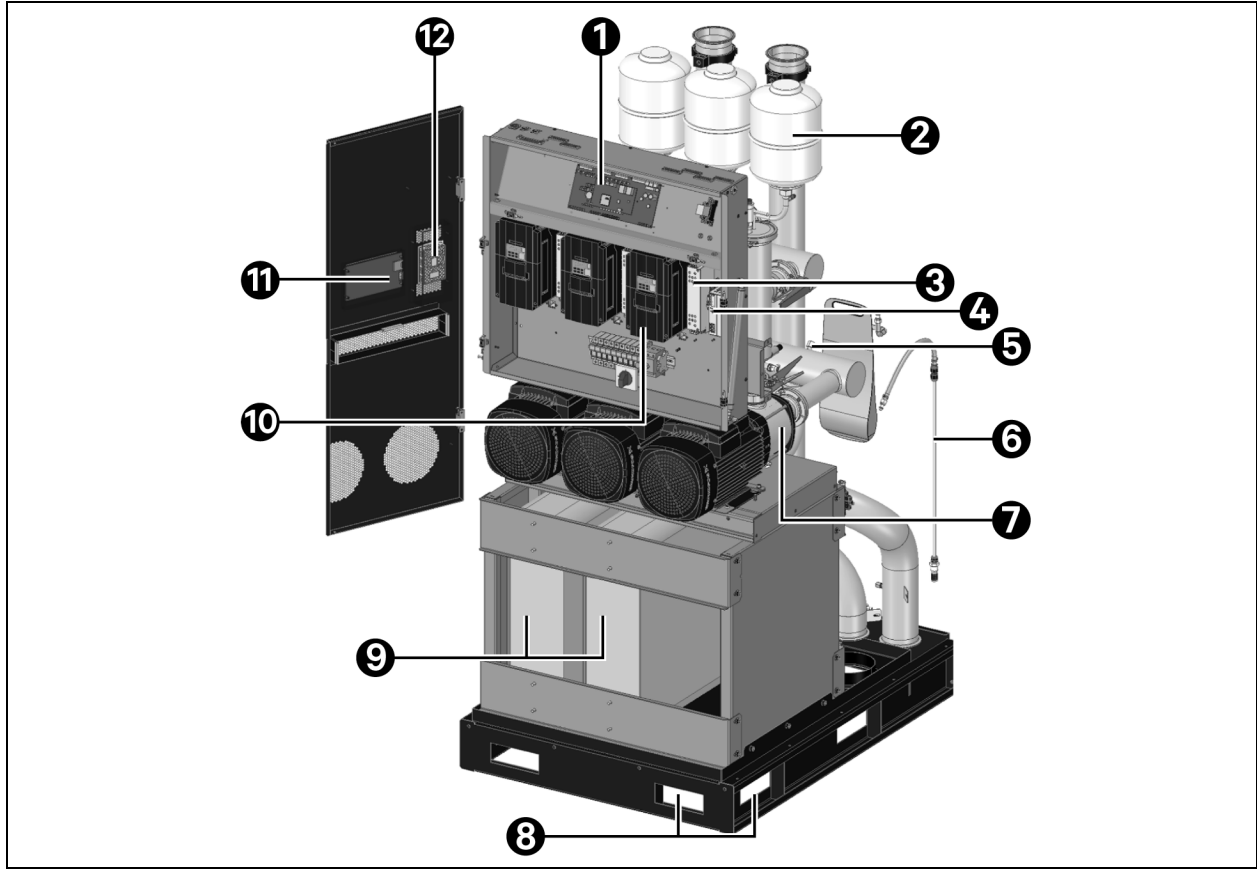
Table 3.2 XDU1350 Standard Model Number Definitions (continued)

Digit	Feature	Value	Description
12	Communication	0	None
		1	Protocol: Modbus, BACnet, SNMP V2 / V3, HTTP(s) Webserver, NTP, SSH-CL, 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 (50μ)
		2	Factory fitted (25μ)
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

Vertiv™ XDU1350 bottom connection primary and secondary tails, flexible makeup bag and no secondary fluid monitoring. See **Figure 3.1** below.

Figure 3.1 Front View of XDU1350 (without panels) with Top Secondary Connection, Bottom Primary Connection and Flexible Make-up Container

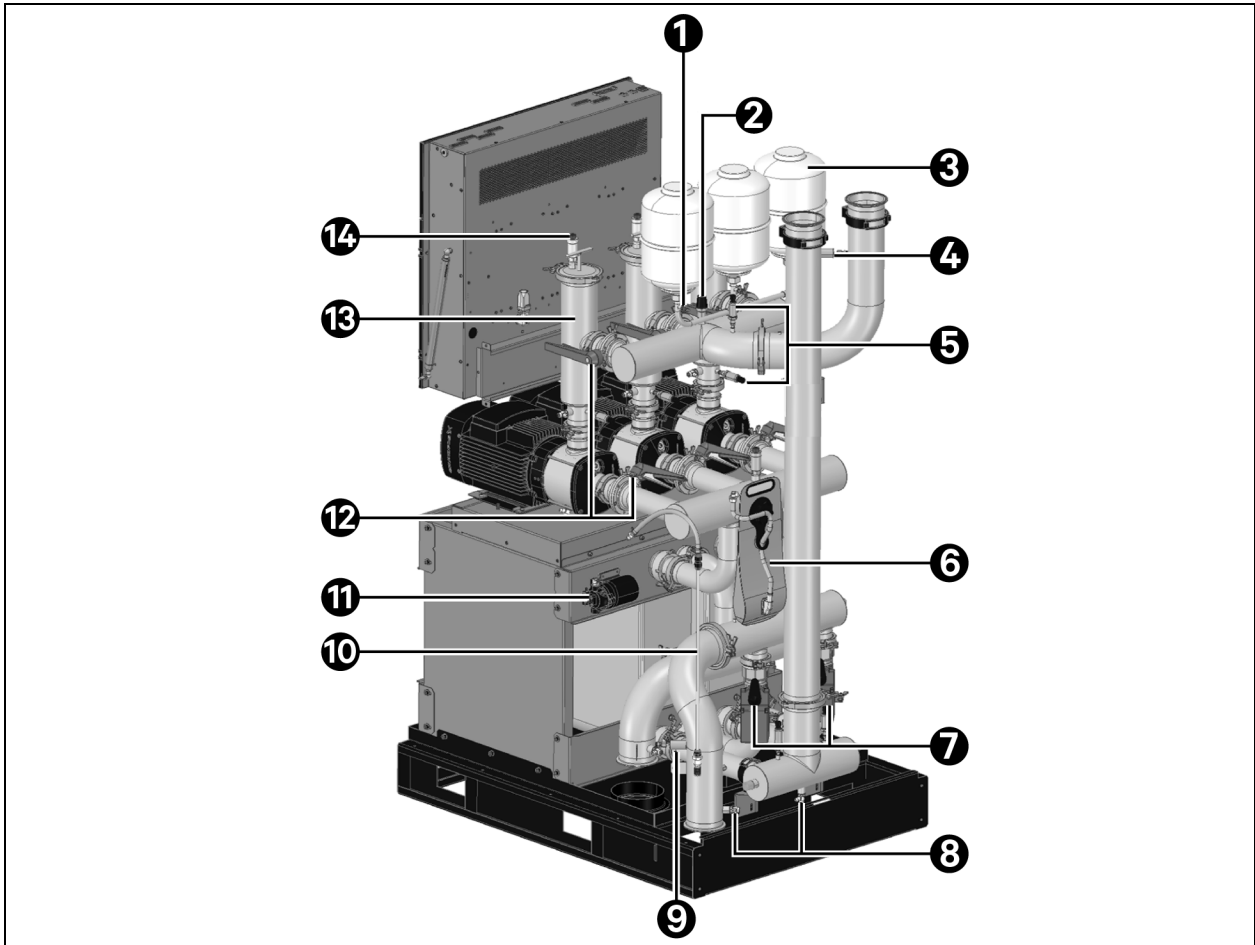


Item	Description
1	Controller/processor board
2	Expansion vessels
3	EMC filters
4	Power supply
5	Level sensors
6	Filling wand
7	Secondary pumps
8	Front and side forklift access
9	Plate heat exchangers

Item	Description
10	Pump inverter drivers
11	Controller touch screen (mounted to front door)
12	Room temperature and RH sensor

Vertiv™ XDU1350 bottom connection primary and secondary tails, flexible makeup bag and no secondary fluid monitoring. See **Figure 3.2** below.

Figure 3.2 Rear View of XDU1350 (without panels) with Top Secondary Connection, Bottom Primary Connection and Flexible Make-up Container

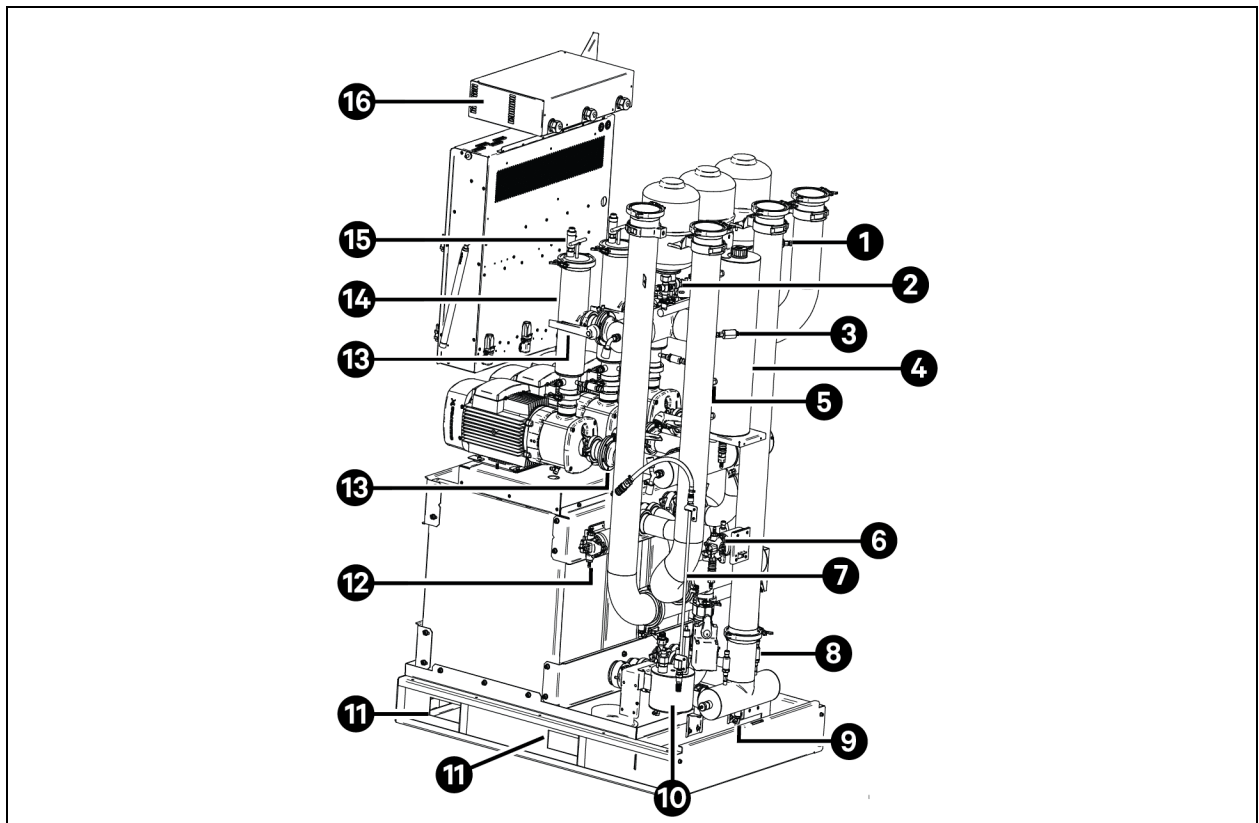


Item	Description
1	Manual air vents (fitted below each expansion vessel)
2	Pressure relief valve
3	Expansion vessels
4	Secondary flow meter
5	Pressure sensors

Item	Description
6	Flexible make up container
7	Primary cooling valves (2-way with manual override)
8	Drain valves
9	Primary flow meter
10	Filling wand
11	Fill pump
12	Filter/pump isolation valves
13	Secondary filters
14	Auto air vent (fitted to each filter housing and pump inlet manifold)

Vertiv™ XDU1350 top connection primary and secondary tails, and secondary fluid monitoring. See **Figure 3.3** below.

Figure 3.3 XDU1350 (without panels) with Top Secondary and Primary Connection, Stainless Steel Reservoir, Secondary Fluid Quality Monitoring and an ATS



Items	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
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 Operation

4.1 Controller Overview

The Vertiv™ XDU1350 controller is designed to monitor and control the supply of cooling fluid to IT equipment in unattended data center environments. Secondary circuit cooling water is closely controlled to a defined temperature and at a controlled flow rate (or differential pressure), for optimum heat management.

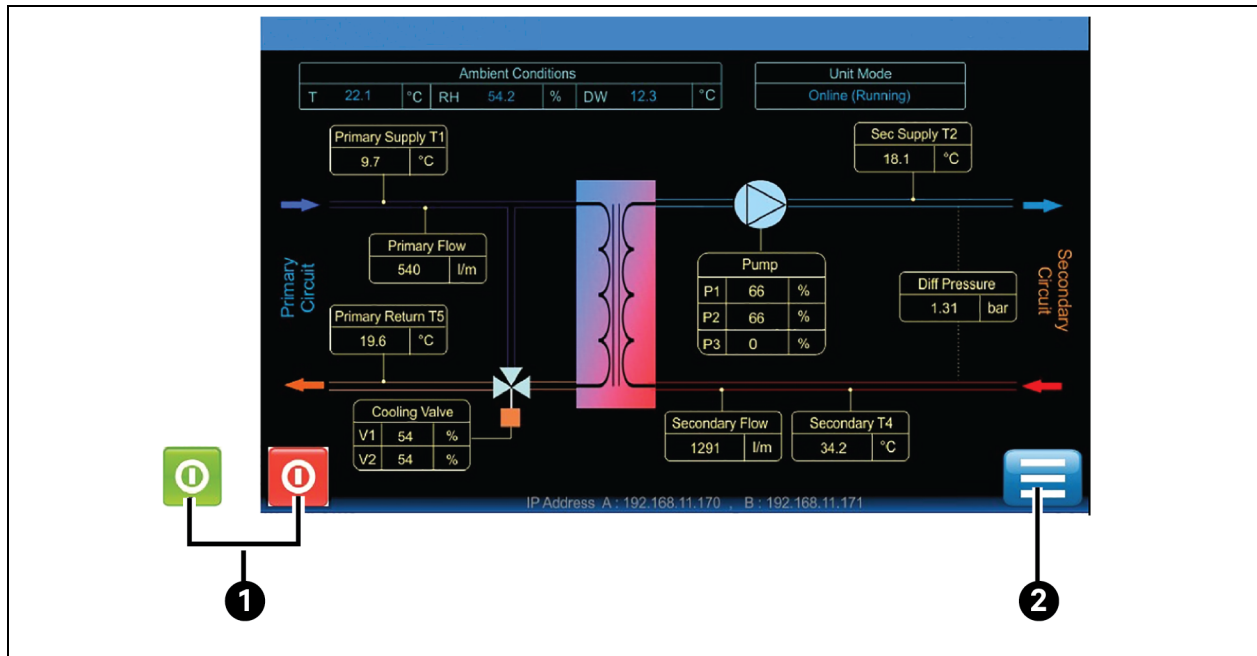
When power is first applied to the unit, the touchscreen will illuminate and the pump inverter drives will energize. After a short initialization period during which the company logo is presented, the display will default to the Home screen, as shown in Figure 4.1 below.

4.2 User Interface

4.2.1 Home Screen

The Home screen displays a schematic representation of the XDU1350, showing essential temperatures, pressures, flows, etc. for both primary and secondary circuits, plus the product code identification, IP addresses, installed software version, and date/time.

Figure 4.1 Control System Home Screen



Item	Description
1	Start/Stop icon changes to green when unit is running.
2	Pressing displays the Main Menu screen.

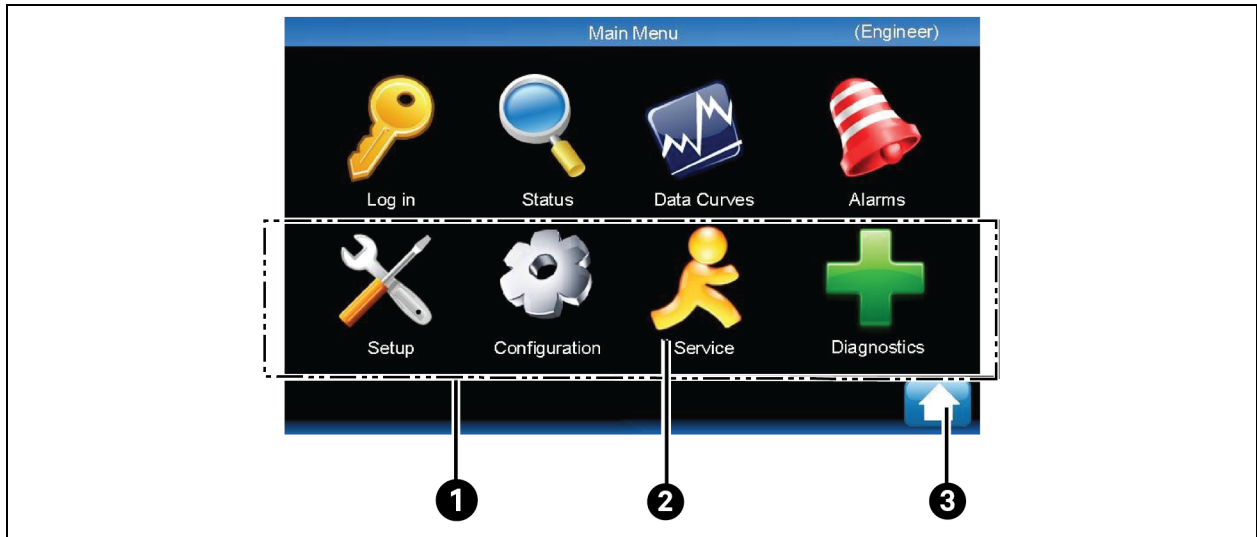
4.2.2 Main Menu Screen

The Main Menu screen displays further accessible submenus for an increased level of information and alteration of certain parameters.

NOTE: Some control system menus may not be visible if the user has not logged in and visibility will also depend on the login access level used.

The touchscreen display has been designed to be intuitive and any user should be able to easily navigate through the various menus without the need for this guide. However, the following explanation is available for additional information, or as a reference for when the user is not in front of the unit.

Figure 4.2 Control System Main Menu Screen



Item	Descriptions
1	Only visible when logged in (see Login Screen on page 25 for access codes).
2	Only visible when logged in at service or engineer level.
3	Pressing returns to Home screen.

4.2.3 Status Screen

The Status screen displays comprehensive view only information on the operating condition of the Vertiv™ XDU1350.

NOTE: If the unit has not been configured for certain options, then corresponding values will not be shown. For example, if the secondary filters are not fitted, then PS5 a, b, c will show -101.

Figure 4.3 Control System Status Screen



There are six information pages within the Status screen, see **Figure 4.3** above and the details for each page are shown in the tables below.

