# Vertiv™ CoolChip CDU2300

## Installation, Commissioning and Maintenance Guide

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

Vertiv recommends installing a monitored fluid detection system that is wired to activate the automatic closure of field-installed coolant fluid supply and return shut off valves, where applicable, to reduce the amount of coolant fluid leakage and consequential equipment and building damage. Refer to local regulations and building codes relating to the application, installation, and operation of this product. The consulting engineer, installer, and/or end user is responsible for compliance with all applicable laws and regulations relation to the application, installation, and operation of this product.

The products covered by this instruction manual are manufactured and/or sold by Vertiv. This document is the property of Vertiv and contains confidential and proprietary information owned by Vertiv. Any copying, use, or disclosure of it without the written permission of Vertiv is strictly prohibited.

Names of companies and products are trademarks or registered trademarks of the respective companies. Any questions regarding usage of trademark names should be directed to the original manufacturer.

### 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

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# 1 Important Safety Information

### SAVE THESE INSTRUCTIONS

This manual contains important instructions that should be followed during operation and maintenance of the Vertiv™ CoolChip CDU2300 unit.

**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 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. Lift the unit only at the designated lifting points provided on the base.**

**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 Table 4.1 on page 15.**

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

**WARNING! Always check for water, waste, or any liquid accumulation on the floor or beneath the unit before and after operation or maintenance. These substances can create slip hazards and may damage the equipment. Ensure the area is clean, dry, and free of obstructions to maintain a safe working environment.**

**CAUTION: Risk of contact with extremely hot or cold surfaces. Can cause injury. Verify that all components have reached a temperature that is safe for human contact or wear appropriate, OSHA-approved PPE before working with the electric connection enclosures or unit cabinet. Perform maintenance only when the system is de-energized and component temperatures have become safe for human contact.**

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

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

**CAUTION: Risk of improper piping installation, leak checking, fluid chemistry and fluid maintenance can cause injury. Building and equipment damage may also result. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.**

**NOTICE**

Risk of improper power supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. Also, ensure that no three-phase sources are single-phased at any time.

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

**NOTICE**

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

**NOTICE**

This equipment is required to be installed only in locations not accessible to the general public. Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers specifications.

**NOTICE**

This unit must be installed and operated at an altitude not exceeding 2000 m.

**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 corrosion. Refer to Technical Data on page 15 for details concerning storage conditions. Automotive antifreeze is unacceptable and must NOT be used in any fluid system. Use only coolant fluid solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

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

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

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

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

Consult fluid manufacturer for testing and maintenance of inhibitors.

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

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

**NOTICE**

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

**NOTICE**

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

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

**NOTICE**

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

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

**NOTICE**

Risk of passageway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a passageway while on or off the skid. Measure the unit and passageway dimensions, and refer to the installation plans prior to moving the unit to verify clearances.

**NOTICE**

Risk of damage from forklift. Can cause unit damage. Keep tines of the forklift level and at a height suitable to fit below the skid and/or unit to prevent exterior and/or underside damage.

**NOTICE**

Risk of improper water supply. Can reduce humidifier efficiency or obstruct humidifier plumbing.

Do not use a hot water source. It will cause deposits that will eventually block the fill valve opening.

**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.

**NOTICE**

Performing any work on the upper section of the unit requires the use of a suitable ladder or platform to ensure safe and stable access. Always use equipment that complies with local safety regulations and ensure that proper fall prevention measures are in place. Never attempt to reach or perform tasks at height without the appropriate support.

## 1.1 General

Mechanical and electrical equipment such as coolant distribution units (CDUs) present potential mechanical and electrical hazards. Adhere to all safety, installation, operation, and maintenance instructions. Any work on or use of the equipment should be carried out and/or supervised by personnel trained and qualified to work on this type of equipment by Vertiv. This product is designed to minimize all potential hazards by restricting access through unit casings, doors and covers while equipment is operational. Before performing any maintenance work, ensure the following:

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

If in doubt regarding safety, installation, operation or maintenance instructions, consult the manufacturer 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. Lift the unit only at the designated lifting points provided on the base. Shipping weights and unit weights are listed in the Table 4.1 on page 15.**

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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 for indoor use only and must be used only for the application it was designed for in consultation with Vertiv. This product must not be used in a hazardous environment.

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

## 1.4 Warranty

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

## 1.5 Electrical Connection

**WARNING! This unit is powered by high voltage. Serious injury or death can occur. Power supplied to this product must be provided with an external means of isolation.**

**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.**

**NOTICE**

Risk of improper power supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. 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.