Table 4.1 Status - Page 1

Parameter	Value
Unit Mode	Standby/Online (running)/ Fault/Shutdown
Unit Cooling Duty	-- kW
Cooling Mode	Off/Fixed Setpoint + DW Offset/Fixed Setpoint
Fixed Setpoint	-- °C
Dew Point Setpoint	-- °C
Cooling Demand	-- %
Cooling Feedback	-- %
Secondary Return Temperature T2	-- °C
T2a	-- °C

Table 4.1 Status - Page 1 (continued)

Parameter	Value
T2b	-- °C
T2c	-- °C
Secondary Return Temperature T4	-- °C

Table 4.2 Status - Page 2

Parameter	Value
Primary Supply Temperature T1	-- °C
Primary Flow Rate	-- l/m
Ambient Temperature T3a	-- °C
Ambient Temperature T3b	-- °C
Ambient RHa	-- °C
Ambient RHb	-- °C
Dewpoint DWa	-- °C
Dewpoint DWb	-- °C

Table 4.3 Status - Page 3

Parameter	Value
Secondary Flow Rate	-- l/m
Secondary Return Pressure PS1	-- Bar
Secondary Return Pressure PS1a	-- Bar
Secondary Return Pressure PS1b	-- Bar
Secondary Supply Pressure PS2	-- Bar
Differential Pressure PS2-PS1	-- Bar
Pump 1 Speed	-- %
Pump 2 Speed	-- %
Pump 3 Speed	-- %
Secondary Filter 1 Inlet Pressure PS5a	-- Bar
Secondary Filter 2 Inlet Pressure PS5b	-- Bar
Secondary Filter 3 Inlet Pressure PS5b	-- Bar
Secondary Filter 1 Diff. Pressure PS5a-PS2	-- Bar
Secondary Filter 2 Diff. Pressure PS5b-PS2	-- Bar
Secondary Filter 3 Diff. Pressure PS5b-PS2	-- Bar

Table 4.4 Status - Page 4

Parameter	Value
Pump 1 Hours Run	__ hrs
Pump 2 Hours Run	__ hrs
Pump 3 Hours Run	__ hrs
Valve 1 Runtime 0 to 25%	__ hrs
Valve 1 Runtime 26 to 50%	__ hrs
Valve 1 Runtime 51 to 75%	__ hrs
Valve 1 Runtime 76 to 100%	__ hrs
Elapsed Minutes	__ mins
Controller Firmware Version	--
Unit Serial Number	--
Controller Hardware Version	--

Table 4.5 Status - Page 5

Parameter	Value
Pump 1 Comms Status	--
Pump 2 Comms Status	--
Pump 3 Comms Status	--
Pump 1 Mode	--
Pump 2 Mode	--
Pump 3 Mode	--
Pump 1 Frequency	__ Hz
Pump 2 Frequency	__ Hz
Pump 3 Frequency	__ Hz
Pump 1 Voltage	__ V
Pump 2 Voltage	__ V
Pump 3 Voltage	__ V
Pump 1 Current	__ A
Pump 2 Current	__ A
Pump 3 Current	__ A
Pump 1 Power	__ kW
Pump 2 Power	__ kW
Pump 3 Power	__ kW
Pump 1 Heat Sink Temperature	__ °C
Pump 2 Heat Sink Temperature	__ °C

Table 4.5 Status - Page 5 (continued)

Parameter	Value
Pump 3 Heat Sink Temperature	__ °C
Pump 1 Last Fault Code	--
Pump 2 Last Fault Code	--
Pump 3 Last Fault Code	--

Table 4.6 Status - Page 6

XDU1350	Mode	DP Bar	Secondary Flow Rate l/m	Pump Speed % for pump 1, 2 and 3	Temp T2 °C	Cooling Demand	Lead
1		0.00	0	0	0.0	0	0
2		0.00	0	0	0.0	0	0
3		0.00	0	0	0.0	0	0
4		0.00	0	0	0.0	0	0
5		0.00	0	0	0.0	0	0
6		0.00	0	0	0.0	0	0
7		0.00	0	0	0.0	0	0
8		0.00	0	0	0.0	0	0

Possible modes: Not configured, shutdown - remote start/stop, shutdown - network, full manual control, standby, online (running), online (filling), filling, shutdown - fault, and group standby

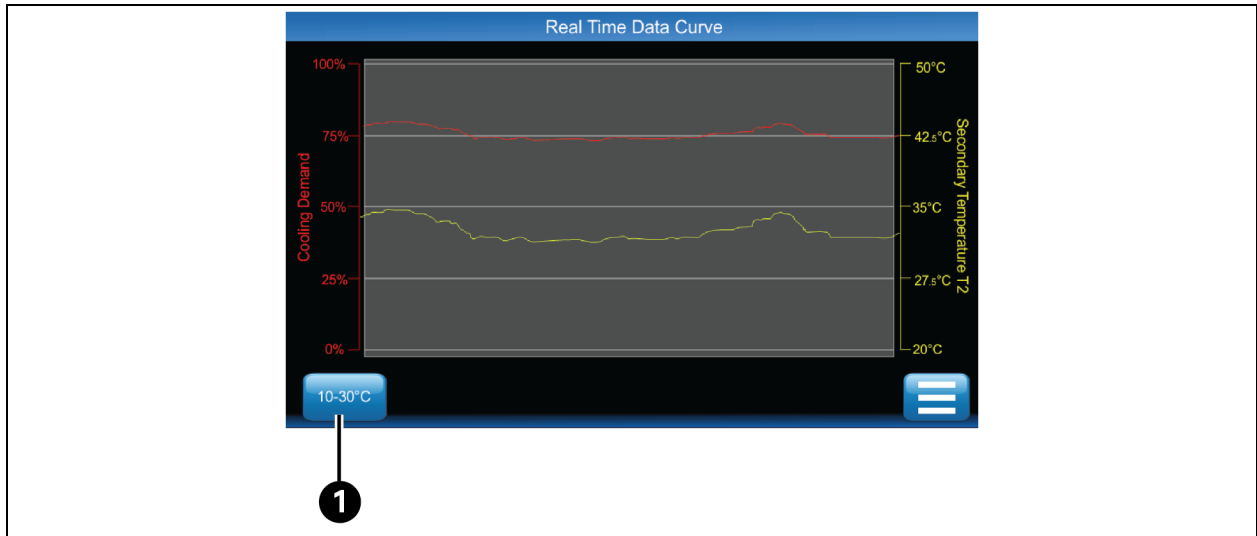
NOTE: Table 4.6 above is a quick reference for when multiple units are connected on a network under Group Control.

Parameter	Value
Average System DP	__ Bar
Total System Flow Rate	__ l/m

4.2.4 Data Curves Screen (Real Time Update)

The Data Curves screen displays a graphical representation of two pieces of variable data. A red trace for Cooling (control valve) Demand and a yellow trace for Secondary Supply Temperature T2, both of which will update in real time (time span of display is 3 minutes).

Figure 4.4 Control System Data Curves Screen



Item	Description
1	Toggle button to switch between secondary temperature T2 axis range of 10 °C to 30 °C or 20 °C to 50 °C.

4.2.5 Alarm Screen

The Alarm screen can be used to view new or active Alarms and to acknowledge these events. Refer to [Troubleshooting \(Alarms\)](#) on page 53 for a full list of alarms and further information.

Figure 4.5 Control System Alarms Screen

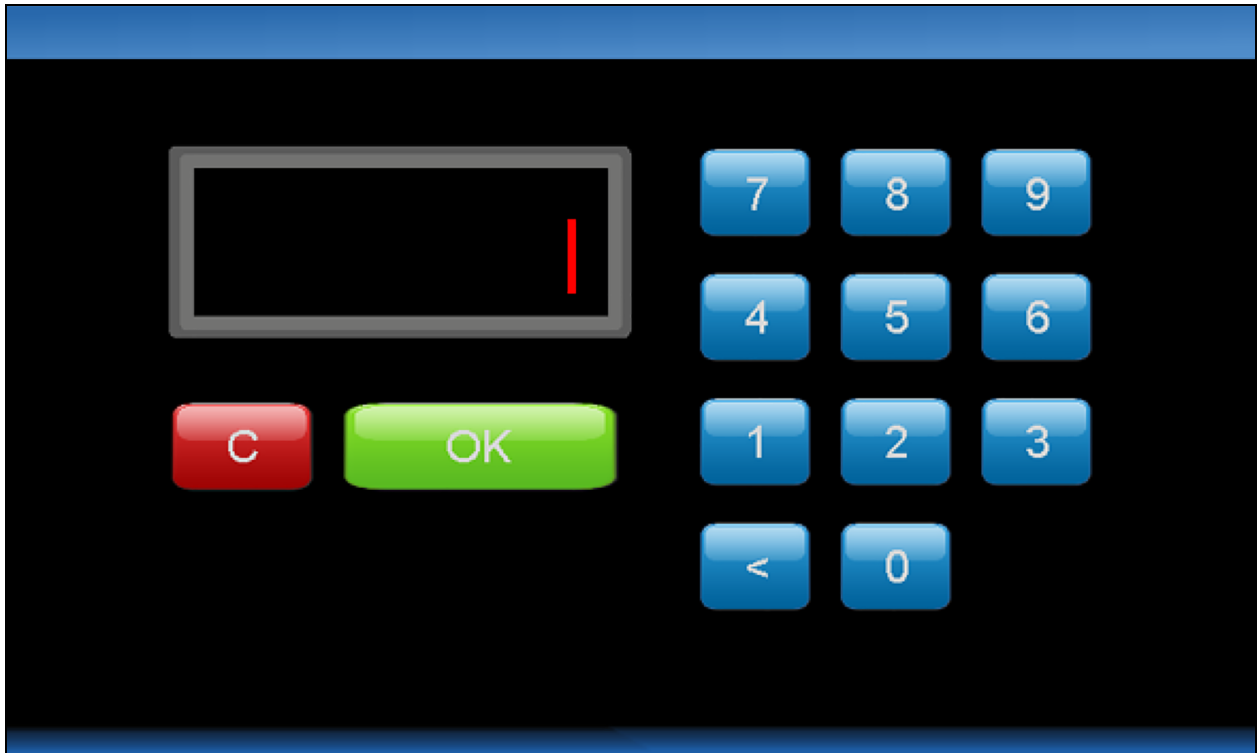


4.2.6 Login Screen

The Login screen allows the user access to further information and to adjust various parameters and settings when logged in at the service or engineer level.

- **No access code** (User Level 1) provides access to Login, Status, Data Curves and Alarm pages.
- Code **1234** (User Level 2) provides read-only access to Setup, Configuration, and Diagnose menus.
- Code **5669** (Service Level) provides full read-only access to everything and write access to select configuration and service features.

Figure 4.6 Control System Login Screen



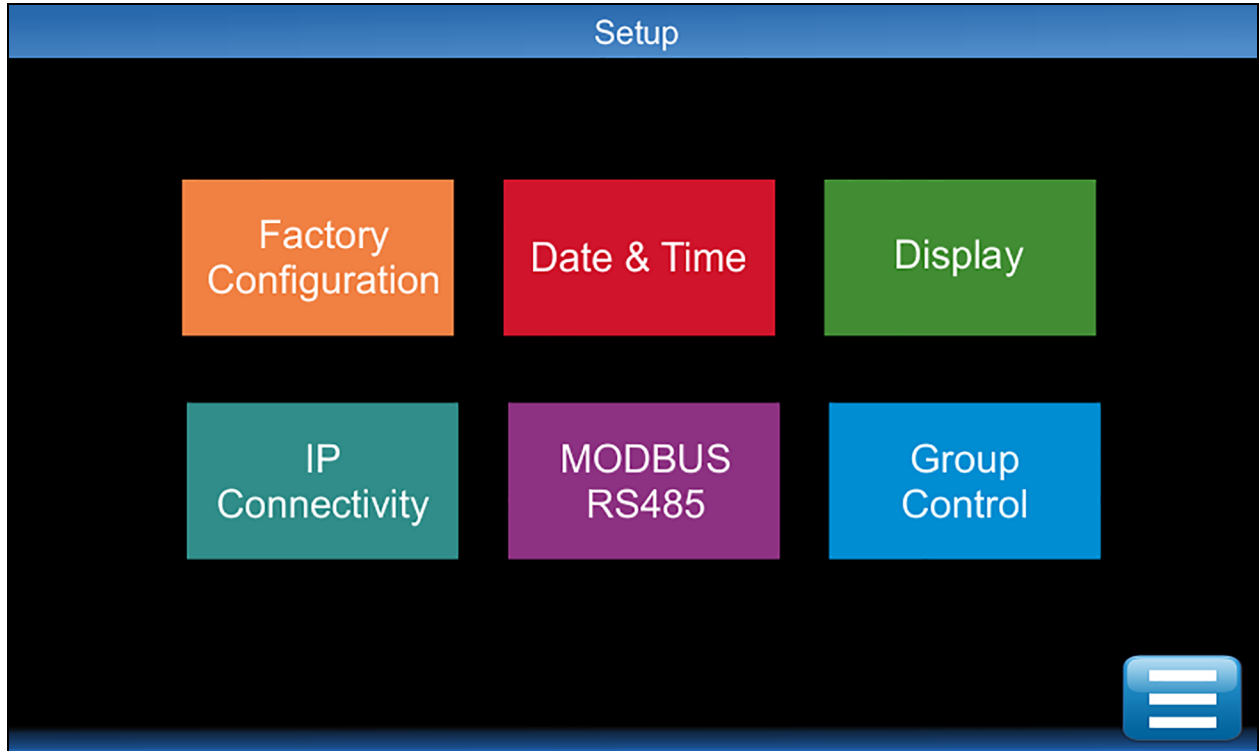
Login codes are available on request from the manufacturer. Entering an invalid code results in an access denied message.

4.2.7 Setup Screen

NOTE: This menu screen is only visible once logged in.

The Setup screen will not normally require access. Items within this screen are either set at the factory, or during commissioning. However, adjustments may need to be made following any site upgrade.

Figure 4.7 Control System Setup Screen



NOTE: Information under Factory Configuration can be viewed with service and engineer access codes. Another code is required to make changes.

Table 4.7 Setup - Factory Configuration

ID	Title	Description	Range
	Unit Serial Number	Select according to unit build	
P001	Redundant Pumps	Select according to unit build	Yes - No
P002	Primary Filter	Select according to unit build	Yes - No
P003	Primary Flow Meter	Select according to unit build	Yes - No
P004	Secondary Filters	Select according to unit build	Yes - No
P005	RH&T Sensor Type	Select according to unit build	Yes - No
P006	Secondary Fluid Quality Instrumentation	Select according to unit build	Yes - No
P007	Single Valve	Select according to unit build	Yes - No

Table 4.8 Setup - Date and Time

ID	Title	Description	Default	Range	Unit
	Date	Adjust date	-	dd/mm/yyyy	-
P021	Date Format	Select preferred format	dd/mm/yyyy	dd/mm/yyyy mm/dd/yyyy yyyy/mm/dd	-
	Time	Adjust time (24 hour clock)	-	hh:mm:ss	-
P022	Daylight Saving	Adjust according to location	None	None, Europe/UK, N. America, Australia	-
P023	NTP Synchronisation	Select if NTP synchronisation is required or not.	Disabled	Disabled, Enabled-Port A, Enabled-Port B	-
P024	NTP Server IP Address	IP address of the NTP Server	0.0.0.0	Configurable	
P025	Time Zone Offset	Select according to location	0.0	-12.0 to +12.0	hrs
P026	NTP Sync Interval	Interval between NTP synchronisations	23	1 to 168	hrs
P027	NTP Logging Verbose Level				

Table 4.9 Setup - Display

ID	Title	Description	Default	Range	Unit
P030	Screen Saver/Logout Period	Elapsed time before screen saver launches or display auto logs out	30	1 to 60	mins
P031	Backlight Period	Elapsed time before screen dims	10	1 to 60	mins
P032	Temperature Units	Select required temperature display units	°C	°C, °F	-
P033	Pressure Units	Select required pressure display units	bar	bar, psi	-
P034	Flow Rate Units	Select required flow rate display units	l/m	l/m, g/m	-

Table 4.10 Setup - IP Connectivity

ID	Title	Description	Default	Range	Unit
P040	Interface A Enabled	Set to active or not (see below for submenu details).	Enabled	Enable - Disable	-
P041	Interface B Enabled	Set to active or not (see below for submenu details).	Enabled	Enable - Disable	-

NOTE: Viewing the CDU data occurs using unsecured http and the feature is read-only. There is no function that offers command and control to the unit. Be aware that status messages could potentially be tampered. If misinterpretation of the data and the consequences of such are a concern, the CDU access via http should be configured on an isolated network with limited user access.

NOTE: Use of Telnet offers no protection on any communication to the CDU. Telnet could access command and control functions of the unit. However, Telnet is disabled by default and should only be enabled temporarily to make any necessary changes to the SNMP settings and disabled after use. If the potential consequences of Telnet are a concern, the CDU should be configured on an isolated network with limited user access.

Table 4.11 Setup - IP Connectivity (Interface A) Submenu

ID	Title	Description	Default	Range	Unit
P050	MAC Address	View MAC address	-----	Read-only	-
P051	DHCP	Select as required	Disabled	Enable - Disable	-
P052	IP Address	Set IP address	192.168.11.170	Configurable	-
P053	Subnet Mask	Set subnet Mask	255.255.255.0	Configurable	-
P054	Default Gateway	Set gateway address	0.0.0.0	Configurable	-
P055	Preferred DNS Server	Set DNS address	0.0.0.0	Configurable	-
P056	Alternative DNS Server	Set DNS address	0.0.0.0	Configurable	-
P057	SNMPv2 Write Access	Allow write access	No	No – Yes	-
P058	TELNET Access	Configure Telnet access	None	None, read-only, Read/Write	-

Table 4.12 Setup - IP Connectivity (Interface B) Submenu

ID	Title	Description	Default	Range	Unit
P060	MAC Address	View MAC address	-----	Read-only	-
P061	DHCP	Select as required	Disabled	Enable - Disable	-
P062	IP Address	Set IP address	192.168.11.171	Configurable	-
P063	Subnet Mask	Set subnet mask	255.255.255.0	Configurable	-
P064	Default Gateway	Set gateway address	0.0.0.0	Configurable	-
P065	Preferred DNS Server	Set DNS address	0.0.0.0	Configurable	-
P066	Alternative DNS Server	Set DNS address	0.0.0.0	Configurable	-
P067	SNMPv2 Write Access	Allow write access	No	No – Yes	-
P068	TELNET Access	Configure Telnet access	None	None, read-only, Read/Write	-

Table 4.13 Setup - Modbus RS485

ID	Title	Description	Default	Range	Unit
P070	Modbus Secondary Address	Set required address	1	1 to 247	-
P071	Baud Rate	Set required baud rate	9600	9600 to 38400	-

Table 4.14 Setup - MODBUS

ID	Title	Description	Default	Range	Unit
P070	Modbus Slave Address	Set required address	1	1 to 247	-
P072	Write Access	Set write access privileges	No	No, Yes	-

Table 4.15 Setup - BACnet

ID	Title	Description	Default	Range	Unit
P074	Protocol	Set required protocol type (and physical communication port)	Disabled	Disabled, IP – Port A, IP – Port B, MSTP	-
P075	Instance Number	Set Device Instance Number	Based on Serial No.	0 - 4194302	-
P076	MSTP MAC Address	Set MSTP MAC Address	1	1-127	
P077	MSTP Max Masters	Set MSTP Max Masters	127	1-127	
P078	MSTP Info Frames	Set MSTP number of Info Frames	1	1-100	
P079	Units	Set Present Value Units	SI	SI, Imperial	

Table 4.16 Setup - Group Control

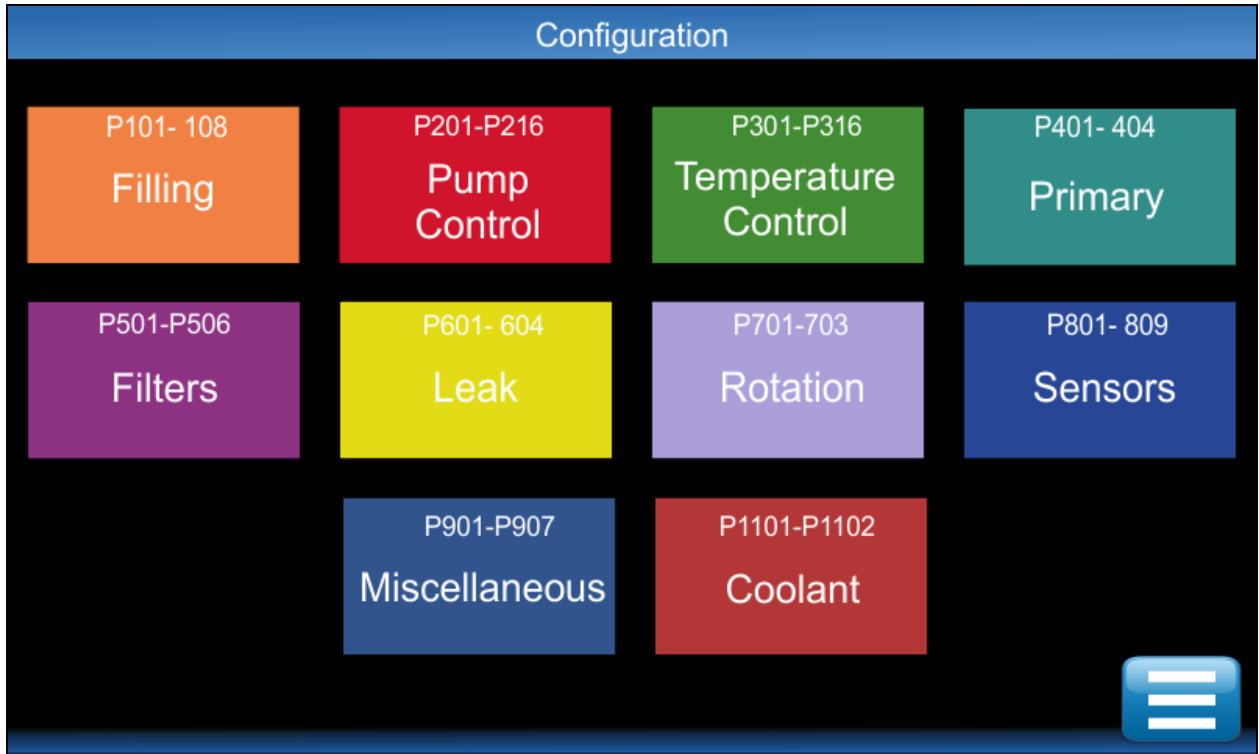
ID	Title	Description	Default	Range	Unit
P081	Unit Address	-	1	1 to 16	-
P082	Number of Units in Group	-	1	1 to 16	-
P083	Number of Run Units	-	1	1 to 16	-
P084	Control Reference	-	-	-	-
P085	Rotation Frequency	-	Weekly	Weekly, Monthly, Never	-
P086	Rotation Day of Week	-	Mon.	Sun. to Sat.	-
P087	Rotation Time of Day - Hours	-	10	00 to 23	hrs
P088	Rotation Time of Day - Minutes	-	00	00 to 59	mins
P089	Unit Receive Timeout Period	Set require unit receive timeout	3000	50 to 10000	msecs
P090	Unit Transmit Period	Set required unit transmit period	100	20 to 1000	msecs
P091	Number of RDHxs	Number of RDHxs	0	0 to 40	-

4.2.8 Configuration Screen

NOTE: This screen is only available once logged in.

The Configuration screen can be used to set specific parameters and control functions.

Figure 4.8 Control System Configuration Screen



NOTE: Parameter IDs shown in red text will only be accessible with the engineer login code.

Table 4.17 Configuration - Filling

ID	Title	Description	Default	Range	Unit
P101	Fill Pressure	Start threshold for fill pump	0.8	0.3 to 1.0	Bar
P102	Fill Hysteresis	Stop hysteresis for fill pump	0.2	0.1 to 0.5	Bar
P103	Fill Pump Run Period	Time for level sensor to make, or fill pressure to be satisfied, prior to alarm (when unit is online)	1	1 to 15	minutes
P104	Level Sensor Delay	Level sensor response time, prior to alarm	1	1 to 6	Seconds
P105	Fill Start Delay Period	Delay prior to pump start after initiate signal	10	1 to 600	Seconds
P106	Fill Warning Delay Period	Delay prior to check make up alarm activated	5	0 to 60	Seconds
P107	Group Fill	Group fill (0 = no, 1 = yes)	0	0 to 1	-
P108	Delta Load	Inhibit fill pump change in kW IT load	0	0 to 1200	kW
P109	Delta Load Period	Change in kW IT load time period	60	90	Seconds

Table 4.18 Configuration - Pump Control

ID	Title	Description	Default	Range	Unit
P201	Control Type	Pump speed flow or differential pressure (DP) controlled	DP	Flow or DP	-
P202	Flow Setpoint	Set the required secondary flow rate	100	50 to 1800	l/m
P203	Differential Pressure Setpoint	Set the required secondary differential pressure (DP)	0.3	0.1 to 5.0	Bar
P204	Low Flow %	Low flow alarm threshold (% of flow setpoint)	90	10 to 95	%
P205	Low DP %	Low DP alarm threshold (% of DP setpoint)	90	10 to 95	%
P206	Low Flow/DP Delay	Time delay prior to low Flow/DP alarm	100	1 to 300	Seconds
P207	Minimum Pump Speed	Set minimum pump running speed	10	10 to 70	%
P208	Triple Pump Control	Set to twin or triple pump mode	No	No, Yes	-
P209	Maximum Pump Speed	Set maximum pump running speed	100	25 to 100	%
P210	Pump Changeover Delay	Pump changeover period (change from P1 to P2 or P2 to P1)	250	50 to 500	msec
P211	Over-pressure Setpoint	Maximum system pressure, prior to alarm (set to pressure relief valve setting, less 10%)	5.4	2.0 to 6.0	Bar
P212	Over-pressure Action	Alarm only, shutdown and alarm, back off and alarm	Alarm	Alarm or Alarm+S/D, Alarm+B/O	-
P213*	Startup Speed	Initial pump start fixed speed (0 = Auto)	0	0 to 100	%
P214*	Startup Period	Initial start speed hold period, prior control loop taking over	0	0 to 100	Seconds
P215*	Loop Refresh Period	Scan period for pump speed control loop	10	1 to 120	Seconds
P216*	Maximum Control Pressure	Maximum pump speed control loop pressure	4.0	1.0 to 8.0	Bar
P217	Failover Speed Reduction	Reduction in pump speed when moving to twin pump mode following group failover	0	0 to 50	%
P218	Fault Reset Attempts	Set number of inverter fault reset attempts	2	0 to 10	
P219	Fault Reset Period	Set fault reset attempts period	600	60 to 3600	Seconds
P220	Twin Maximum Pump Speed	Set maximum pump running speed when operating in twin pump mode	100	25 to 100	%

*Parameter IDs will only be accessible with the engineer login code.

Table 4.19 Configuration - Temperature Control

ID	Title	Description	Default	Range	Unit
P301	Temperature Setpoint	Set required secondary temperature setpoint	18.0	10.0 to 55.0	°C
P302	Control Mode	Select from fixed setpoint or fixed setpoint with dewpoint Offset	FSDO	FS, FSDO	-
P303	Dewpoint Offset	Minimum offset of setpoint from dewpoint temp.	3.0	1.0 to 5.0	°C
P304	Sec. Low Temp Diff.	Low temperature alarm offset below setpoint	2.0	1.0 to 10.0	°C
P305	Sec. High Temp Diff.	High temperature alarm offset above setpoint	2.0	1.0 to 10.0	°C

Table 4.19 Configuration - Temperature Control (continued)

ID	Title	Description	Default	Range	Unit
P306	Sec. Temp Reset Hysteresis	Low/high temp. alarm reset point	1.0	0.5 to 5.0	°C
P307*	PID – Control Period	Scan period for control valve positioning	1	1 to 30	Seconds
P308*	PID – Proportional Band	Proportional band	12.0	1.0 to 25.0	°C
P309*	PID – Integral Reset	Integral reset time	18	0 to 999	Seconds
P310*	PID – Derivative	Derivative reset time	5	0 to 999	Seconds
P311	Demand/Actual Error	Cooling valve demand to feedback error for alarm	10	0 to 50	%
P312*	Valve Check Period	Scan period for cooling valve position monitoring	15	1 to 120	Minutes
P313	Valve Runtime	Cooling valve motor run time for control loop	40	10 to 180	Seconds
P314	Minimum Position	Required minimum valve position to be adopted in online mode	0	0 to 80	%
P315	Valve Control Strategy	Select valve control scheme (0=parallel, 1=series)	0	0 or 1	-
P317	Maximum Position	Required maximum valve position to be adopted in online mode	100	40 to 100	%

*Parameter IDs will only be accessible with the engineer login code.

Table 4.20 Configuration - Primary

ID	Title	Description	Default	Range	Unit
P401	Pri. Flow Delay	Time delay prior to low flow alarm	15	1 to 120	Minutes
P402	Pri. Low Temp Setpoint	Low temp alarm threshold	4	2 to 40	°C (°F)
P403	Pri. High Temp Setpoint	High temp alarm threshold	11	6 to 50	°C (°F)
P404	Pri. Temp Reset Hysteresis	Low/high alarm reset from threshold	1	0.5 to 5.0	°C (°F)
P405	Pri. Low Flow Alarm Method	Method used to generate low flow alarm. 0 = derived, 1 = volumetric	0	0,1	
P406	Pri. Low Flow Setpoint	Volumetric Low Flow Setpoint	100	50 to	

Table 4.21 Configuration - Filters

ID	Title	Description	Default	Range	Unit
P504	Sec. Filter Dirty Setpoint	Differential pressure alarm threshold for secondary filter dirty	0.2	0.2 to 1.0	Bar
P505	Sec. Filter Dirty Hysteresis	Alarm reset from threshold	0.1	0.1 to 0.5	Bar
P506	Sec. Filter Dirty Delay Period	Time delay prior to alarm	60	10 to 600	Seconds

Table 4.22 Configuration - Leak Detection

ID	Title	Description	Default	Range	Unit
P601	Leak Detection - Flood Tray	Alarm only, or shutdown and alarm	Alarm	Alarm or Alarm+S/D	-
P602	Leak Detection - Underfloor	Alarm only, or shutdown and alarm	Alarm	Alarm or Alarm+S/D	-
P603	Underfloor Threshold	Set sensitivity of leak tape	50	1 to 65	kohm
P604	Underfloor Delay Period	Time delay prior to alarm	30	5 to 60	Seconds

Table 4.23 Configuration - Rotation

ID	Title	Description	Default	Range	Unit
P701	Frequency	Frequency of pump changeover (twin pump operation only)	Weekly	Never, Weekly, Monthly	-
P702	Day of Week	Set day of changeover	Mon.	Sun. to Sat.	-
P703	Time of Day - Hours	Time of changeover (hour)	10	00 to 23	Hours
P704	Time of Day - Minutes	Time of changeover (minute)	00	00 to 59	Minutes

Table 4.24 Configuration – Sensors

ID	Title	Description	Default	Range	Unit
P801	Secondary T2 Temperature Differential	Alarm threshold T2a/b/c temperature differential	1	0.1 to 10	°C
P802	Secondary T2 Period	Time delay before T2a/b/c differential alarm	30	0 to 120	Seconds
P803	Secondary PS1 Pressure Differential	Alarm threshold PS1a-PS1b pressure differential	0.2	0.1 to 10	Bar
P804	Secondary PS1 Period	Time delay before PS1a-PS1b differential alarm	30	0 to 120	Seconds
P805	Secondary Flow Sensor Full Scale	Adjust full scale (20mA) reading when external external flow meter fitted.	1725	100 to 3000	l/m
P806	Primary Flow Sensor Full Scale	Adjust full scale (20mA) reading when external external flow meter fitted.	1725	100 to 3000	l/m
P807	Sensor Input Multiplex Period	Time period between multiplexing sensor inputs	30	5 to 300	Seconds
P809	PS1a Scaling	Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar	2	0 to 2	-
P810	PS1b Scaling	Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar	2	0 to 2	-
P811	PS2a Scaling	Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar	2	0 to 2	-
P812	PS2b Scaling	Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar	2	0 to 2	-

Table 4.24 Configuration – Sensors (continued)

ID	Title	Description	Default	Range	Unit
P813	PS3/PS4 Scaling	Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar	2	0 to 2	-
P814	PS5a Scaling	Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar	2	0 to 2	-
P815	PS5b/c Scaling	Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar	2	0 to 2	-

Table 4.25 Configuration - Miscellaneous

ID	Title	Description	Default	Range	Unit
P901*	Manual Override Period	Time delay before controls revert to auto mode	15	0 to 120	Minutes
P902*	Alarm Delay	Alarm suppression on startup	20	1 to 120	Minutes
P903*	Alarm Relays	Extended alarm relay operation mode	N/O	N/O or N/C	-
P904*	Post Power Failure Options	Action to be taken following a power failure once power is restored	Run	Run, Standby	-
P905*	Data Logging Interval	Set logging interval (0 = 1 minute 1 = 30 seconds, 2 = 10 seconds, 3 = 5 seconds)	0	0-3	-
P906*	Remote Start/Stop Options	Closed or Open circuit to run unit	N/C	N/O or N/C	-
P908*	Display Lockout	Lockout following failed Log Ins	No	No, Yes	-

*Parameter IDs will only be accessible with the engineer login code.

Table 4.26 Configuration - Coolant

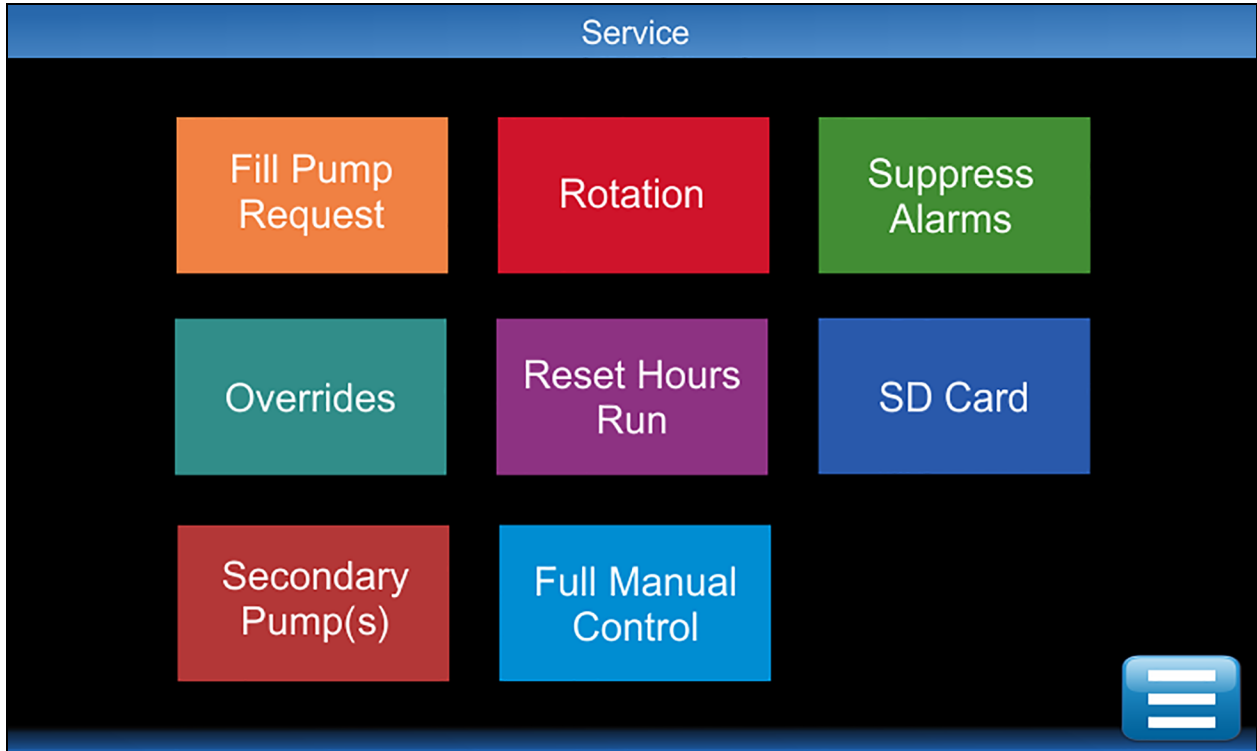
ID	Title	Description	Default	Range	Unit
P1101	Secondary Loop Coolant Type	Set secondary loop coolant type.	PG25	Water, PG25	-
P1102	Primary Loop Coolant Type	Set primary loop coolant type.	PG25	Water, PG25	-

4.2.9 Service Screen

NOTE: This screen is only available once logged in.

The Service screen (accessible only with service and engineer login codes) can be used to set some parameters and to assist in commissioning.

Figure 4.9 Control System Service Screen



NOTE: The Full Manual Control option (service IDs used) will only be accessible with the engineer login code.

Table 4.27 Service

	<p>This fill function is used at commissioning only and allows the fill pump to run without a time limit. Fill pump switches Off automatically when unit reaches required static pressure</p>
	<p>Used to force a pump changeover at an unscheduled time or to force a unit changeover when Group Control is active.</p>
	<p>Resets the alarm delay timer (normally only activated during startup) to stop nuisance alarms breaking through during manual operation.</p>

Table 4.28 Service - Overrides

ID	Title	Description	Default	Range	Unit
S101	Pump 1 Speed	Set pump 1 inverter speed. 0% = no override.	0	0 to 100	%
S102	Pump 2 Speed	Set pump 2 inverter speed. 0% = no override.	0	0 to 100	%
S103	Pump 3 Speed	Set pump 3 inverter speed. 0% = no override.	0	0 to 100	%
S104	Cooling Valve 1	Set cooling valve 1 position. 0% = no override	0	0 to 100	%
S105	Cooling Valve 2	Set cooling valve 2 position. 0% = no override	0	0 to 100	%
S108	Alarm	Simulate fault on customer alarm relay	Auto	Auto – Man.	-

Overrides allows the user to manually control some functions of the unit for a limited time period while running in automatic mode, for troubleshooting (see **Vertiv™ XDU1350 Installation and Commissioning Guide SL-71308** for more information). If the operator issues an override and the Vertiv™ XDU1350 is not in automatic mode, the override is ignored and the value is automatically set back to default.

Table 4.29 Service - Reset Hours Run

ID	Title	Description	Default	Range	Unit
S201	Pump 1 Run Hours	Set pump 1 run hours to zero	-	-	-
S202	Pump 2 Run Hours	Set pump 2 run hours to zero	-	-	-
S202	Pump 3 Run Hours	Set pump 3 run hours to zero	-	-	-
S203	Cooling Valve 1 Run Hours	Set cooling valve 1 run hours to zero	-	-	-
S204	Cooling Valve 2 Run Hours	Set cooling valve 2 run hours to zero	-	-	-

Table 4.30 Service - SD Card

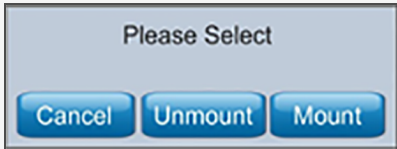
	<p>This dialog is used to control access to the SD card. Select Unmount in order to allow safe removal of the SD card or mount following re-insertion of SD card.</p>
---	---

Table 4.31 Service - Secondary Pumps

ID	Title	Description	Default	Range	Unit
S401	Pump 1 Service Status	Allows pump 1 to be set for in service or out of service.	In Service	In Service – Out of Service	-
S402	Pump 2 Service Status	Allows pump 2 to be set for in service or out of service.	In Service	In Service – Out of Service	-
S403	Pump 3 Service Status	Allows pump 3 to be set for in service or out of service.	In Service	In Service – Out of Service	-

Full Manual Control allows the user to manually control all functions of the unit for a limited time period. Selection causes the unit to shut down and all outputs will be inactive unless manually set and all alarms will be ignored. See **Vertiv™ XDU1350 Installation and Commissioning Guide SL-71308** for more information. Manual override requests are only honored if S301 is set to Enabled, otherwise commands are automatically reset to default.

Table 4.32 Service - Full Manual Control for Stainless Steel Reservoir

ID	Title	Description	Default	Range	Unit
S301	Full Manual Control	Allows full manual control of all functions	Enabled	Disabled, Enabled	-
S302	Pump 1 Speed	Set pump 1 speed	0	0 to 100	%
S303	Pump 2 Speed	Set pump 2 speed	0	0 to 100	%
S304	Pump 3 Speed	Set pump 3 inverter speed	0	0 to 100	%
S305	Cooling Valve 1	Set control valve position	0	0 to 100	%
S306	Cooling Valve 2	Set control valve position	0	0 to 100	%
S307	Unit Fill Pump P4	Switch fill pump ON	Off	Off – On	-
S308	Reservoir Fill Pump P5	Switch fill pump ON	Off	Off – On	-
S309	Alarm	Simulate fault on customer alarm relay	Off	Off – On	-

4.2.10 Diagnostics Screen

NOTE: This screen is only available after you are logged in.

This screen gives raw information and analog to digital conversion factors for the status for all Universal Inputs, Resistive Inputs, Digital Inputs, Digital Outputs, and Analogue Outputs.

Table 4.33 I/O Diagnostics – Universal Inputs 1 to 8

ID	Description	ADC Value	Electrical	Processed	ID	Description
UI01	Secondary Return Pressure PS1a	0	0.00	mA	0.00	bar
UI02	Secondary Return Pressure PS1b	0	0.00	mA	0.00	bar
UI03	Secondary Return Pressure PS2a	0	0.00	mA	0.00	bar
UI04	Secondary Supply Pressure PS2b	0	0.00	mA	0.00	bar
UI06	Secondary Filter Inlet Pressure PS5a	0	0.00	mA	0.00	bar
UI07	Secondary Filter Inlet Pressure PS5b	0	0.00	mA	0.00	bar
UI08	ATS Status	0	0.00	ohm	No ATS	

Table 4.34 I/O Diagnostics – Universal Inputs 9 to 14

ID	Description	ADC Value	Electrical	Processed	ID	Description
UI09	Primary Temp. T1	0	0.00	ohm	0.00	°C
UI10	Secondary Return Temp. T4	0	0.00	ohm	0.00	°C
UI11	Primary Flow Rate	0	0.00	mA	0	l/m
UI12	Secondary Flow Rate	0	0.00	mA	0	l/m
UI13	Ambient Sensor – RH	0	0.00	mA	0	%
UI14	Ambient Sensor – Temperature T3	0	0.00	mA	0.00	°C
UI15	Primary Return Temp. T4	0	0.00	ohm	0.00	°C
UI16	Control Valve 1/2 Feedback	0	0.00	V	0.00	%

Table 4.35 I/O Diagnostics – Resistive Inputs 1 to 4 and Universal Inputs 17 to 19

ID	Description	ADC Value	Electrical	Processed	ID	Description
RI01	Underfloor Leak Tape (Optional)	0	0.00	ohm	0	
RI02	Secondary Flow Temp. T2a	0	0.00	ohm	0.0	°C
RI03	Secondary Flow Temp. T2b	0	0.00	ohm	0.0	°C
RI04	Secondary Flow Temp. T2c	0	0.00	ohm	0.0	°C
UI17	Secondary Fluid Quality – Turbidity (Optional)	0	0.00	mA	0.0	NTU
UI18	Secondary Fluid Quality – PH (Optional)	0	0.00	mA	0.0	PH
UI19	Secondary Fluid Quality – Conductivity (Optional)	0	0.00	mA	0.0	uS/cm

Table 4.36 I/O Diagnostics – Digital and Analogue Outputs

ID	Description	State
DO01	Unit Fill Pump P4	OFF
DO02	Control Valve 1 & 2 Feedback Select	
DO03	PS3/PS4 Select	OFF
DO04	PS5b/PS5c Select	OFF
DO05	Reservoir Tank Fill Pump P5	OFF
DO06	Extended Alarm	OFF
AO01	Cooling Valve 1	%
AO02	Cooling Valve 2	%

4.2.11 Calibration Screen

The touchscreen will enter calibration mode if the screen is pressed 20 times within a 4 second interval. To complete calibration follow the on screen instructions.

NOTE: This screen is only available after you have logged in.

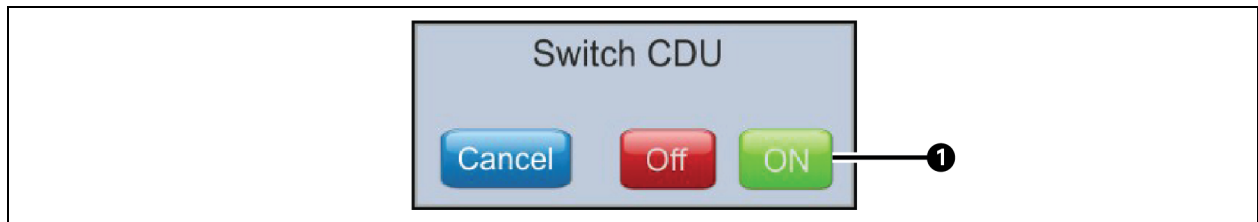
Figure 4.10 Control System Calibration Screen



4.3 Automatic Operation

After commissioning, the unit will be ready to run in automatic mode. Press the Start/Stop icon button on the display Home screen (see Figure 4.1 on page 17), then select the ON button as shown in Figure 4.11 below.

Figure 4.11 Control System On/Off Button



Item	Description
1	Press ON to start the unit.

4.3.1 Primary Circuit Operation

The primary water temperature is monitored at the inlet to the Vertiv™ XDU1350 cabinet. The cooling performance of the XDU1350 has been calculated for a primary temperature range from 6 °C to 45 °C (43 °F to 113 °F) (ASHRAE W3). Refer to **Vertiv™ XDU1350 Application and Planning Guide SL- 71309** for more information.

- If the primary temperature falls below default 4 °C (40 °F), an A30 - Primary Water Low Temperature alarm will be generated. This alarm will remain present until the temperature rises above the default 1°C (2 °F) reset hysteresis.
- If the primary temperature rises above default 11 °C (52 °F), an A31 - Primary Water High Temperature alarm will be generated. This alarm will remain present until the temperature falls below the default 1 °C (2 °F) reset hysteresis.
- The high and low temperature alarms are ignored for a default 20 minute period on startup to allow the system time to settle without generating nuisance alarms.

The secondary temperature PID control loop is operational from when the Start/Stop button is pressed and the pumps have ramped up to speed. If the secondary circuit temperature starts to rise above the setpoint, then the cooling valves will start to open to allow more primary cooling water through the heat exchangers. The cooling valves will modulate from 0% (fully closed) to 100% (full flow through heat exchanger). The valve positions can be monitored on the Home screen or page 1 of the Status screen. The demand signal to each valve is compared to a position feedback signal every 15 minutes (default) to check the healthy operation of the valves.

NOTE: If the feedback signal is more than 10% (default) different from the demand signal (allowing for the drive time of the actuator to respond to load changes), then a A27 – Valve 1 Fault and/or A28 – Valve 2 Fault alarm will be generated. Valves will continue to operate until fault is rectified.