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

## 1.6 Replacement Parts

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

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

## 1.7 Waste Disposal

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

## 1.8 Documentation

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

# 2 Agency

## 2.1 Product Standards and Approvals

Vertiv products, when installed and operated in accordance with this document, the Operation and Maintenance Guide, and the Installation and Commissioning Guide, comply with the Machinery directive 2014/35/EU, Low Voltage Directive 2014/35/EU, and EMC Directive 2014/30/EU for CE. Additionally, this product is cCSAus listed for the appropriate voltage models, with certification under UL 60335-1, 6th ed., UL 60335-2-40, 4th Ed., and CAN/CSA C22.2 No. 60335-1:16, 2nd Ed., CAN/CSA C22.2 No.60335-2-40:22, 4th Ed. Certificates are available upon request (Pending certification).

As manufacturer, Vertiv products are designed to comply with an IP21 rating.

## 2.2 REACH and RoHS Compliance

Vertiv certifies that all products manufactured and supplied by Vertiv are fully REACH and RoHS compliant in accordance with EN IEC 63000 and the directive 2011/65/EU revised directive (EU) 2015/863 and (EC) 1907/2006.

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# 3 Product Description

Please refer to the following submittals located in Submittal Drawings on page 61.

**Table 3.1 Submittals**

| Submittal Number | Title |
|---|---|
| 20000262 | Vertiv™ CoolChip CDU2300 Component Location Diagram |
| 20000263 | Vertiv™ CoolChip CDU2300 Cabinet Dimensional Data |
| 20000266 | Vertiv™ CoolChip CDU2300 Piping Schematic |

## 3.1 General

This document describes the performance, possible configurations, application, and specification of the Vertiv™ CoolChip CDU2300.

The Vertiv CoolChip CDU2300 contains a secondary closed loop circuit that provides a supply of cooling fluid to equipment based on differential pressure, either through indirect cooling (rack mounted rear door heat exchangers) or direct cooling (cold plates at chip level).

The secondary circuit is a low pressure sealed system that removes heat from the downstream equipment and rejects to an external cooled water source (primary circuit) via low pressure drop plate heat exchangers. The secondary circuit ensures that the cooling fluid in the secondary network can be kept to a minimum volume, is closely controlled for flow, pressure, and temperature (with condensation control) and can be accurately maintained for fluid quality (with filtration and additives).

The primary cooling source can be a chilled water system (either dedicated or from building system), fluid cooler, cooling tower or dry air cooler, depending on the desired secondary temperature and heat transfer duty. Refer to the Vertiv™ CoolChip CDU2300 Application and Planning Guide SL-80094. For more information, contact a Vertiv Sales Representative.

## 3.2 Model Number Nomenclature

The Vertiv™ CoolChip CDU2300 can be configured for voltage options to suit most global locations, secondary filtration, primary top/bottom connections and secondary top/bottom connections. Table 3.2 below is an example of the Vertiv CoolChip CDU2300 model number, fully configured. Table 3.3 below describes each digit of the model number.

**Table 3.2 Standard Model Number**

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

**Table 3.3 Model Number Definitions**

| Digit | Feature | Value | Description |
|---|---|---|---|
| 1, 2, 3 | Product family name | XDU | Product family |
| 4, 5, 6, 7 | Unit model | 2300 | Model |
| 8 | Revision | A | Product revision |
| 9 | Power supply | A | 480 V - 3 PH - 60 Hz |
| | | Q | 400 V - 3 PH - 50/60 Hz |
| 10 | ATS | 0 | No |
| | | 1 | Dual power alternate |
| 11 | Controller | A | Standard controller |
| 12 | Communication protocol | 1 | Modbus, SNMPv2/3, HTTPs, SSH, SFTP, BACnet, NTP. |
| 13 | Display | 7 | 7 in. display |
| 14 | Fluid monitoring | 0 | None |
| | | A | Turbidity sensor, pH sensor, Conductivity. |
| 15 | Pump configuration | 2 | 2 Pumps |
| 16 | Electrical performance | 3 | PF (>=0.89) |
| | | 4 | PF (>=0.95) & THD (IEEE519) |
| 17 | Primary connection | T | Primary circuit piping top connection |
| | | B | Primary circuit piping bottom connection |
| 18 | Primary filtration | 0 | None |
| 19 | Chilled water valve | H | Standard 2-way valve |
| 20 | Secondary connection | T | Secondary circuit piping top connection |
| | | B | Secondary circuit piping bottom connection |
| | | X | Top connection (No expansion tank) |
| | | Y | Bottom connection (No expansion tank) |