The cooling valves are drive open/drive close devices and in the event the positioning signal is lost, they will remain at the last known operating position (assuming no signal, if at 0 V then valve will close).

The default setting for valve operation is for both valves to run in parallel (Configuration – Temperature Control screen P315). In instances where the heat transfer load is low, this can alternatively be set for series operation for improved secondary temperature control.

Primary flow rate is monitored with a calorimetric flow meter at the primary inlet to the XDU1350. The flow can be read on the Home screen or on page 2 of the Status screen.

NOTE: The flow meter will only read the total primary flow through the XDU1350, it does not monitor the flow rate through individual heat exchangers.

- A A29 - Primary Water Low Flow alarm is generated if the A33 - Secondary Water High Temperature alarm is active, there is not a A31 - Primary Water High Temperature alarm present and the demand to the operational cooling valves is at 100%.
- A A41 - Primary No Flow alarm will also be generated if the A33 - Secondary Water High Temperature event is active, there is a A31 - Primary Water High Temperature alarm present and the demand to the operational cooling valve is at 100%.

NOTE: Flows below 46 l/m (12 gpm) are outside the range of the flow sensor and will not be displayed.

4.3.2 Secondary Circuit Operation

When the ON button is pressed, the icon on the Home screen change from red to green. Providing that the fluid level and static pressure are healthy, one or both pumps (depending on configuration) will start to increase in speed, arrows are displayed on the Home screen for both primary and secondary circuits and the pump speed as a percentage of maximum is displayed. The inverter displays also show the actual frequency output to the pump motors.

Fluid Level

- If the fluid level switch is not made, insufficient water is signified, then neither main pump will not run.
- If after a default period of 1 minute of fill pump operation the level switch has still not made, then the fill pump will stop and an A21 - Insufficient Water Level alarm will be generated. This is a latched alarm and it will not be possible to restart the unit until the event has been manually cleared.

The system pressure at the Vertiv™ XDU1350 inlet (PS1) is continuously monitored (see **Table 4.3** on page 20) to ensure that the system is always pressurized.

Static Pressure

- After the unit is running, a low system pressure below the default 0.8 bar (12 psi) at PS1 does not stop the main pump from running, but does initialize the fill pump (after a default 10 second delay) to raise the PS1 pressure to a default of 1.0 bar (15 psi). At this point the fill pump stops. If the fill pump has been running for more than 5 seconds, an A38 - Check Water Make up Level alarm is also generated. If the fill pump runs for more than 1 minute (default) and PS1 pressure has still not reached 1.0 bar (15 psi), then the fill pump stops and an A20 - Water Make up Empty alarm will be generated. This is a latched alarm and needs to be manually cleared, but does not stop the unit from running.
- If inlet pressure drops to 0.2 bar (3 psi) (set, non-adjustable) below fill pump activation threshold (i.e. to 0.6 bar (9 psi), if default values) for more than 1 minute (set, non-adjustable), an A39 System Low Pressure event is generated.

The following flow charts show the unit pressure/level monitoring and fill pump control during initial startup of the unit after commissioning (from a unit offline condition) and also during normal running (unit online):

Figure 4.12 Fill Pressure and Level Flow Chart (At Initial Start) Flexible Makeup Container

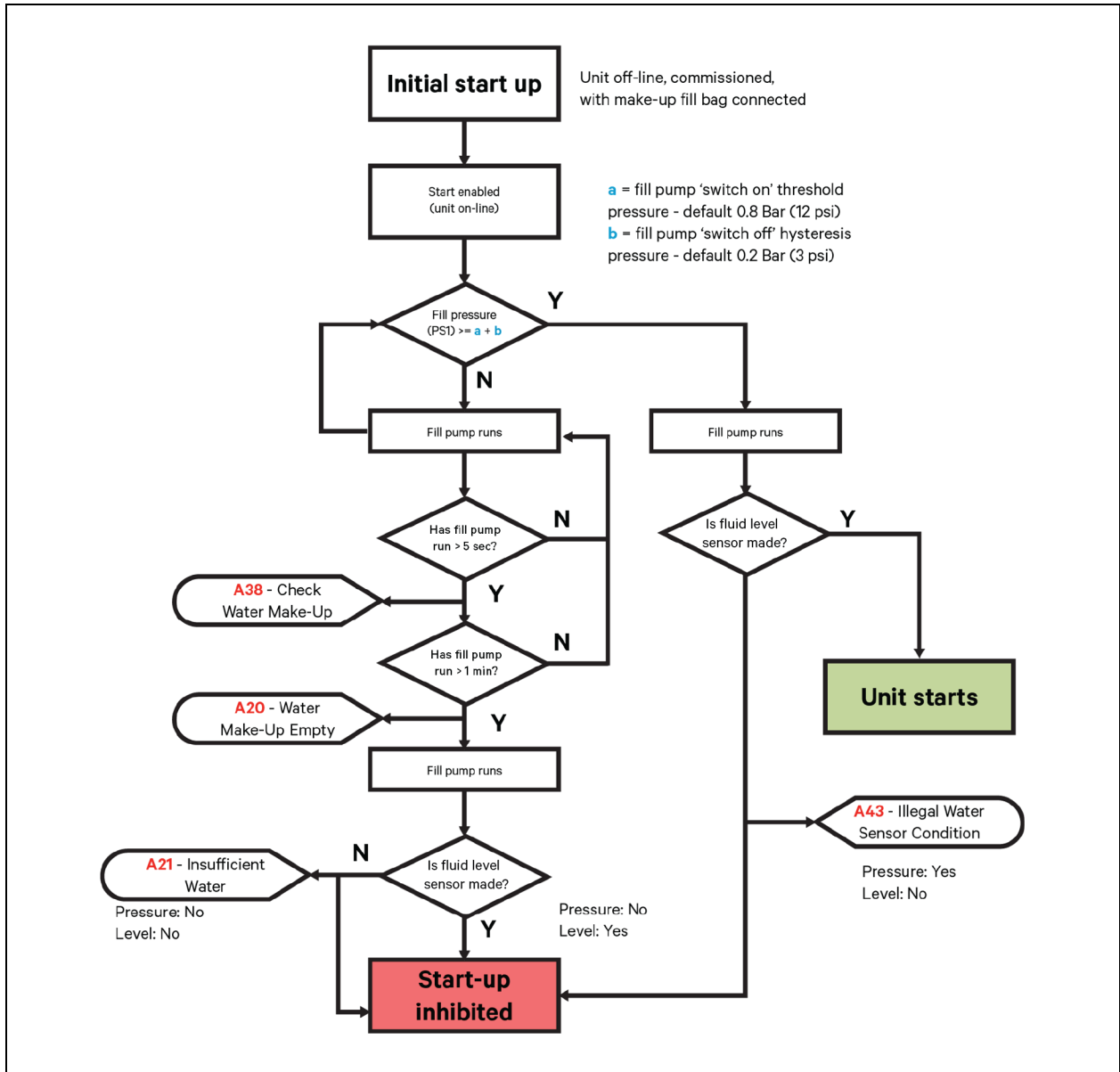


Figure 4.13 Fill Pressure and Level Flow Chart with Stainless Steel Reservoir Tank

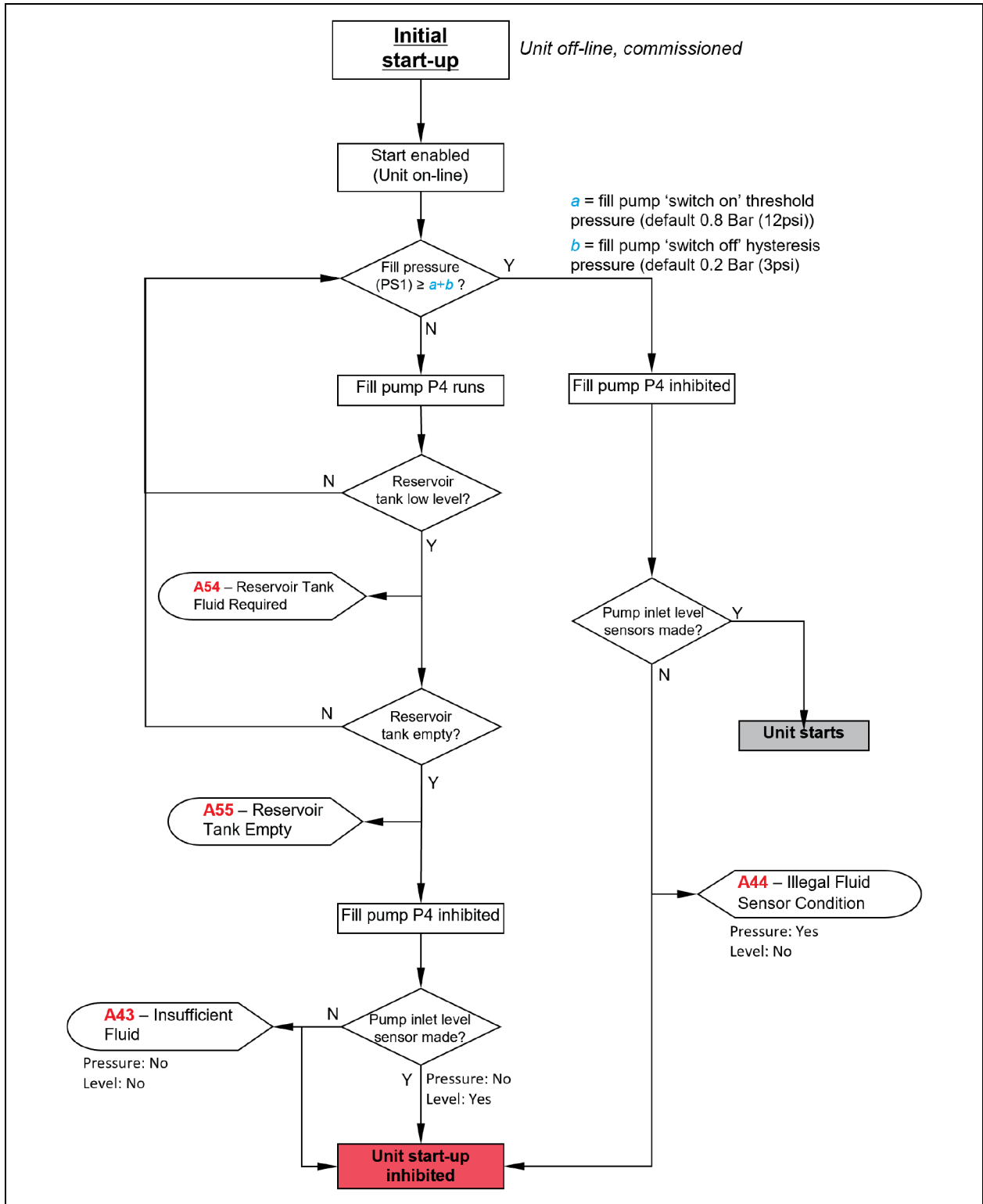


Figure 4.14 Fill Pressure and Level Flow Chart (When Running) Flexible Makeup Container

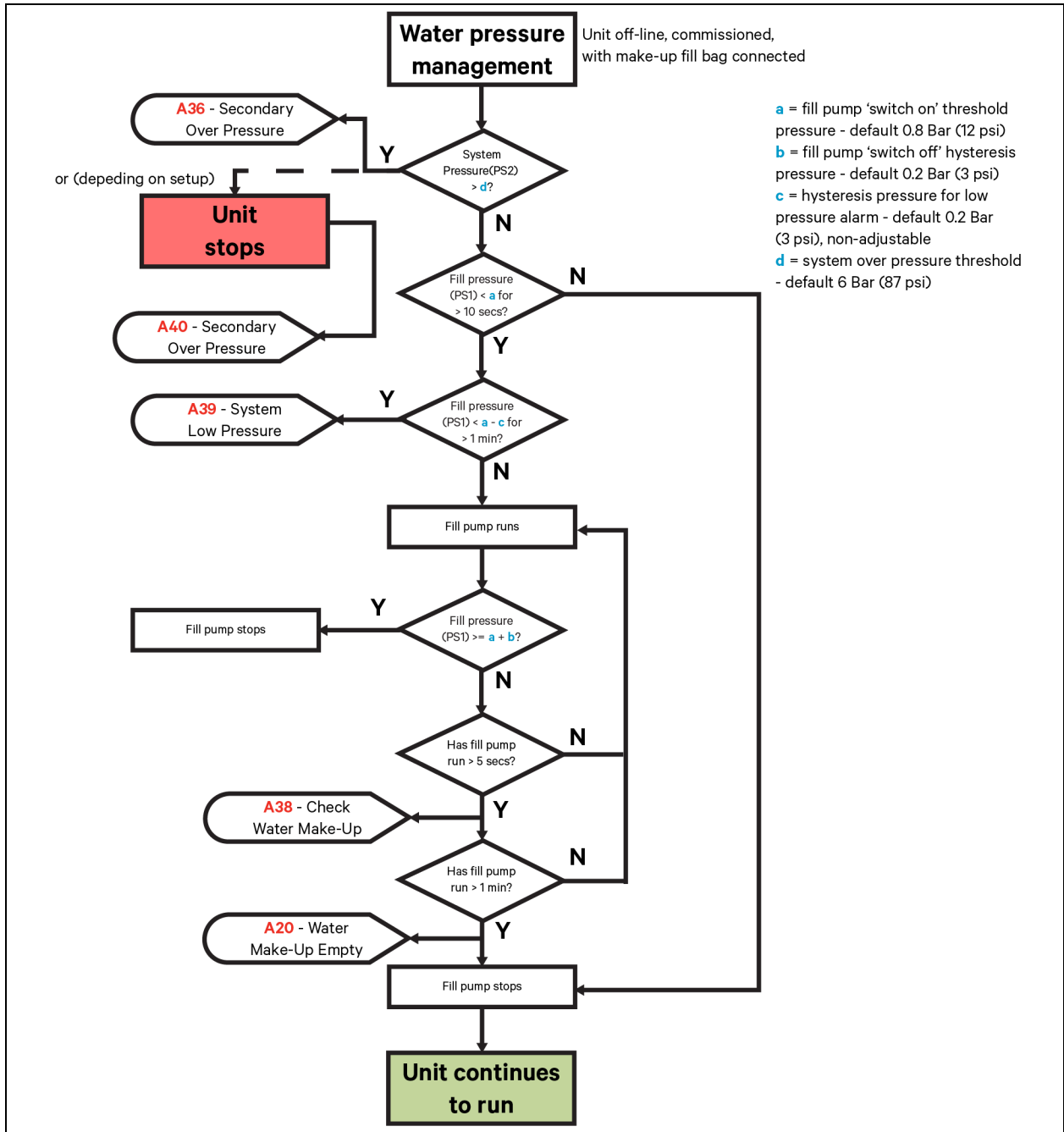


Figure 4.15 Fill Pressure and Level Flow Chart with Stainless Steel Reservoir Tank

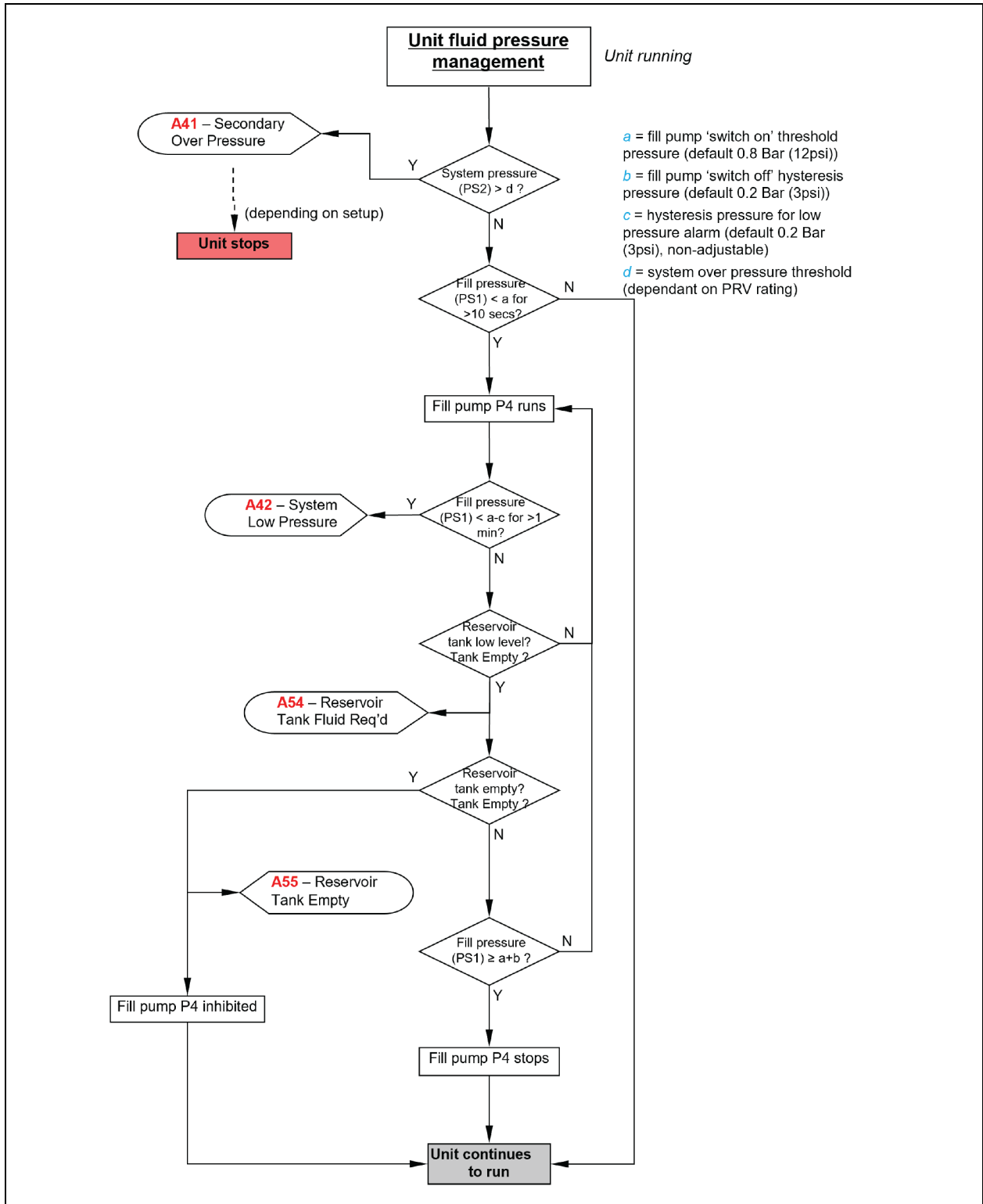


Figure 4.16 Water Level Management Flow Chart (When Running) Flexible Makeup Container

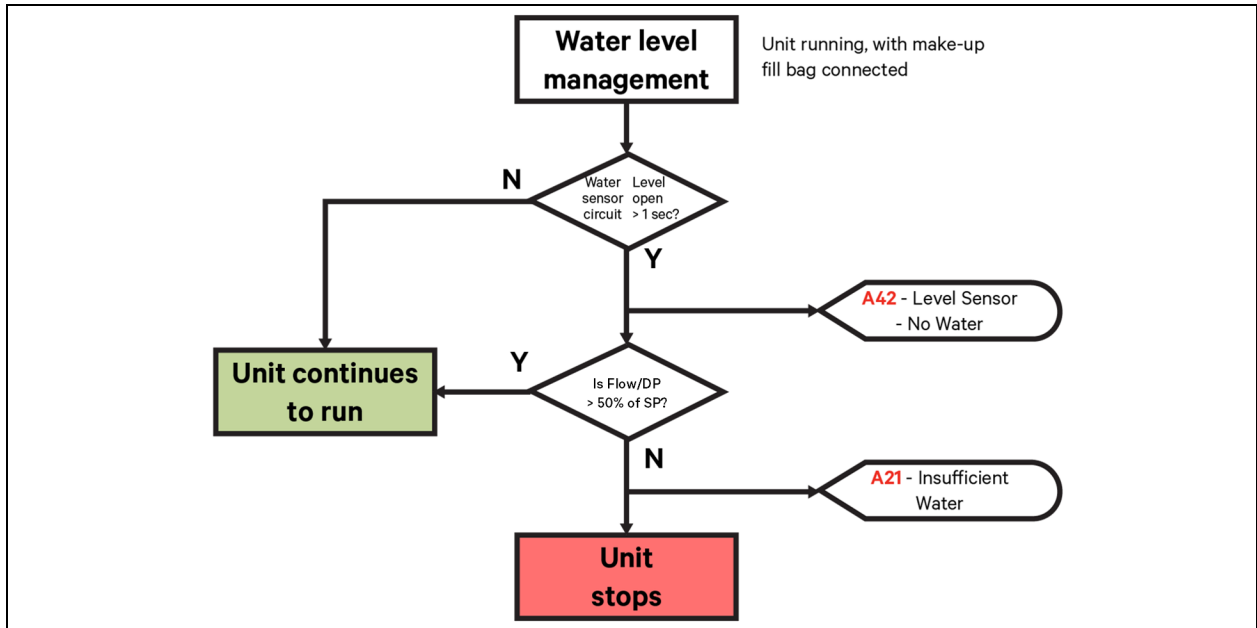
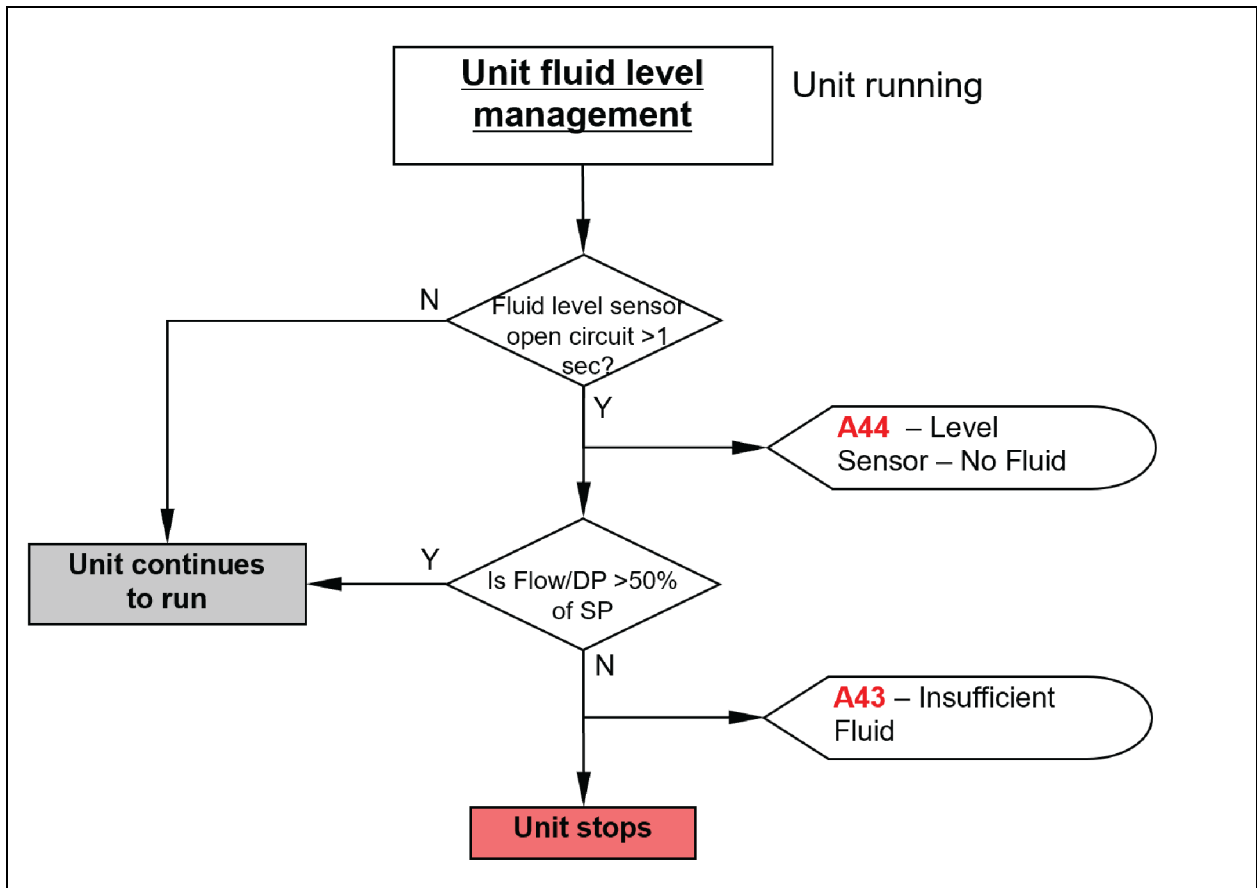


Figure 4.17 Fluid Level Management Flow Chart (When Running) with Reservoir Tank



Pump control logic

Pump flow/pressure performance (pump speed) can be controlled through either a flow or differential pressure control loop depending on configuration ([Configuration - Pump Control](#) on page 31).

Flow control monitors the secondary flow with a calorimetric flow meter and on startup, the control loop will increase the pump speed in stages until the flow matches the demand setpoint. If over pressure protection is enabled then the flow will be automatically restricted to reduce any buildup in secondary pressure.

DP control monitors the secondary differential pressure with sensors on the supply and return connections of the Vertiv™ XDU1350. On startup, the control loop increases the pump speed in stages until the DP matches the DP setpoint. If over pressure protection is enabled then the flow automatically restricted to reduce any buildup in secondary pressure.

The pump control loop has a default scan time of 10 seconds to avoid control oscillation.

During normal operation, if set up for run/standby (twin) pump operation, the pumps operate on a duty sharing cycle. For example, every 7 days (default), one of the operational pumps ramps down to a stop and the standby pump then starts and continues operating for the next 7 days. Changeover default time is set at 10:00 am on a Monday morning (default) and the complete changeover sequence takes approximately 0.25 seconds (default).

NOTE: Each time the unit is stopped and re-started, it selects the operating pumps that have accrued the lowest run time hours (twin pump operation only).

Secondary supply temperature control logic

The secondary fluid temperature is monitored close to the secondary circuit supply connection. Three temperature sensors are positioned here to give extended component redundancy (T2a, T2b, and T2c). The controller will take an average between all three readings as its input value.

- If the difference between the sensors exceeds a default 1.0 °C (2 °F), then an A50 (A51 or A52) - Secondary Temp T2a (T2b or T2c) Diff Out of Limits alarm will be raised (after a default 30 second delay) and the controller will only read and average the two remaining healthy sensors.
- If any of the T2 temp. sensors go open circuit, then an A02 (A03 or A04) – T2a (T2b or T2c) Secondary Temperature Sensor Fault alarm will be raised (no time delay) and the controller will only read and average the two remaining healthy sensors.

Temperature sensor (T4) monitors the secondary circuit return temperature and is used in conjunction with the flow rate to calculate the heat transfer duty.

Fixed SP control mode

The secondary supply temperature should correspond to the desired setpoint (default fixed setpoint is 18 °C (65 °F) and is used by the control loop to regulate the primary water cooling valve positions to achieve and maintain the setpoint. The cooling valve positions can be monitored on the Home screen or page 1 of the Status screen (Cooling Valve Demand/Feedback). High and low temperature alarms are set at a default value of 2 °C (4 °F) either side of setpoint (floating with setpoint) when either Fixed SP or Fixed SP + Dew Point Offset control mode is selected from Configuration – Temperature Control screen, with a default hysteresis of 1 °C (2 °F).

- The high and low temperature alarms are ignored for a period of 20 minutes (default) on startup to allow the system time to settle without generating nuisance alarms.
- If the secondary temperature deviates by more than 2 °C (4 °F) below setpoint for 2 minutes or more, an A32 - Secondary Water Low Temperature alarm is generated. This alarm remains present until the temperature rises above the hysteresis value.

- If the secondary temperature deviates by more than 2 °C (4 °F) (default) above setpoint for 2 minutes or more, an A33 - Secondary Water High Temperature alarm is generated. This alarm remains present until the temperature falls below the hysteresis value.

Fixed SP+Dew Point Offset control mode

In Fixed SP + Dew Point Offset control mode, the setpoint can be overridden by a dew point condition. This occurs where there is a risk of condensation occurring at the IT equipment. The room temperature and relative humidity are constantly monitored and used to calculate the anticipated dew point adjacent to the Vertiv™ XDU1350 (or wherever the room temperature/humidity sensor has been located).

- When Dew point offset is activated, it is displayed on the Home screen under the Unit Mode heading. With this cooling mode, the XDU1350 operates as per fixed setpoint mode unless the dew point temperature rises to within 3 °C (6 °F) of this setpoint. When this happens, dew point override is activated and the controller re-adjusts the fixed setpoint to keep it at least 3 °C (6 °F) above the dew point.

If the optional filtration has been specified and fitted to the secondary circuit, there are additional sensors (PS5a for filter 1, PS5b for filter 2, PS5c for filter 3) fitted for monitoring the filter differential and give pre-warning of potential filter clogging.

- If the differential pressure exceeds 0.3 bar (4.5 psi) for filter 1, then an A47 – secondary filter 1 Dirty alarm is generated.
- If the differential pressure exceeds 0.3 bar (4.5 psi) for filter 2, then an A48 – secondary filter 2 Dirty alarm is generated.
- If the differential pressure exceeds 0.3 bar (4.5 psi) for filter 3, then an A49 – secondary filter 3 Dirty alarm is generated.

Secondary flow rate is monitored with a calorimetric flow meter at the secondary inlet to the XDU1350. The flow can be read on the Home screen or on page 3 of the Status screen.

NOTE: Flows below 18 l/m (4.8 gpm) are outside the range of the flow sensor and are not be displayed.

4.4 Temperature Control Loop Adjustment

In most applications, the default PID settings in the controller provide temperature control. If it is found necessary to change these settings, then it is recommended to use Zeigler-Nichols manual tuning method.

NOTE: The Ziegler-Nichols method requires system to be operating under typical load conditions and initially causes the control loop to temporarily become unstable with wide temperature swing oscillations. It is important to ensure that this does not cause any damage to the equipment being cooled. Login at engineering level will be required to make the necessary changes.

1. Set the Integral Reset Time and Derivative Reset Time (Configuration – Temperature Control screens P309 and P310) to 0 seconds.
2. Increase the Proportional Band (Configuration – Temperature Control screen P308) to a higher value from the default for example, 20 °C (68 °F).
3. Check that secondary supply temperature (T2) stabilizes.

NOTE: Temperature stabilizes at a higher temperature than the current setpoint. This offset is eradicated once the Integral Reset Time is added back in.

4. If temperature control is unstable, raise the Proportional Band to a higher value until temperature stabilizes, otherwise gradually decrease the Proportional Band in 1 °C (33.8 °F) steps until the supply temperature (T2) starts to oscillate at a constant rate.
5. Measure the frequency of the oscillation time (peak to peak) in seconds (t).

4.4.1 PI Control

For systems that have reasonably steady or slowly changing heat loads, PI control only should be sufficient.

1. Set the Proportional Band to 2.2 x the Proportional Band setting at which the system became unstable.
2. Set the Integral Reset Time to 0.83 x the oscillation time (t).
3. Leave the Derivative Reset Time at 0.

4.4.2 PID Control

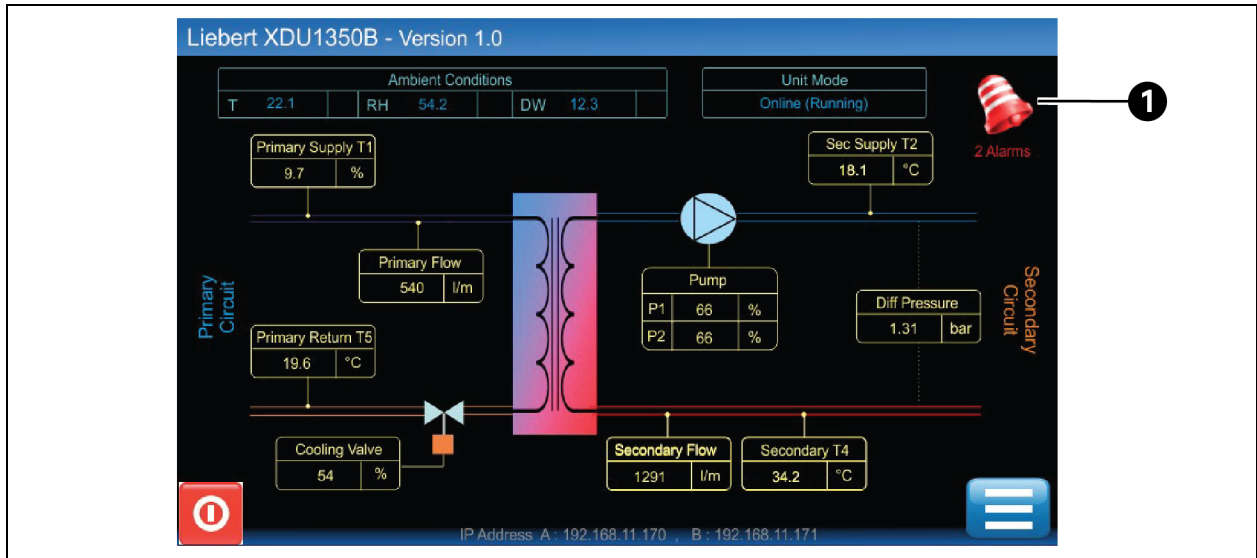
For systems that see high or sudden changing heat loads, PID control generally is the preferred option.

1. Set the Proportional Band to 1.67 x the Proportional Band setting at which the system became unstable.
2. Set the Integral Reset Time to 0.5 x the oscillation time (t).
3. Set the Derivative Reset Time to 0.125 x the oscillation time (t).

4.5 Alarm Management

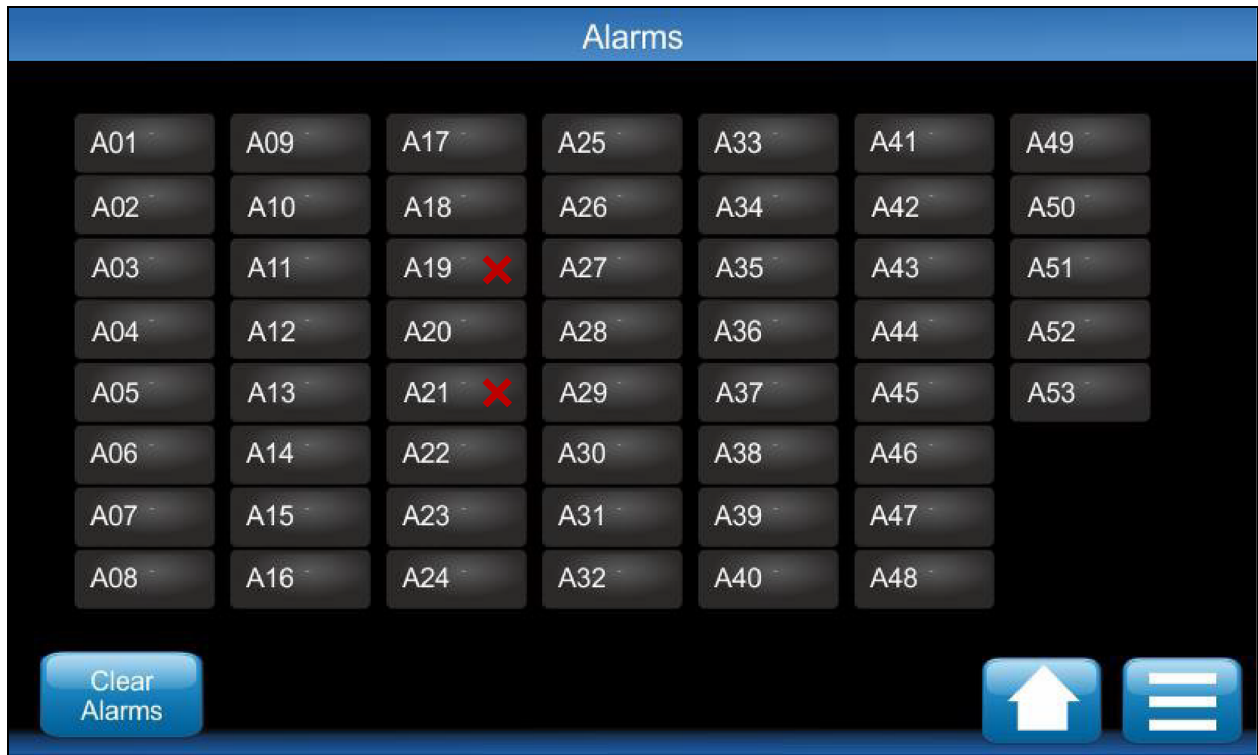
When an alarm occurs, a flashing alarm bell icon immediately breaks through at the top right-hand corner of the Home screen with the number of active alarms stated below.

Figure 4.18 Control Screen Alarm Indication



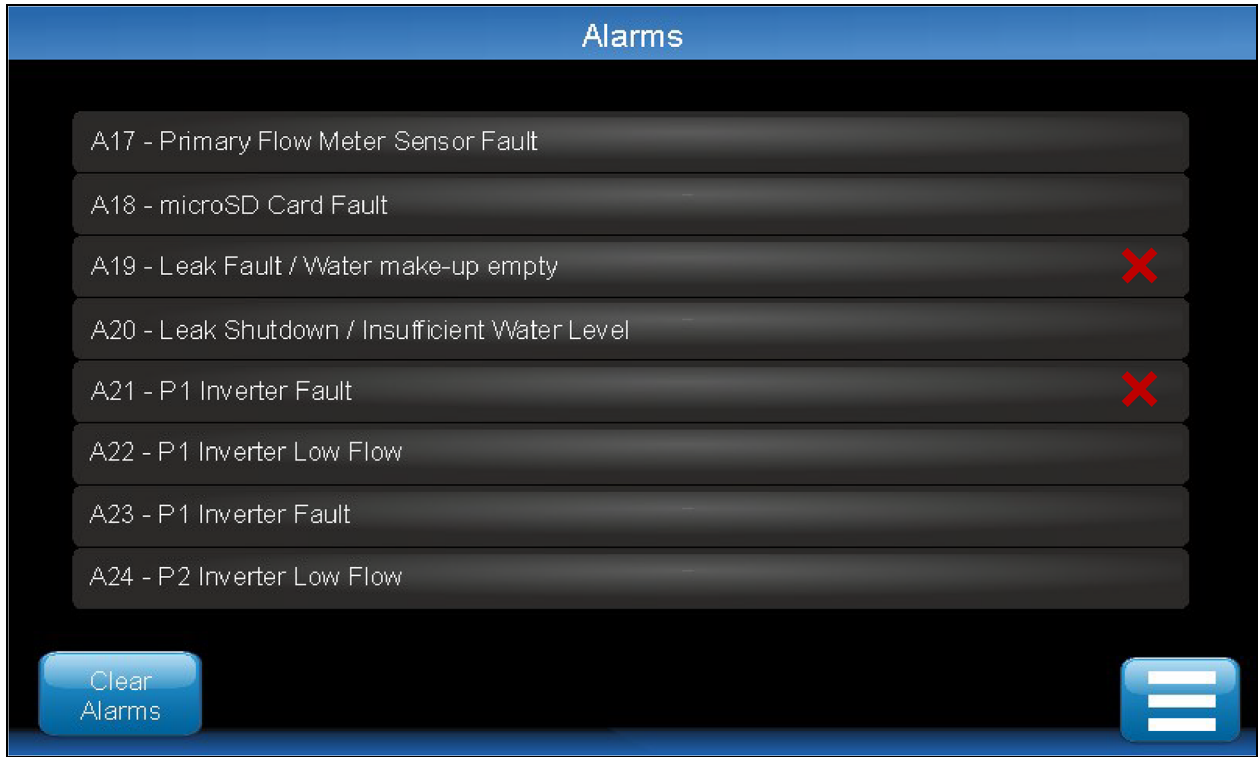
Item	Description
1	A flashing alarm bell icon gives alarm indication. Pressing the alarm bell icon will bring up the Alarm page (as shown in Figure 4.19 on the facing page) which will identify which alarms are active.

Figure 4.19 Control Screen Active Alarms



The alarm descriptions may be accessed by selecting the vertical columns where the alarms appear (as shown in Figure 4.20 on the next page).

Figure 4.20 Control Screen Alarm Identification



Some alarms will self clear if the condition is a brief one. Examples are when a temperature goes over alarm threshold and then comes back to a healthy condition and when the fault has been rectified, such as when a faulty sensor has been replaced.

Latching alarms need to be manually cleared when logged on at the service level or higher by pressing the Clear Alarms button on either of the screens above.

The self-clearing and latching alarms are identified in [Troubleshooting \(Alarms\)](#) on the facing page.

All alarms are automatically logged in an Alarm Log file stored on the controller SD card with the time and date of generation.

4.6 Troubleshooting (Alarms)



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.

NOTE: This is the full list of all alarms, however not all will necessarily be active depending on unit configuration, for example if the Vertiv™ XDU1350 has not been fitted and configured for a primary filter, then the associated A29 – Filter Dirty alarm will not be active, etc. Alarms shown with an asterisk (*) beside the code number in this table may not be active, depending on unit configuration.