**Table 3.3 Model Number Definitions (continued)**

| Digit | Feature | Value | Description |
|---|---|---|---|
| 21 | Secondary filtration | 0 | None |
| | | 1 | 50-micron mesh filter |
| | | 2 | 25-micron mesh filter |
| 22 | Pressure relief device for secondary circuit | 6 | Pressure setting: 6 bar |
| 23 | Reservoir | N | Stainless steel |
| 24 | Packaging | S | Seaworthy |
| | | L | Roadworthy |
| | | P | Pallet |
| | | A | Airworthy |
| 25 | SCCR | 0 | 65 kA |

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# 4 Technical Data

## 4.1 General

**Table 4.1 Technical Specifications**

| Specification | Detail |
|---|---|
| Product dimensions | 1200 mm width |
| | 1200 mm depth |
| | 2300 mm height |
| Shipping dimensions | 1340 mm width |
| | 1390 mm depth |
| | 2486 mm height |
| Dry weight | 1563 kg max. |
| Shipping weight | 1793 kg max |
| Operational weight | 1971 kg max. |
| Operating conditions | 41 to 104 °F (5 to 40 °C) (ambient), 10 to 80 % RH (non-condensing) |
| Storage environment | Keep unit vertically upright, covered completely (preferably in original packaging), in an indoor environment, conditioned warehouse that is protected against freezing temperatures. Keep clean (no dust), well-ventilated, non-condensing. |
| Storage time | Less than 6 months. If storage exceeds 6 months, preventive maintenance service is required. |
| Maximum flow, dual pump operation | 3400 lpm at 3.2 bar external pressure drop |
| Secondary coolant type | Water, water/glycol |
| Primary coolant type | Water, water/glycol |
| **NOTE: For more details on dimension, refer to the Cabinet Dimension Data in Submittal Drawings on page 61.** | |

## 4.2 Pipe Connections

Pipe connections for both the primary and secondary circuits are made at the rear of the cabinet and can be found at either the top or bottom exit, according to how the unit is specified.

- Internal CDU pipework is not load bearing.
- Engineer of record must provide external support structure to attach/secure and support all field piping external to the CDU.

**Table 4.2 Pipe Connections**

| Circuit Type | Pipe Connections |
|---|---|
| Primary (Facility) Circuit | 6 in. sanitary flanges, top or bottom exit |
| Secondary Circuit | 6 in. sanitary flanges, top or bottom exit |

## 4.3 Pressure Limitations

**Table 4.3 Pressure Limitations**

| Circuit Type | Minimum working pressure | Maximum working pressure |
|---|---|---|
| Primary (Facility) Circuit | 0.5 bar | 10 bar |
| Secondary Circuit | 0.5 bar | 6 bar (depending on PRV rating) |

## 4.4 Circuit Fluid Volumes

**Table 4.4 Primary and Secondary Circuit Fluid Volumes**

| Circuit Type | Circuit Fluid Volume |
|---|---|
| Primary (Facility) circuit (maximum) | 145 liters, basic |
| Secondary circuit (maximum) | 220 liters |

## 4.5 Electrical Data

**Table 4.5 Supported Electrical Supplies, Twin Pump**

| Electrical Supply | FLA, MCA, MOP | With ATS | Without ATS |
|---|---|---|---|
| 400 V (±10 %) 50/60 Hz (±3 Hz) | FLA | 77.4 A | 76.7 A |
| | MCA | 87 A | 87 A |
| | MOP | 100 A | 100 A |
| 480V (±5 %) 60 Hz (±3 Hz) | FLA | 65.1 A | 64.5 A |
| | MCA | 73 A | 73 A |
| | MOP | 100 A | 100 A |
| Definitions:<br>• FLA: Full load ampere<br>• MCA: Minimum circuit ampacity<br>• MOP: Maximum overcurrent protection | | | |

**Table 4.6 Electrical Load and Consumption Twin Pump Operation**

| Parameter | Value |
|---|---|
| Maximum power consumption | 47.8 kW |
| Short circuit current rating (SCCR) | 65 kA |

**NOTE: It is expected that the Vertiv™ CoolChip CDU2300 is connected to a UPS for backup power in case of a power outage. Consult your Vertiv representative to verify that the UPS is correctly sized.**

# 5 Installation

## 5.1 Unloading and Positioning

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

**WARNING! Risk of improper moving. Can cause serious injury or death. Building and equipment damage may also result. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. Lift the unit only at the designated lifting points provided on the base. Shipping weights and unit weights are listed in the Table 4.1 on page 15.**

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

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

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

**NOTICE**

Risk of passageway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a passageway while on or off the skid. Measure the unit and passageway dimensions, and refer to the installation plans prior to moving the unit to verify clearances.