Table 4.37 Alarms List

Code	Description	Type	Self-clear	Latching	Shutdown	Delay
----	No Display		-	-	-	-
	Detail: The display is not illuminated. Power failure on the display board or controller I/O board.					
	Action: Open the upper electrical panel door to check that 24 VDC is available at the controller I/O board. If there are no LEDs showing on the processor board then check the I/O board 24 V fuse FS1. If the LEDs are on, check for wiring faults between I/O board and display.					
A01	T1 Temperature Sensor Fault	3	✓	-	-	-
	Detail: Reading from the primary temperature sensor T1 is outside the normal range of 5 °C to 70 °C (41 °F to 158 °F), or disconnected. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A02	T2a Secondary Temperature Sensor Fault	3	✓	-	-	-
	Detail: Reading from the coil air on temperature sensor T2 is outside the normal range of 5 °C to 74 °C (41 °F to 165 °F), or disconnected. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A03	T2b Secondary Temperature Sensor Fault	3	✓	-	-	-
	Detail: Reading from the secondary supply temperature sensor T2b is outside the normal range of 5 °C to 70 °C (41 °F to 158 °F), or disconnected. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A04	T2c Secondary Temperature Sensor Fault	3	✓	-	-	-
	Detail: Reading from the fluid supply temperature sensor T3b is outside the normal range of 5 °C to 74 °C (41 °F to 165 °F), or disconnected. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					

Table 4.37 Alarms List (continued)

Code	Description	Type	Self-clear	Latching	Shutdown	Delay
A05	T3 Room Temperature Sensor Fault	3	✓	-	-	-
	Detail: Reading from the room temperature sensor T3 is outside the normal range of 5 °C to 70 °C (41 °F to 158 °F), or disconnected. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A06	T4 Secondary Temperature Sensor Fault	3	✓	-	-	-
	Detail: Reading from the secondary return temperature sensor T4 is outside the normal range of 5 °C to 70 °C (41 °F to 158 °F), or disconnected. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A07	T5 Primary Temperature Sensor Fault	3	✓	-	-	-
	Detail: Reading from the primary return temperature sensor T4 is outside the normal range of 5 °C to 70 °C (41 °F to 158 °F), or disconnected. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A08	RH Relative Humidity Sensor Fault	3	✓	-	-	-
	Detail: Reading from the room humidity sensor RH is outside the normal range of 5 to 100% RH, or disconnected. NOTE: If in Fixed Set Point + DW Offset mode, the unit will revert to Fixed Set Point mode – default 18 °C (65 °F). Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A09	PS1a Secondary Pressure Sensor Fault	3	✓	-	-	-
	Detail: Reading from the secondary return pressure sensor PS1a (fill pressure) is outside the normal range of -1 to 8 bar (-15 to 116 psi) and min/max values only will be displayed. NOTE: For DP control, if the system differential pressure is not valid, then the pump speed will remain at last known demand. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A10	PS1b Secondary Pressure Sensor Fault	3	✓	-	-	-
	Detail: Reading from secondary return pressure sensor PS1b (also static fill pressure) is outside the normal range of -1 to 8 bar (-15 to 116 psi) and min/max values only will be displayed. NOTE: For DP control, if the system differential pressure is not valid, then the pump speed will remain at the last known demand. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					

Table 4.37 Alarms List (continued)

Code	Description	Type	Self-clear	Latching	Shutdown	Delay
A11	PS2a Secondary Pressure Sensor Fault	3	✓	-	-	-
	Detail: Reading from the secondary supply pressure sensor PS2a is outside the normal range of -1 to 8 bar (-15 to 116 psi) and min/ max values only will be displayed. NOTE: For the DP control, if the system differential pressure is not valid, then the pump speed will remain at the last known demand. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A12	PS2b Secondary Pressure Sensor Fault	3	✓	-	-	-
	Detail: Reading from the secondary supply pressure sensor PS2b is outside the normal range of -1 to 8 bar (-15 to 116 psi) and min/ max values only will be displayed. NOTE: For the DP control, if the system differential pressure is not valid, then the pump speed will remain at the last known demand. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A13*	PS3 Primary Pressure Sensor Fault	3	✓	-	-	-
	Detail: Reading from the primary filter inlet pressure sensor PS3 is outside the normal range of -1 to 8 bar (-15 to 116 psi) and min/ max values only will be displayed. NOTE: If the filter differential pressure is not valid, then the pump speed will remain at the last known demand. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A14*	PS4 Primary Pressure Sensor Fault	3	✓	-	-	-
	Detail: Reading from the primary filter outlet pressure sensor PS4 is outside the normal range of -1 to 8 bar (-15 to 116 psi) and min/ max values only will be displayed. NOTE: If the filter differential pressure is not valid, then the pump speed will remain at the last known demand. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A15*	PS5a Secondary Pressure Sensor Fault	3	✓	-	-	-
	Detail: Reading from the secondary filter inlet pressure sensor PS5a (Pump 1 outlet) is outside the normal range of -1 to 8 bar (-15 to 116 psi) and min/ max values only will be displayed. Action: Check the sensor connections to the control board, check the inline connections, replace the sensor.					
A16*	PS5b Secondary Pressure Sensor Fault	3	✓	-	-	-
	Detail: Reading from secondary filter inlet pressure sensor PS5b (Pump 2 outlet) is outside the normal range of 0 to 15 bar (0 to 218 psi) and min/max values only will be displayed. Action: Check sensor connections to the control board, check inline connections, replace sensor.					
A17*	PS5c Secondary	3	✓	-	-	-

Table 4.37 Alarms List (continued)

Code	Description	Type	Self-clear	Latching	Shutdown	Delay
	Pressure Sensor Fault					
	Detail: Reading from secondary filter inlet pressure sensor PS5b (Pump 2 outlet) is outside the normal range of 0 to 15 bar (0 to 218 psi) and min/max values only will be displayed. Action: Check sensor connections to the control board, check inline connections, replace sensor.					
A18	Secondary Flow Meter Sensor Fault	2	✓	-	-	-
	Detail: Secondary flow meter output is below 4mA. Action: Check sensor connections to the control board, check inline connections, replace sensor.					
A19*	Primary Flow Meter Sensor Fault	3	✓	-	-	-
	Detail: Primary flow meter output is below 4mA. Action: Check sensor connections to the control board, check inline connections, replace sensor.					
A20	Micro SD Card Fault	3	✓	-	-	-
	Detail: The SD card has either been removed or physically damaged. Action: Replace the SD card					
A21	Pump P1 Inverter Fault	2	-	✓	-	-
	Detail: Pump 1 is drawing excessive current, or inverter has been subjected to over/under voltage. Alarm will only appear after inverter has gone into fault condition a second time (default), after first attempting a fault reset. Pump 1 will then run. Action: Take a note any fault code on the inverter display and contact Vertiv for more information/corrective action.					
A22	Pump P2 Inverter Fault	2	-	✓	-	-
	Detail: Pump 2 is drawing excessive current, or inverter has been subjected to over/under voltage. Alarm will only appear after inverter has gone into fault condition a second time (default), after first attempting a fault reset. Pump 2 will then run. Action: Take a note any fault code on the inverter display and contact Vertiv for more information/corrective action.					
A23*	Pump P3 Inverter Fault	2	-	✓	-	-
	Detail: Pump 3 is drawing excessive current, or inverter has been subjected to over/under voltage. Alarm will only appear after inverter has gone into fault condition a second time (default), after first attempting a fault reset. Pump 3 will then run. Action: Take a note any fault code on the inverter display and contact Vertiv for more information/corrective action.					
A24	Pump P1 Inverter Communications Fault	2	-	✓	-	-
	Detail: Controller unable to communicate with pump inverter 1. Action: Check wiring and terminations					

Table 4.37 Alarms List (continued)

Code	Description	Type	Self-clear	Latching	Shutdown	Delay
A25	Pump P2 Inverter Communications Fault	2	-	✓	-	-
	Detail: Controller unable to communicate with pump inverter 2. Action: Check wiring and terminations					
A26*	Pump P3 Inverter Communications Fault	2	-	✓	-	-
	Detail: Controller unable to communicate with pump inverter 3. Action: Check wiring and terminations					
A27	Pump Low Flow	2	-	✓	-	-
	Detail: Pumps have not reached the flow rate (or differential pressure) setpoint in the specified time limit (default 100 secs). Action: Check that unit has been set for the correct system flow rate (or DP), check for system blockages, check inverter drive for faults, check non-return valves on Pumps are not sticking open (pump rotating slowly backwards). Reduce flow setting (or DP).					
A28	Valve 1 Fault	2	-	✓	-	-
	Detail: Feedback signal from cooling valve 1 is more than 10% (default) adrift from demand signal sampled every 15 minutes (default) and allowing for 40 second (default) positioning time. Action: Check the wiring connections to the actuator. Try to set the actuator position manually using the Auto Overrides function. Check the voltage out and return signals (Page 1 of Diagnostics screen).					
A29*	Valve 2 Fault	2	-	✓	-	-
	Detail: Feedback signal from cooling valve 1 is more than 10% (default) adrift from demand signal sampled every 15 minutes (default) and allowing for 40 second (default) positioning time. Action: Check the wiring connections to the actuator. Try to set the actuator position manually using the Auto Overrides function. Check the voltage out and return signals (Page 1 of Diagnostics screen).					
A30	Primary Fluid Low Flow	2	-	✓	-	✓
	Detail: Activates when valve demand is at 100%, A33 - secondary fluid high temp alarm is active and primary fluid temperature is within specified limits (default 5 min. delay applies). Action: Check operation of cooling valve. Check primary fluid supply flow rate. Ensure system heat load does not exceed the XDU1350 capacity (i.e. check that primary flow is sufficient for heat load – refer to Vertiv™ XDU1350 Application and Planning Guide SL-71309).					
A33	Primary Fluid Low Temperature	3	✓	-	-	✓
	Detail: Primary fluid temperature has dropped below the default 4 °C (40 °F) threshold. Alarm will cancel when temperature rises to 5 °C (42 °F) or higher (default 2 minute delay applies). Action: Check chilled water supply.					
A34	Primary Fluid High Temperature	2	✓	-	-	✓
	Detail: Primary fluid temperature has risen above the default 11 °C (52 °F) threshold. Alarm will cancel when temperature falls to 10 °C (50 °F) or lower (default 2 minute delay applies). Action: Check chilled water supply.					

Table 4.37 Alarms List (continued)

Code	Description	Type	Self-clear	Latching	Shutdown	Delay
A35	Secondary Fluid Low Temperature	2	✓	-	-	✓
	Detail: Secondary fluid temperature has dropped by more than 2 °C (4 °F) below set point (default). Alarm will cancel when temperature rises to 1 °C (2 °F) below set point or higher. If Dew Point Offset is active, then this alarm will only activate when at or below dew point for a period of 3 minutes or more (default 2 minute delay applies). Action: Check operation of control valve.					
A36	Secondary Fluid High Temperature	2	✓	-	-	✓
	Detail: Secondary fluid temperature has risen by more than 2 °C (4 °F) above set point (default). Alarm will cancel when temperature falls to 1 °C (2 °F) above set point or lower. If Dew Point Offset is active, then this alarm activates at a pre set default value of 20 °C (70 °F). See Parameters screen 3 to 12 (default 2 minute delay applies). Action: Check operation of cooling valve.					
A37	Leak - Unit	1	-	✓	✓ (or not)	-
	Detail: Level switch in cabinet drip tray has detected a substantial water leak. Event may be set for Alarm Only (default), or Alarm + Unit Shutdown. Action: Identify and repair the leak. NOTE: A leak of this magnitude that does not bring up any other alarms, would most likely be from the primary circuit.					
A38	Leak - External	1	-	✓	✓ (or not)	-
	Detail: The leak detection tape installed under the floor (if fitted – optional extra) has detected a substantial fluid leak. Alarm may be set for Alarm Only (default), or Alarm + Unit Shutdown. Action: Identify and repair the leak. NOTE: A leak of this magnitude that does not bring up any other alarms, would most likely be from the primary circuit.					
A39	PS1 Difference Out of Limits	3	✓	-	-	-
	Detail: Difference between secondary return pressure sensors PS1a and PS1b is more than 0.2 bar (3 psi), (default) for a period of 30 seconds (default) or more. Controller will continue to read just the higher of the 2 values. Action: Replace sensor with the lower reading.					
A40	PS4 Difference Out of Limits	3	✓	-	-	-
	Detail: Difference between secondary return pressure sensors PS4a and PS4b is more than the default of 0.2 bar (3 psi), for a period of 30 seconds (default) or more. Controller will continue to read just the higher of the 2 values. Action: Replace sensor with the lower reading.					
A41	Sec. Over Pressure	1	✓	-	✓ (or not)	-
	Detail: Pressure at PS2 has increased above the set default value of 6 bar (87 psi). Alarm may be set for Alarm Only (default), or Alarm + Unit Shutdown. Action: Most likely causes excessive heat build up in the system, or a breach between primary and secondary circuits within the plate heat exchanger. Check for high temperature alarms, check bladder in expansion vessels has not ruptured, relieve pressure at drain point. Remove heat exchanger and replace.					

Table 4.37 Alarms List (continued)

Code	Description	Type	Self-clear	Latching	Shutdown	Delay
A42	System Low Pressure	2	-	✓	-	✓
	<p>Detail: Pressure at PS1 has dropped more than 0.2 bar (3 psi) (set, non-adjustable) below fill pump activation threshold for more than 1 minute (set, non-adjustable, applicable when unit is running in automatic/online mode).</p> <p>Action: Check amount of fluid in makeup container and re-fill if necessary. Ensure fill pump hoses are free of air locks, container is properly connected and fill pump is operational. Check system for leaks.</p>					
A43	Insufficient Fluid	1	-	✓	✓	-
	<p>Detail:</p> <p>On Initial Startup: level sensors are not made, fill pressure has not been achieved and fill pump has been running for more than 1 minute, then unit will not start or shutdown immediately.</p> <p>While Unit is Running: This will be in conjunction with a A44 – Level Sensor – No Fluid Detected alarm (refer to A44 for detail). If level sensors are not made and flow or DP is < 50% of flow/DP setpoint, then unit will shutdown after a 1 second delay.</p> <p>Action: Check that water makeup container is properly connected (or filling wand is fully immersed, if used). Check system for leaks. Check there is no trapped air in fill pump hoses and system is fully vented. Check auto air vents are open.</p>					
A44	Level Sensor – No Fluid Detected	2	✓	-	-	-
	<p>Detail: While Unit is Running only: If both Level sensors are open circuit for more than 1 second then this alarm will be raised, providing flow or DP (depending on control function set) is >50% of flow/DP setpoint. If flow/DP is below this threshold, then A43 - Insufficient fluid alarm (refer to A43 for detail) will be raised and unit will shutdown after a 1 second delay.</p> <p>Action: Check that water make-up container is properly connected and filling wand is fully immersed, if used. Check system for leaks. Check there is no trapped air in fill pump hoses and system is fully vented. Check auto air vents are open.</p>					
A45	Illegal Fluid Sensor Condition	2	✓	-	-	-
	<p>Detail: On Initial Startup if fill pressure has been achieved, but level sensors are not made.</p> <p>Action: Likely cause is trapped air. Vent air from secondary circuit.</p>					
A46*	Group Control Network Fault	2	✓	-	-	-
	<p>Detail: Communications failure between XDUs on network.</p> <p>Action: Check wiring and terminations.</p>					
A47*	Group Control Insufficient Units Available	2	✓	-	-	-
	<p>Detail: Group control cannot bring a redundant unit on-line because it's either in a fault condition, has locally been put into standby mode, or has a communications failure.</p> <p>Action: Check status of redundant unit, check wiring and terminations.</p>					
A48*	Secondary Filter 1 Dirty	3	✓	-	-	-
	<p>Detail: Differential pressure across secondary filter 1 (if fitted) is greater than 0.2 bar (3 psi), indicating that the filter should be cleaned (default 60 second delay applies).</p> <p>Action: Clean filter screen as described in the Maintenance on page 71.</p>					

Table 4.37 Alarms List (continued)

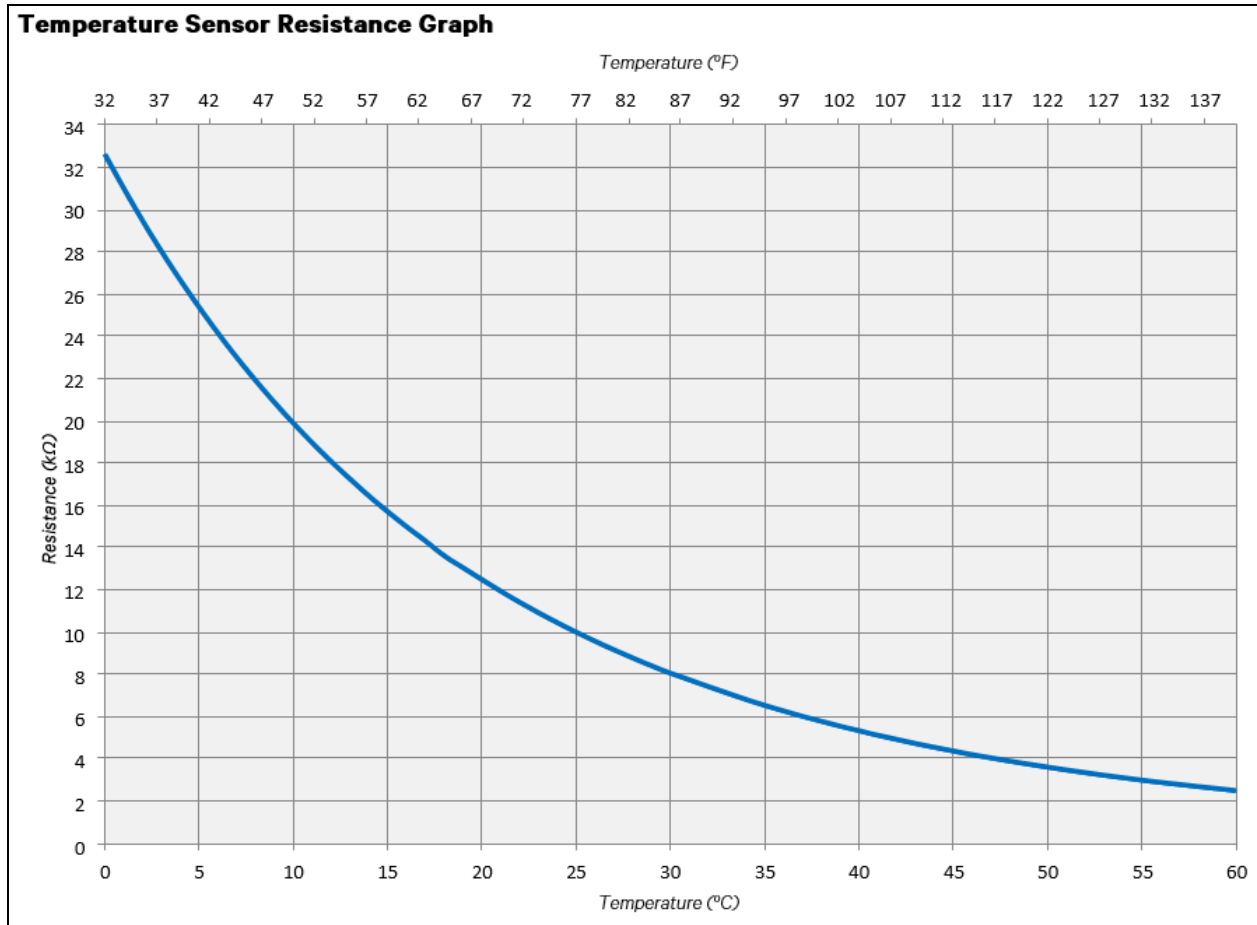
Code	Description	Type	Self-clear	Latching	Shutdown	Delay
A49*	Secondary Filter 2 Dirty	3	✓	-	-	-
	Detail: Differential pressure across secondary filter 2 (if fitted) is greater than 0.2 bar (3 psi), indicating that the filter should be cleaned (default 60 second delay applies). Action: Clean filter screen as described in the Maintenance on page 71.					
A50*	Secondary Filter 3 Dirty	3	✓	-	-	-
	Detail: Differential pressure across secondary filter 3 (if fitted) is greater than 0.2 bar (3 psi), indicating that the filter should be cleaned (default 60 second delay applies). Action: Clean filter screen as described in the Maintenance on page 71.					
A51	Secondary Temp T2a Diff Fault	3	✓	-	-	-
	Detail: Difference between secondary temp. sensor T2a is more than default 1 °C (2 °F) adrift from T2b and T2c, for a period of 30 seconds (default) or more. Controller will read the average of T2b and T2c only. Action: Check T2a sensors against temperature sensor resistance chart in Temperature Sensor Graph on page 62 and replace if faulty.					
A52	Secondary Temp T2b Diff Fault	3	✓	-	-	-
	Detail: Difference between secondary temp. sensor T2b is more than default 1 °C (2 °F) adrift from T2a and T2c, for a period of 30 seconds (default) or more. Controller will read the average of T2a and T2c only. Action: Check T2b sensors against temperature sensor resistance chart in Temperature Sensor Graph on page 1 and replace if faulty.					
A53	Secondary Temp T2c Diff Fault	3	✓	-	-	-
	Detail: Difference between secondary temp. sensor T2c is more than default 1 °C (2 °F) adrift from T2a and T2b, for a period of 30 seconds (default) or more. Controller will read the average of T2a and T2c only. Action: Check T2c sensors against temperature sensor resistance chart in Temperature Sensor Graph on page 1 and replace if faulty.					
A54*	Reservoir Tank Fluid Required	3	✓	-	-	-
	Detail: Fluid level in the reservoir tank has dropped to the low level sensor. Action: Use external fluid source, engage filling wand and pump P5 to refill the reservoir tank.					
A55*	Reservoir Tank Empty	2	✓	-	-	-
	Detail: Fluid level in the reservoir tank has dropped to the very low level sensor and unit fill pump P4 operation is inhibited. Action: Use external fluid source, engage filling wand and fill pump P5 to refill the reservoir tank.					
A56	Below Dewpoint	2	✓	-	-	-
	Detail: Fluid supply temperature is below ambient dewpoint. Action: Check for condensation and adjust setpoints accordingly.					

Table 4.37 Alarms List (continued)

Code	Description	Type	Self-clear	Latching	Shutdown	Delay
A57*	Auxiliary IO Module Communications Fault	3	✓	-	-	-
	Detail: Controller unable to communicate with auxiliary IO module. Action: Check wiring and terminations.					
A58*	Turbidity Sensor Fault	3	✓	-	-	-
	Detail: Turbidity sensor output is below 4mA. Action: Check sensor connections to the IO module, check inline connections, replace sensor.					
A59*	PH Sensor Fault	3	✓	-	-	-
	Detail: PH sensor output is below 4mA. Action: Check sensor connections to the IO module, check inline connections, replace sensor.					
A60*	Conductivity Sensor Fault	3	✓	-	-	-
	Detail: Conductivity sensor output is below 4mA. Action: Check sensor connections to the IO module, check inline connections, replace sensor.					
A62*	PH Sensor Out of limits	3	✓	-	-	-
	Detail: PH sensor output is below or above configured limits. Action: Check fluid quality.					
A63*	Conductivity Out of limits	3	✓	-	-	-
	Detail: Conductivity sensor output is below or above configured limits. Action: Check fluid quality.					

4.7 Temperature Sensor Graph

Figure 4.21 Temperature Sensor Resistance



This chart may be used to check the validity of the 10 K thermistor temperature sensors used in the unit.

4.8 Manual Operation of Cooling Valve



WARNING! Risk of electric shock. Can cause equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. 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.

If the control valve actuator should fail completely, the secondary supply temperature can be controlled by manually overriding the valve actuator as detailed below.

NOTE: The valve actuator should first be disconnected from the control panel. Unplug the 4-way connector, terminals 9 to 12, from socket SK8. This ensures the actuator maintains its manually set position.

Figure 4.22 Manual Operation of Cooling Valve



Item	Description
1	Internal gear release for manual control
2	Less cooling
3	More cooling

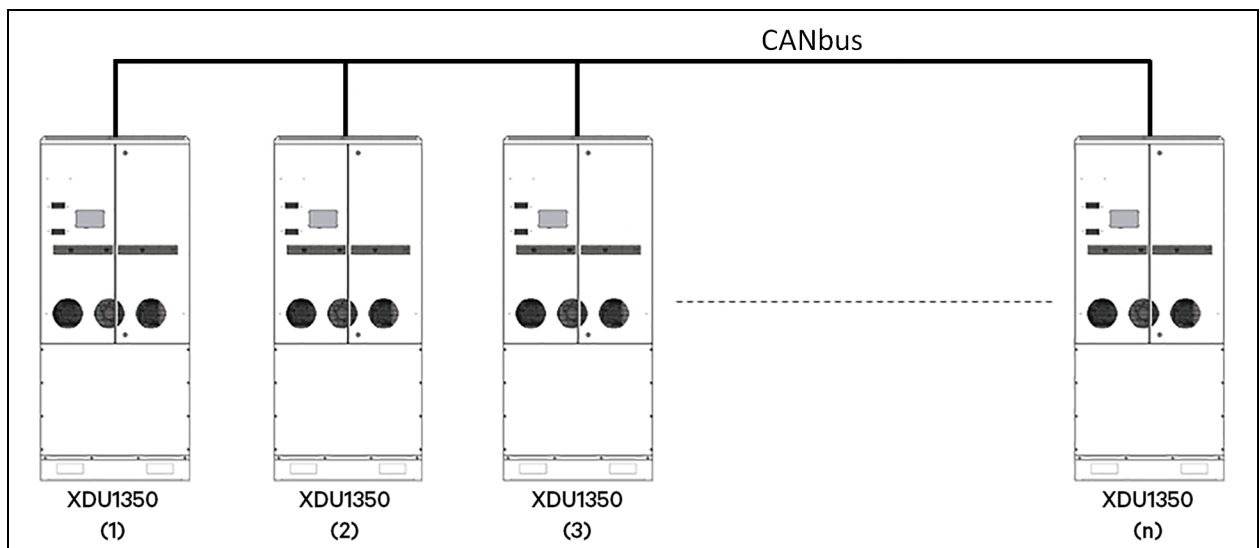
Press the internal gear release button down and move the valve handle to the desired position. This will allow the Vertiv™ XDU1350 unit to continue running and providing cooling until the valve actuator can be replaced.

4.9 Group Control

This section to be considered only if there is more than one Vertiv™ XDU1350 units installed per system.

Groups of up to 8 XDU1350s can be connected using a high speed, robust twisted pair CANbus network in order to provide coordinated control in larger installation and N+X redundancy.

Figure 4.23 Group Control



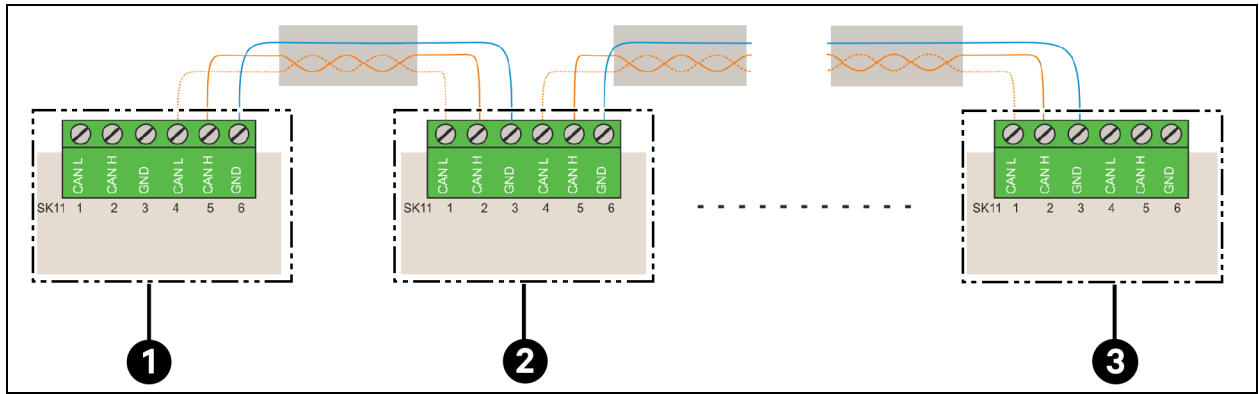
4.9.1 Group Control—Network Cabling

CANbus is used for communication between XDU1350 units for group control. CANbus always requires at least 3 conductors: 2 signal wires (CAN Hand CAN L) and a 1 signal return path (GND).

The XDU1350 provides 2 CAN H, 2 CAN L and 2 GND terminals on sockets SK9, 1, 2 and 3 for In and terminals 4, 5 and 6 for Out.

Beldon 3106A, or equivalent (1 pair+1, shielded 22AWG) is the recommended cable type to be used and pre configured cable assemblies are provided with each unit if required.

Figure 4.24 Group Control Wiring Configuration



Item	Description
1	XDU1350 (#1)
2	XDU1350 (#1)
3	XDU1350 (#n)

Units become self organizing when in group control. The lead 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 the group settings or system settings can be made via any Vertiv™ XDU1350 touchscreen user interface at any time and are automatically synced across the network.

Figure 4.25 Group Control Status Screen

Group Control Status									
CDU	Mode	DP bar	Flow Rate l/m	Pump Speed %		Temp T2 °C	Cooling Demand %	Alarm	Lead
				P1	P2				
1	Online (Running)	1.89	230	55	0	18.2	67	0	1
2	Online (Running)	1.92	235	0	55	18.1	73	0	0
3	Online (Running)	1.97	210	55	0	18.0	59	0	0
4	Group Standby	1.76	0	0	0	18.8	0	0	0
5	Shutdown	1.23	0	0	0	19.2	0	1	0
6	Not In Group	0	0	0	0	0	0	0	0
7	Not In Group	0	0	0	0	0	0	0	0
8	Not In Group	0	0	0	0	0	0	0	0

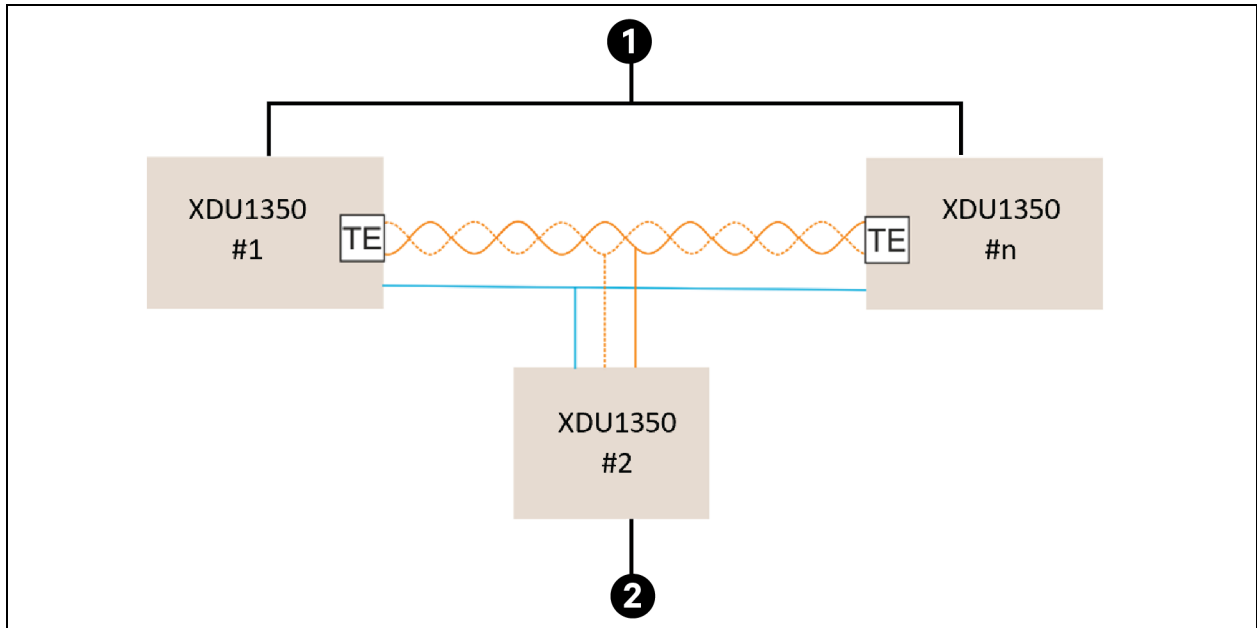
Average System DP	1.93 bar	Total System Flow Rate	675 l/m
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4.9.2 Group Control—Network Termination Resistors

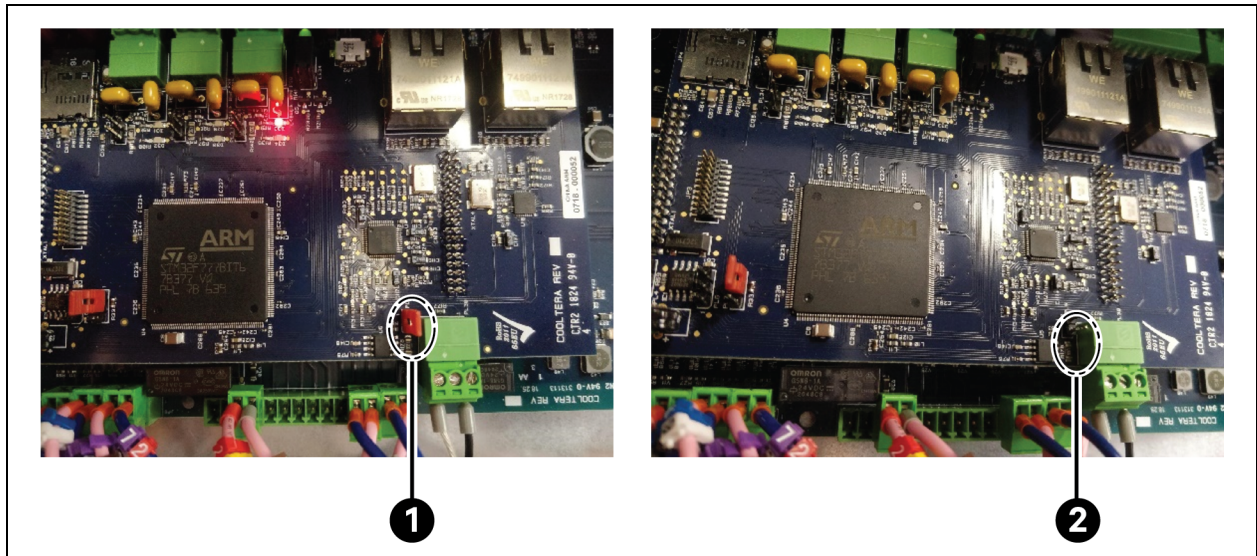
The XDU1350 controller includes an onboard 120 ohm resistor which can be activated by fitting a hardware jumper. If only one XDU1350 unit is installed, the resistor does not require activation. For a 2x unit installation, both units should have the termination resistors enabled. For 3x units and above, units 1 and n should have the termination resistors enabled, while units between should be disabled. Failure to disable the middle resistors could result in intermittent communications. See **Figure 4.26** on the next page and **Figure 4.27** on the next page for the location of the jumper to enable/disable the termination resistor (the jumper is fitted by default and must be removed if not required).

Figure 4.26 CANbus Network Termination Resistors Wiring



Item	Description
1	Units with termination enabled
2	Units with termination disabled

Figure 4.27 CANbus Network Termination Resistors



Item	Description
1	Jumper fitted. Termination resistor activated.
2	Jumper not fitted. Termination resistor not activated.

4.9.3 Group Control—Network Addresses

Each Vertiv™ XDU1350 must be given a unique address. A XDU1350 network address should be allocated to each unit in ascending order, starting from 1.

The XDU1350 network address is configured via Setup screen > Group Control > Unit Address (P081). Configure each XDU1350 so that it is aware of the other XDU1350 devices on the network:

- Enter the total number of XDU1350 units in the networked system via Setup screen > Group Control > Number of Units in Group (P082)
- Enter the number of run units via Setup screen > Group Control > Number of Run Units (P083)

4.9.4 Group Control—Start Sequence from Power Up

1. Power is available when the controller is active.
2. POST (power on system test) and Firmware initializes in less than 1 second—CANbus network activity and RS485 communications with inverters will be established within the 1 second period.
3. When the controller is initialized, it looks for messages from the other Vertiv™ XDU1350s in the Group. Messages from XDUs are transmitted asynchronously every 100 milliseconds, so within 200 milliseconds messages will have been exchanged and the group demand shared.
4. When the group demand is shared, the inverters will be driven to the group demand instantly via RS485 Modbus RTU communication from the controller.
5. The inverters are programmed with a 2 seconds ramp up period (2 seconds to 100%), so if the group demand is typically at 65% to 75%, ramp up will take 1.5 seconds. This ramp up period is designed to prevent a secondary discharge pressure over shoot on XDU1350 (or pump) re start. It is also configurable via the F002 Acceleration Time parameter on the inverter.
6. Total startup time in Group Control mode is 1 second + 200 milliseconds + 1.5 seconds = 2.7 seconds to the required pump speed, pressure, and flow rate.

4.9.5 Group Control—Controls

When in group control, the lead XDU1350 modulates its pump speed to maintain a differential pressure setpoint. The differential pressure setpoint default is an average over all the individual running XDU1350 differential pressure readings. This can be changed to the differential pressure over all XDU1350s in the group in Seh1p/Group Control/P094 regardless if they are running. All XDU1350 units work in parallel and set their pump speeds to be identical with that of the lead XDU1350.

Each XDU1350 modulates its own primary (facility) fluid control valve to maintain a group wide IT supply fluid temperature setpoint. Each XDU1350 also locally regulates temperature using the average of its individual temperature sensors.

4.9.6 Group Control—Unit Rotation and Standby Units

Unit rotation can be configured to be weekly, monthly, or never in the Setup screen under Group Control. Upon rotation, one of the standby units is switched on and one of the duty units is switched off. For example, if units 1, 2, 3, and 4 are running and 5 and 6 are off, after rotation units 2, 3, 4, and 5 will run while 1 and 6 off.

In the event that the load exceeds the capacity of the running units and there are standby units, the standby units will not kick in automatically. The configured number of duty units is selected based the max load. If this max load increases, then additional load has been added and the operator should increase the configured number of duty units.

4.9.7 Group Control—Failover Offset

Failure mode enables standby XDU pumps to start in 75 ms and a 2 seconds ramp up when a XDU1350 in the group is taken offline. This is to seamlessly maintain system differential pressure if a unit is lost without over/undershoots.

The failure offset is applicable only when a group of 3 or more XDU1350 units are configured in N (that is all XDU1350s set to run, with no XDU1350 redundancy) and they are configured to spin up the standby pump when an XDU1350 failure/power off occurs. The pump reduction (or failure) offset is applied to the system pump speed when there is a XDU1350 failure (that is shutdown) or the unit is switched off. Spinning up the standby pumps in the running XDU1350s will result in more pumps running than when all CDUs are healthy and operational. To avoid spikes in differential pressure, P217 failure pump speed offset is applied to the system pump speed at the time of the CDU failure. P217 should be determined at commissioning.

4.9.8 Group Control—Failure Modes

When there is communication failure between units, a new lead XDU1350 will be established for each new grouping of units. When communication is re-established, the original lead XDU1350 will take control. See **Figure 4.28** below. If only the lead XDU1350 loses communication, the next XDU1350 will take over the lead role. When the previous lead XDU1350s communication is re-established, it will not take over the lead role again. See **Figure 4.29** on the facing page.

Figure 4.28 General Communication Failure

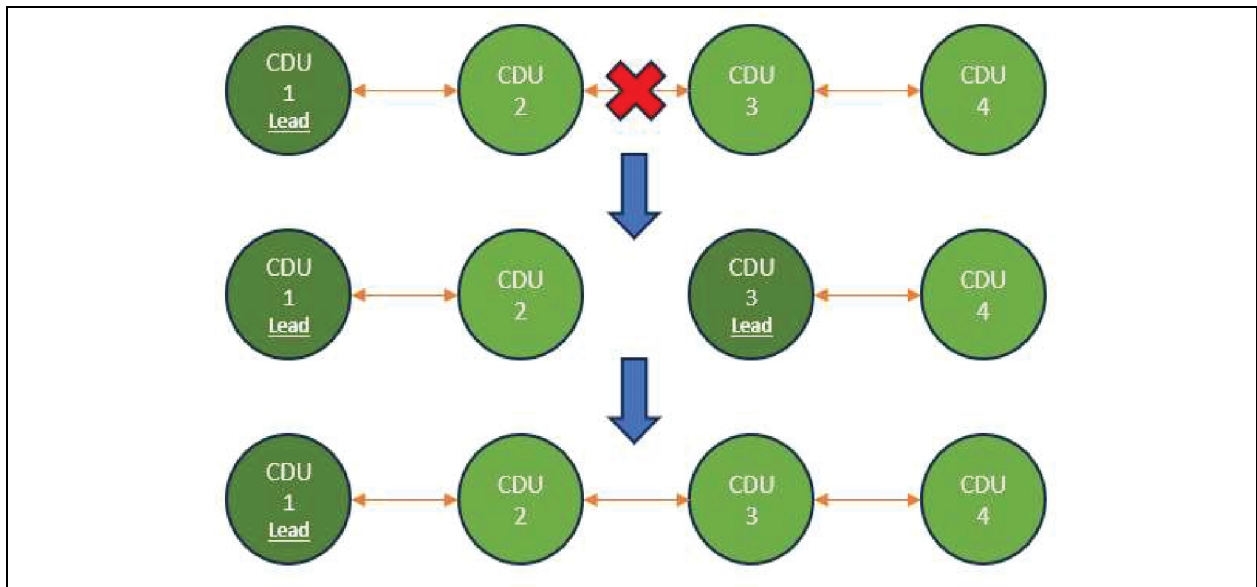
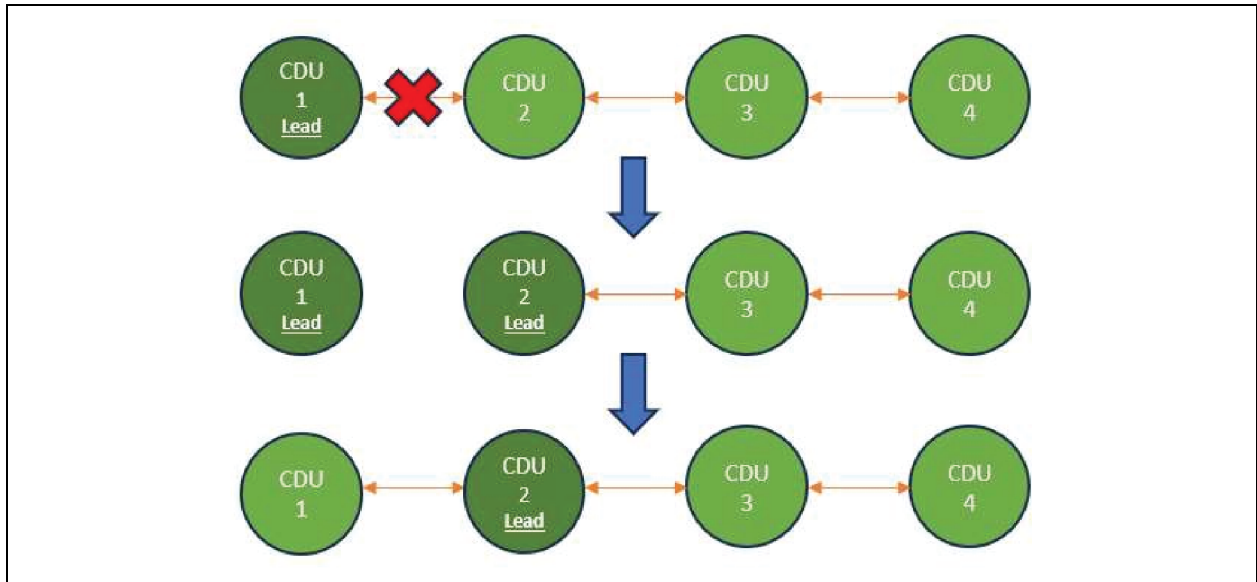


Figure 4.29 Lead Communication Failure



In the event of a sensor failure, all sensors related to control (PS1, PS2 and T2) are redundant at the Vertiv™ XDU1350 level, so a single sensor failure will not impact the operation or the status of the XDU1350. So, if the lead XDU1350 does have a sensor failure it will not result in a change of lead.

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5 Maintenance

5.1 General



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 equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. 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, and activation of fire suppression systems and EMS personnel. 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 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 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.

The Vertiv™ XDU1350 should be cleaned on a regular basis and checked for leaks and malfunctions. Maintenance should only be carried out by personnel qualified to work on this type of equipment. For information on Maintenance or Service Support, contact Vertiv. See [Technical Support and Contacts](#) on page 81.

5.2 Fluid Specifications



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 water/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/coolant leakage from the unit. Water/coolant fluid can result in fluid leakage, 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 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 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.

Primary Circuit

The Vertiv™ XDU1350 is designed for use with a facility supply of plain water or up to 20% glycol/water. A 20% glycol concentration will give protection to approximately -9 °C (16 °F). 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).

Secondary Circuit

The secondary circuit should be filled with particulate free deionized water or glycol treated with suitable corrosion inhibitors and biocides.

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

5.3 Planned Preventative Maintenance

Planned maintenance services should be carried out in 3 months, 6 months, and 12 months in the first year after the commissioning. After then, the planned maintenance service will be twice every year, with interval of 6 months.

Planned maintenance service every 3 months

- Check Vertiv™ XDU1350 valve operation, with necessary parameter adjustment.
- Check valve command and feedback.
- Check for any current alarms, correct and clear.
- Download historic alarm and event logs (refer to manufacturer for instructions).
- Record and clear any inverter error code and historic data.
- Check T2a, T2b, and T2c difference less than 0.3 °C (0.5 °F).
- Check all temperature sensors with calibrated temperature sensor.
- Check all temperature and pressure sensors are securely fixed with no leakage.
- Check primary pipework is securely connected with no leakage.
- Check primary pipework thermal insulation (if fitted).
- Check the maximum flow rate of primary circuit, and adjust if necessary.
- Check the primary supply temperature.
- Check the primary pressure.
- Check fuses.
- Check contactors for pitting (replace if pitted).
- Check/Retighten wire connections.
- Pump - Compare to nameplate amps L1, L2, L3.
- Check secondary (pipework) is securely connected with no leakage.
- Check the normal secondary flow rate.
- Check the opening of XDU1350 auto air vent.
- Check the expansion vessels and the air vent.
- Test the supplementary filling with override operation (check makeup bag or stainless steel is full, properly connected and purged of air).
- Check the sync date and time of the units in parallel or in redundancy.
- Check firmware status and upgrade if necessary.
- Take water sample and have tested for correct levels of inhibitors and biocides.
- Check secondary fluid monitoring package sensors and values (optional)

Planned maintenance service every 6 months (in addition to 3 month maintenance)

- Simulate the pump change over.
- Simulate the Vertiv™ XDU1350 switch off, using backup XDU1350 or parallel operation to meet the performance requirement.
- Check the leakage detection.
- Check remote communication functions correctly if applied.

Planned maintenance service every 12 months (in addition to 3 and 6 months maintenance)

- Check drain valves.
- Check all the cable connections and terminals.
- Check the rack heat load and the secondary flow rate setting.
- Override primary valve from 0% to 100%.
- Override pump inverters from 0% to 100%.
- Visual and audio check the pump bearings running.
- Record current of pump.
- Record pump run times.
- Record valve run times.