**NOTICE**

Risk of damage from forklift. Can cause unit damage. Keep tines of the forklift level and at a height suitable to fit below the skid and/or unit to prevent exterior and/or underside damage.

**NOTICE**

Risk of improper storage. Can cause unit damage.

Keep the unit upright, indoors and protected from dampness, freezing temperatures and contact damage. See Table 4.1 on page 15.

**Handling the unit while packaged:**

1. Transport packaged unit using a fork lift.
2. When using a fork lift, make sure lift has adjustable forks. Forks are to be spread to widest allowable distance to still fit under shipping pallet. Make sure fork length is suitable for shipping pallet length. Shipping pallet length is 64 in. (1626 mm).
3. When using a fork lift, unit shall not be lifted any higher than 2-4 in. (51-102 mm) off ground when handled. All by-standing personnel shall be no closer than 12 in. (304.8 mm) to handled packaged unit.
4. If circumstances require unit to be lifted higher than 4 in. (102 mm) great care shall be excercised, and all by-standing personnel shall be no closer than 20 in. (508 mm) to lift point of unit.

On arrival at site, the Vertiv™ CoolChip CDU2300 crate should be placed on a level solid surface to safely unload the unit from the crate.

Check the crate for any signs of external transit damage and ensure the tilt, shock, and freeze labels have not been activated. Prior to unpacking, serious damage must be reported to Vertiv immediately.

Keys for the front and rear doors are supplied in a bag tied to the inside of the front door.

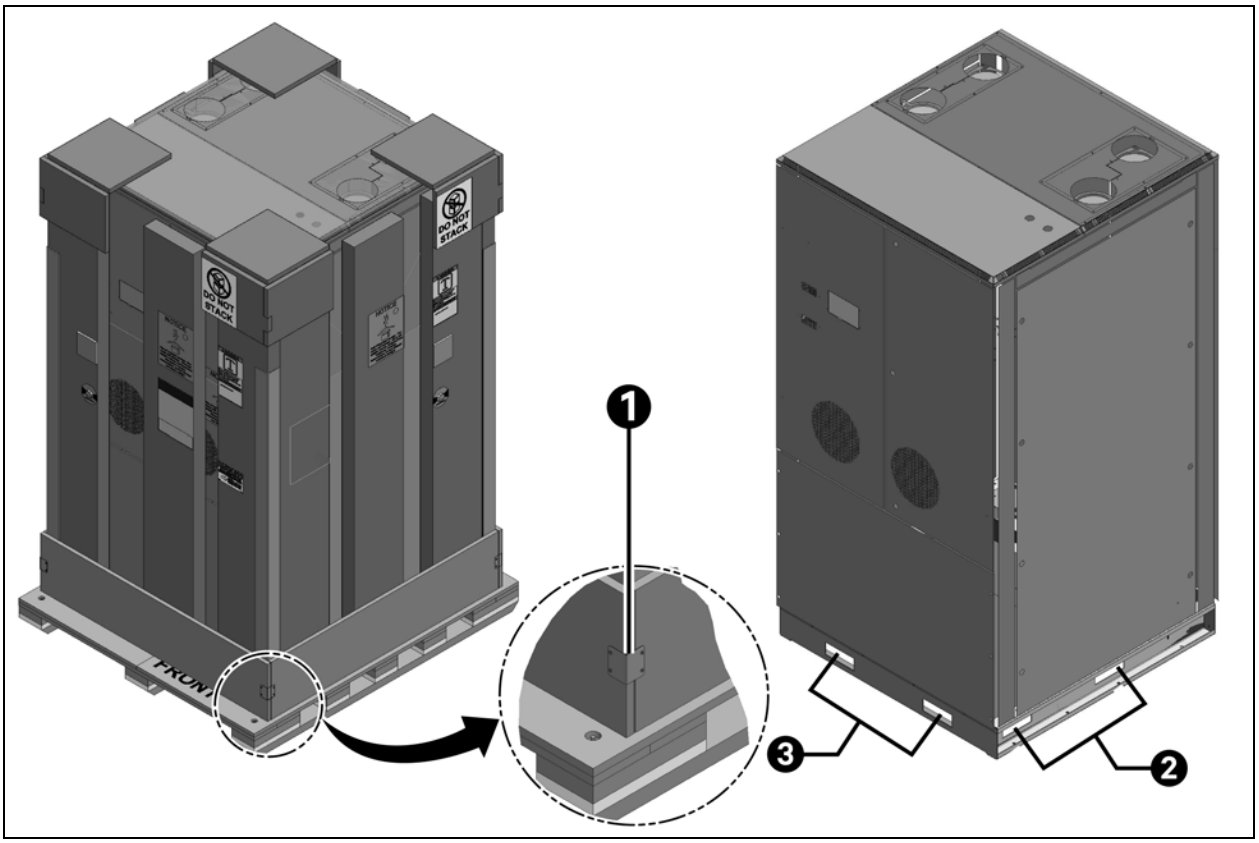
When the crate is at floor level, remove the protective packaging. Inspect the unit for transit damage. Report any damage to Vertiv immediately and prior to installation.

Space must be allowed at the front and rear of the unit in excess of 31.5 in. (800 mm) to allow access doors to be fully opened. Ensure 36 in. (913.4 mm) clearance above unit for service to the power termination enclosure.

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

**CAUTION: The Vertiv CoolChip CDU2300 is a heavy piece of equipment and a minimum of two persons is required to carry out the unloading task safely. If the Vertiv CoolChip CDU2300 is positioning on a raised floor, adequate under floor supports should be installed to bear the weight of the unit.**

**Figure 5.1 Unloading Vertiv™ CoolChip CDU2300 from Crate**




| Item | Description |
|---|---|
| 1 | Phillips head screws |
| 2 | Alternative access from either side, after unloading access when unloading from crate |
| 3 | Front access when unloading from crate |

## 5.2 Preparing Vertiv™ CoolChip CDU2300 for Operation: Holding Charge

The Vertiv™ CoolChip CDU2300 is shipped with a nitrogen gas holding charge in the fluid circuit to ensure the integrity of this circuit is not compromised during transit and remains free of contamination. This holding charge should be released through the Schrader valve before any other work is carried out on the unit.

## 5.3 Piping

The CDU is intended to be positioned on a smooth, level floor. Overhead field piping should be fitted by the installer with high point air vents to remove air during filing and commissioning. These maybe manual or automatic style vents. Automatic vents should not be placed in lines overhead of cabinets containing sensitive electronics or other electrical equipment.

Bottom exit pipework should have at least 20 in. (500 mm) of clear under floor space for connection to a manifold system. If the Vertiv™ CoolChip CDU2300 has bottom exit pipework, provisions should be made to cut away the floor tiles as required to allow pipework to run to/from the CoolChip CDU2300 under the floor.

For the detailed view of piping connections, refer to the Piping Schematic in Submittal Drawings on page 61.

External isolation valves should be fitted by the installer to both supply and return pipes, as close as possible to the Vertiv CoolChip CDU2300 for maintenance purposes and care should be taken that all inter connecting pipework to/from the Vertiv CoolChip CDU2300 is adequately supported, as the Vertiv CoolChip CDU2300 is not designed for any external pipe loads. Suitable flexible connections should be fitted as determined by engineer of record.

- Internal CDU pipework is not load bearing.
- Engineer of record must provide external support structure to attach/secure and support all field piping external to the CDU.

## 5.4 Primary Connections

**CAUTION: Risk of improper piping installation, leak checking, fluid chemistry and fluid maintenance can cause injury. Building and equipment damage may also result. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.**

**NOTICE**

Risk of leaking chilled 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. Fluid leakage can result in severe property damage and loss of critical data center equipment. Do not locate unit directly above any equipment that could sustain water damage.

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

**NOTICE**

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

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

**NOTICE**

The primary circuit fluid is to be supplied by the end user and is outside the scope of this product.

Primary connections for the Vertiv™ CoolChip CDU2300 are 6" (DN150) sanitary flanges (to BS4825 Pt.3 or equivalent with 166.9 mm diameter flange).