Planned maintenance service every 24 months

- Drain the fluid and re-commission the secondary circuit, if necessary. Only replace with DEI fluid that has the correct treatment additives. See the [Fluid Specifications](#) on page 72.
- Change the secondary filter screen (if fitted), if necessary.

5.4 Secondary Filter Service (if fitted)

Providing the electrical panel transit screws were removed during installation (see the **Vertiv™ XDU1350 Installation and Commissioning Guide SL-71308**), the electrical panel can be easily hinged upwards to a horizontal position to give unimpeded access to the secondary filters. This can be done while the Vertiv™ XDU1350 remains operational.

Figure 5.1 Access to Secondary Filters with Electrical Panel in Horizontal Position

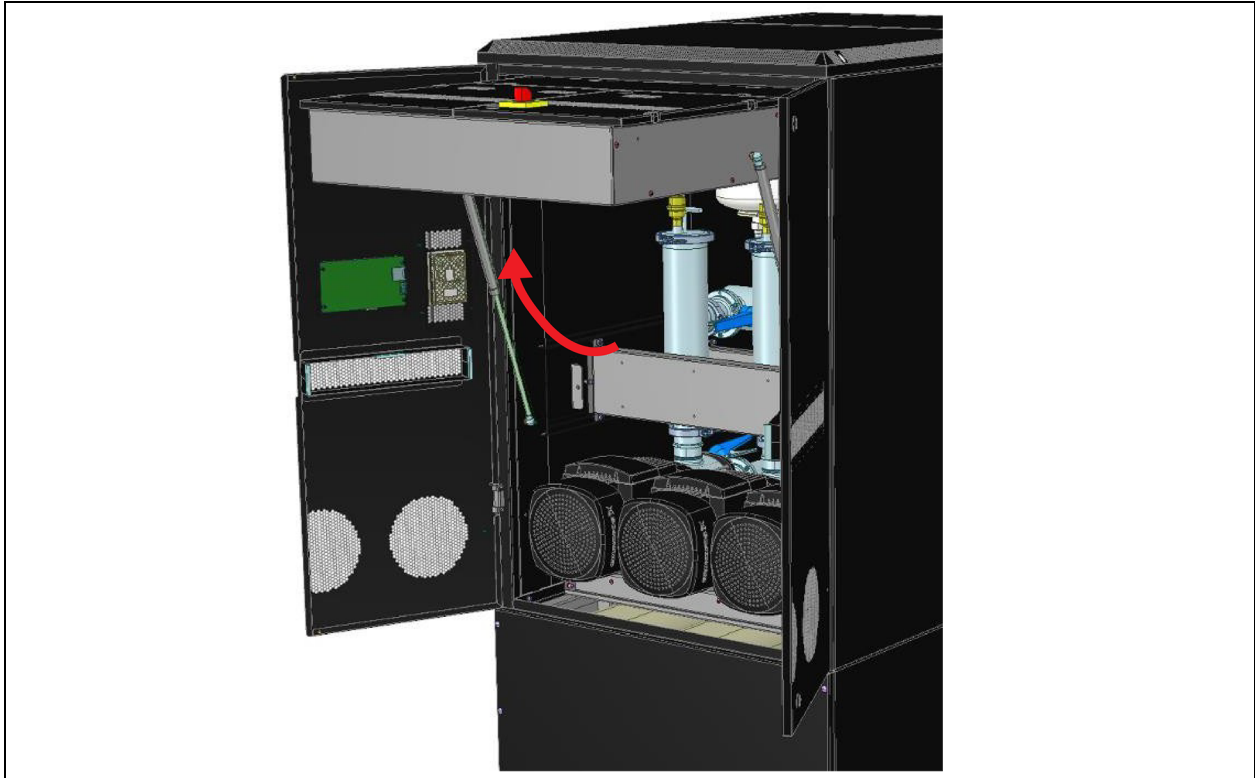
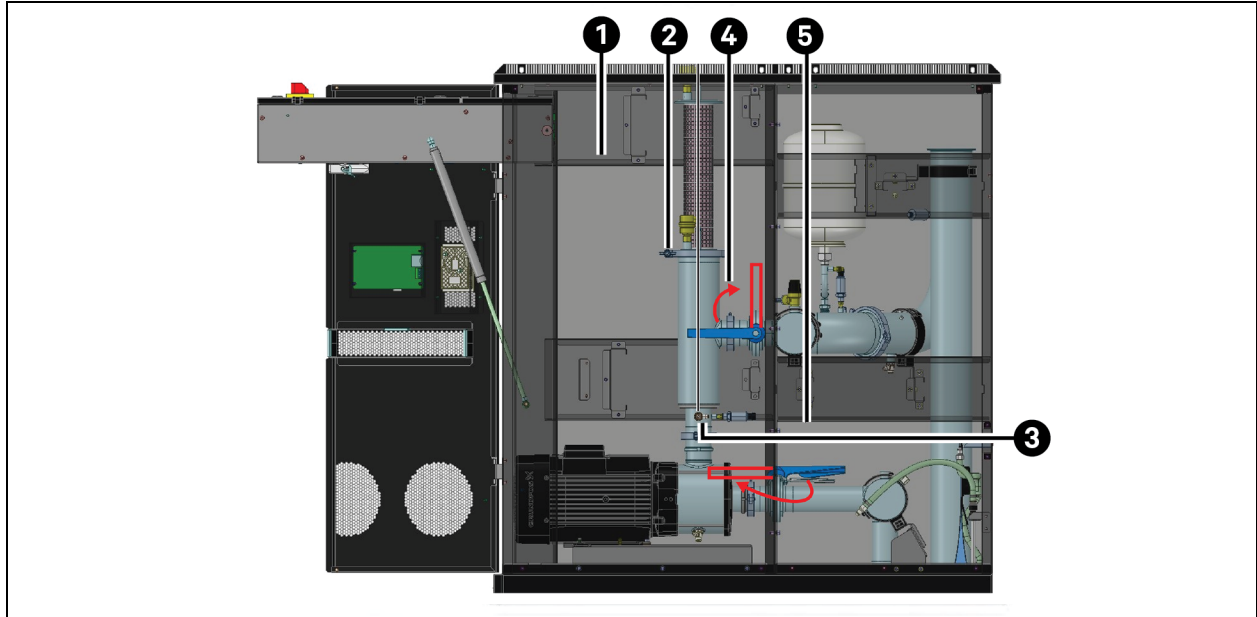


Figure 5.2 Servicing Secondary Filter



Item	Description
1	Withdraw filter from housing
2	Filter clamp ring
3	Connect hose to drain valve
4	Filter isolation valve
5	Filter isolation valve

NOTE: Each filter can be cleaned while the unit is running provided the operation is switched to the pumps/filters not to be cleaned. Place the pump for the filter to be cleaned into out-of-service state via the service secondary pumps menu.

The secondary filter may be removed and cleaned following the procedure below:

1. Open the cabinet front doors, and swing the electrical panel up and out of the way as shown in **Figure 5.1** on the previous page.
2. Close filter isolation valves 4 and 5 to positions shown by red handle outlines, as shown in **Figure 5.2** above (i.e. handles are vertical/horizontal).
3. Connect hose to drain valve 3.
4. Once drained, undo the clamp ring then withdraw the cap and filter screen using the Tee handle provided. Lift filter screen up and out of the filter housing, then out through the front of the unit.
5. The filter screen may now be washed under a running tap however, if possible, a high-pressure water jet is preferable for more effective cleaning.

Replacement is the reverse of above procedure, taking care to first check there is no damage to the sealing gasket and to ensure good gasket alignment before tightening the clamp ring. Ensure the water make up container is full, with additional water available to fill the filter housing. When opening the valves, open valve 5 initially until all the contained air is purged out of the filter housing through the automatic air vent. Then open valve 4. When valve 5 is opened, the loss of system pressure should automatically start the fill pump to fill the filter housing and bring the system back to the operating pressure.

5.5 Unit Draining

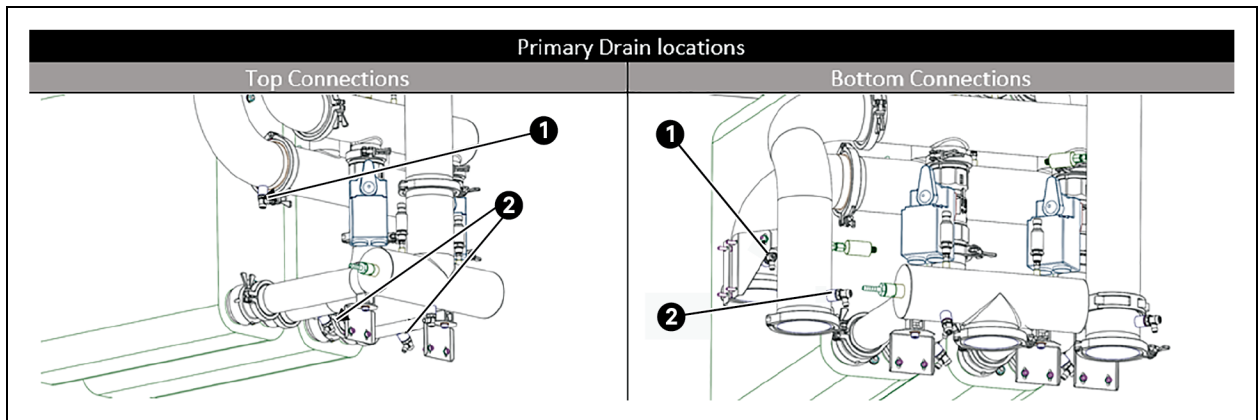
Drain valves are provided throughout the Vertiv™ XDU1350 to permit the removal of system fluid for filter change and other service work. Field supplied external isolation valves should be fitted by the installer to both supply and return pipes, as close as possible to the XDU1350 for maintenance purposes.

Figure 5.3 Drain Valve



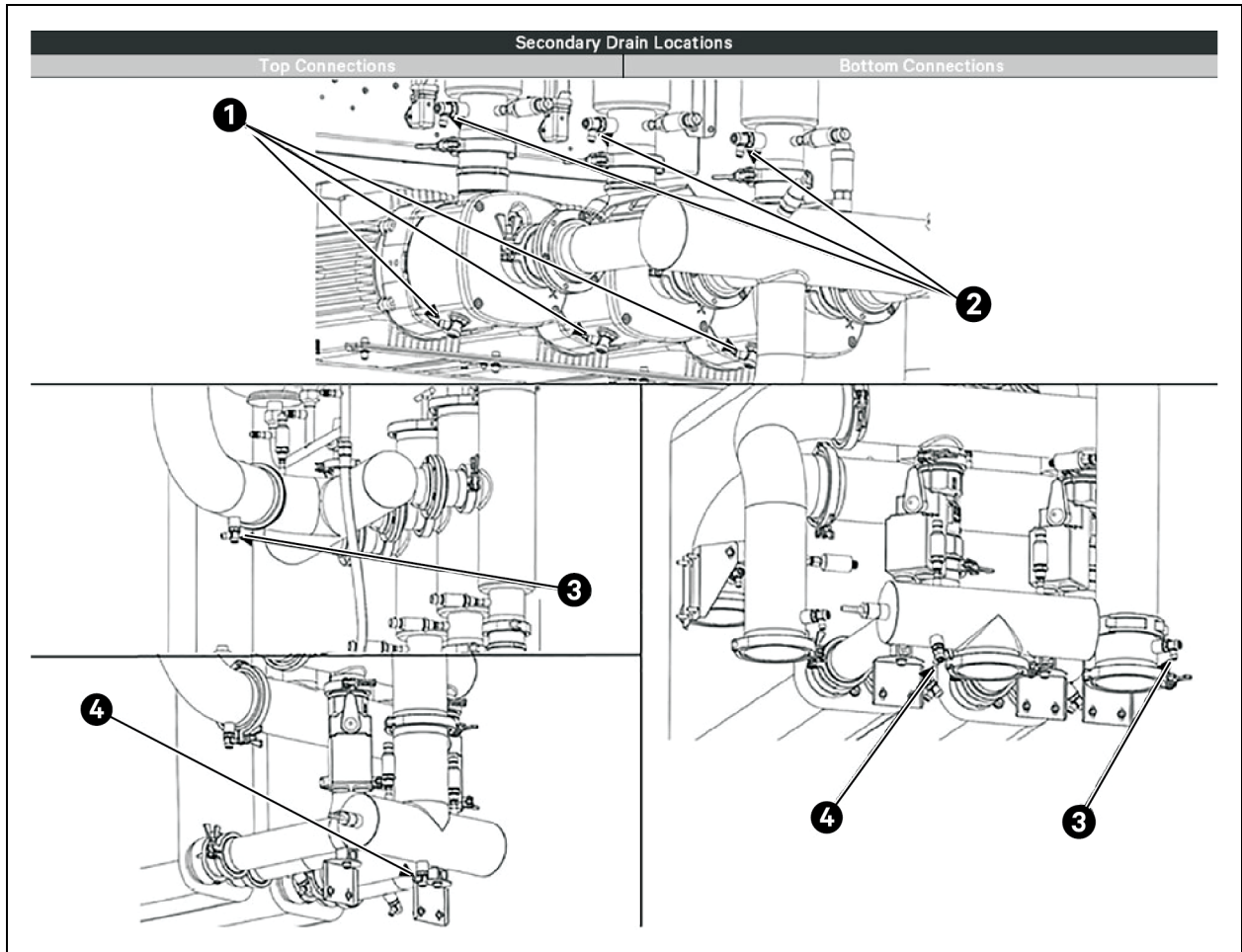
Item	Description
1	Use 3/8" ID hose for draining.

Figure 5.4 Primary Drain Valve Locations



Item	Description
1	Supply tail pipe (top or bottom exit)
2	Return tail pipe (top or bottom exit)

Figure 5.5 Secondary Drain Valve Locations



Item	Description
1	Pump base
2	Pump discharge
3	Supply tail pipe (top or bottom exit)
4	Return tail pipe (top or bottom exit)

5.6 Spare Parts

It is recommended that the end user holds a kit of essential spare parts to enable the Vertiv™ XDU1350 to be kept running with the minimum of down time. Any parts replaced during maintenance or servicing must be the same specification as those being replaced and should only be obtained from Vertiv. Please contact your local Vertiv representative for Vertiv engineered parts, check <https://www.Vertiv.com/en-us/support/> or call 1-800-543-2778.

The use of incorrect replacement parts may affect the operation or reliability of the unit and invalidate any warranty.

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, USA

Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road, Wanchai

Hong Kong

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Appendix B: Pipe Schematic Vertiv™ XDU1350

Figure B.1 Pipe Schematic with Flexible Makeup Container

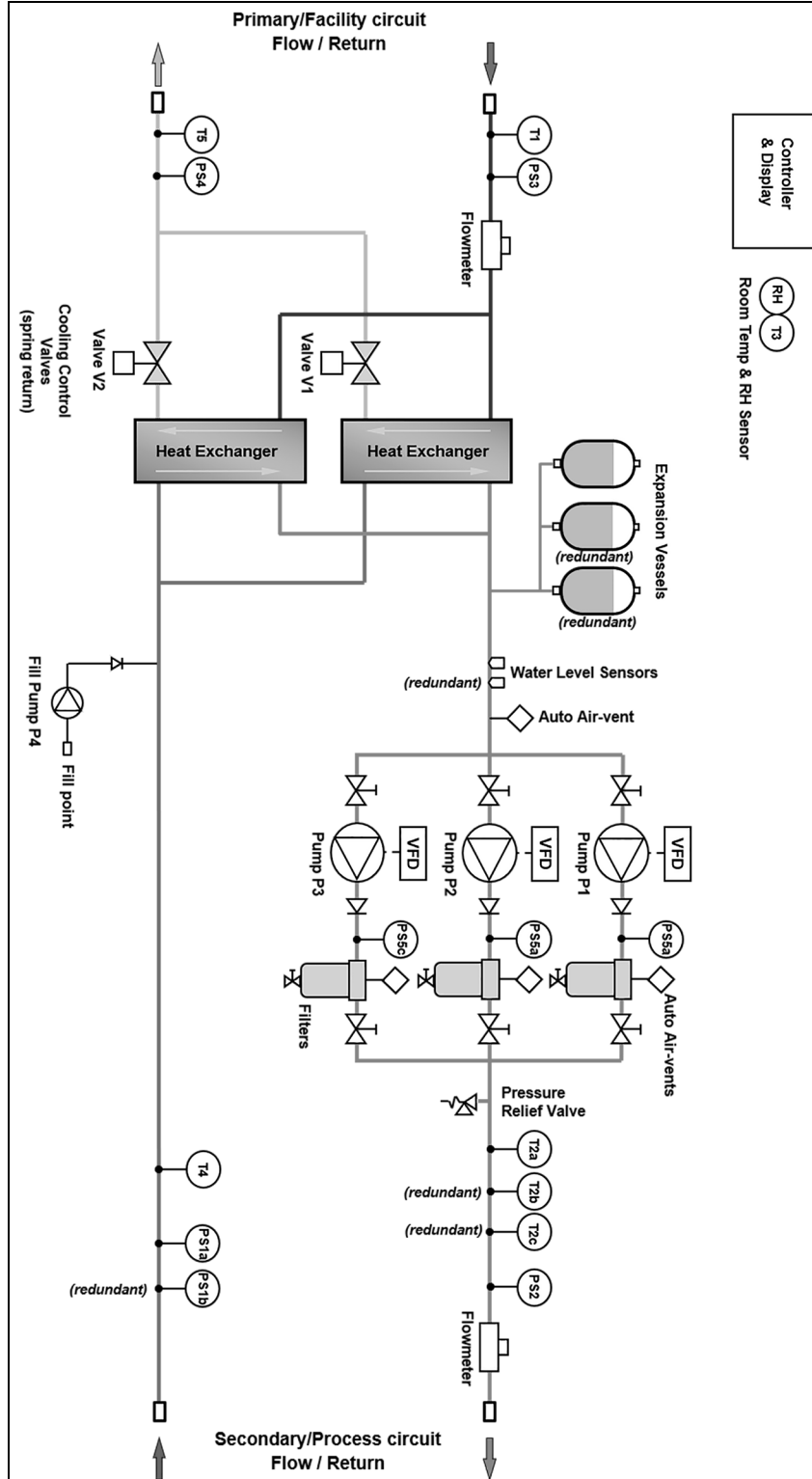
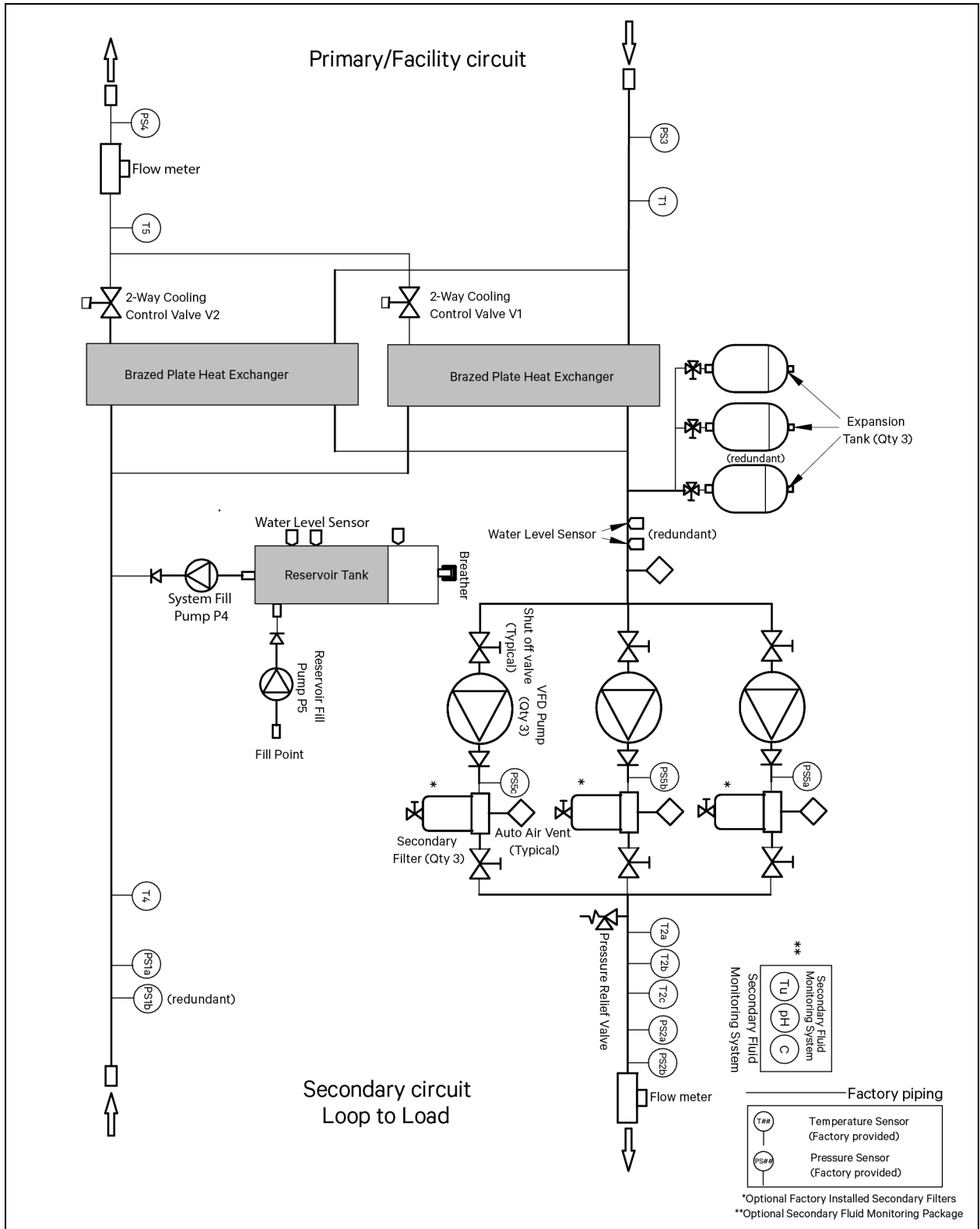


Figure B.2 Pipe Schematic with Stainless Steel Reservoir Tank



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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