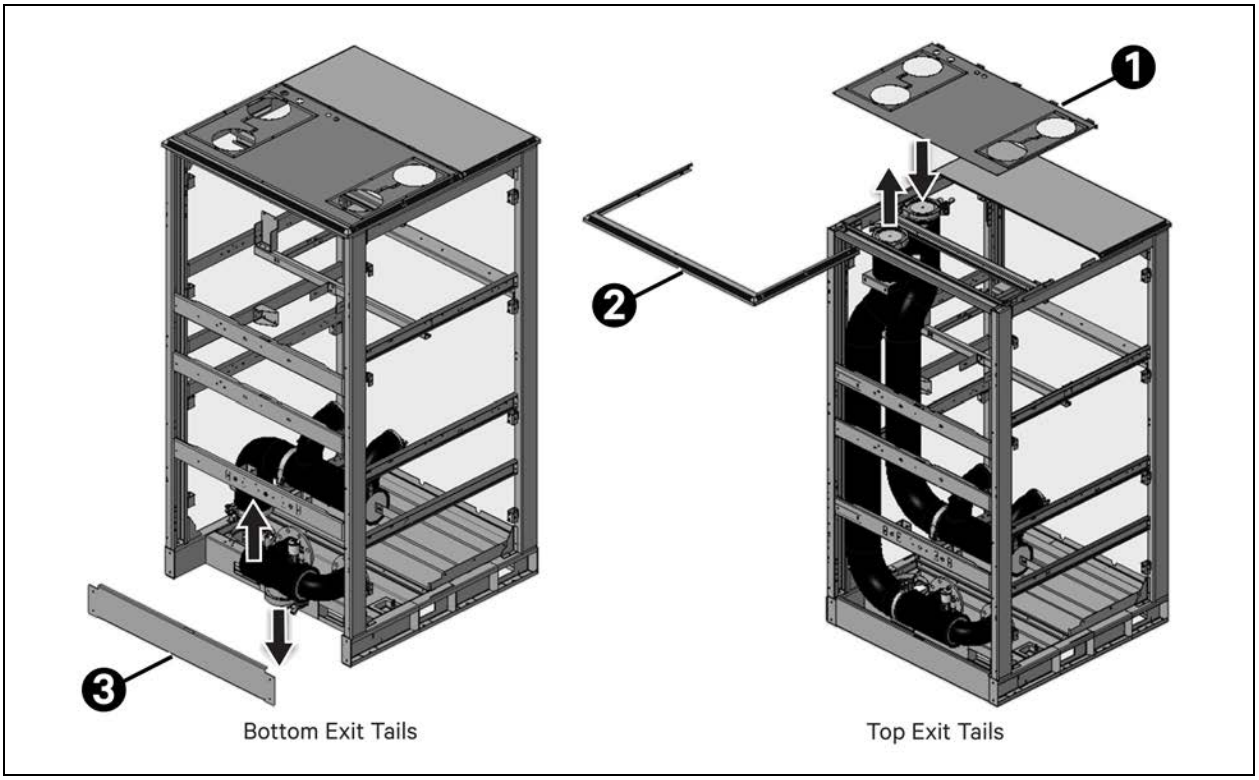
The flanges are fitted with stainless steel blanking caps to ensure pipework remains contaminant free during transit. Blanking caps will need to be removed for installation.

For the detailed view of component location, refer to the Component Location Diagram in Submittal Drawings on page 61.

The Vertiv CoolChip CDU2300 primary connections are located at the rear of the unit and can be configured for bottom or top exit from the cabinet as shown in **Figure 5.2** below which is specified at time of order.

- Internal CDU pipework is not load bearing.
- Engineer of record must provide external support structure to attach/secure and support all field piping external to the CDU.

**Figure 5.2 Primary Circuit Connections**




| Item | Description |
|---|---|
| 1 | Rear roof panel discarded for top exit tails |
| 2 | Removable upper transom and roof panel for ease of access |
| 3 | Removable lower transom and roof panel for ease of access |

External isolation valves should be fitted by the installer to both supply and return pipes as close as possible to the Vertiv™ CoolChip CDU2300 for maintenance purposes. Care should be taken that all interconnecting pipework to/from the Vertiv CoolChip CDU2300 is adequately supported, as the Vertiv CoolChip CDU2300 is not designed for any external pipe loads.

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

## 5.5 Secondary Connections

**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 leaking chilled 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. Fluid leakage can result in severe property damage and loss of critical data center equipment. Do not locate unit directly above any equipment that could sustain water damage.

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

**NOTICE**

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

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

For the detailed view of component location, refer to the Component Location Diagram in Submittal Drawings on page 61.

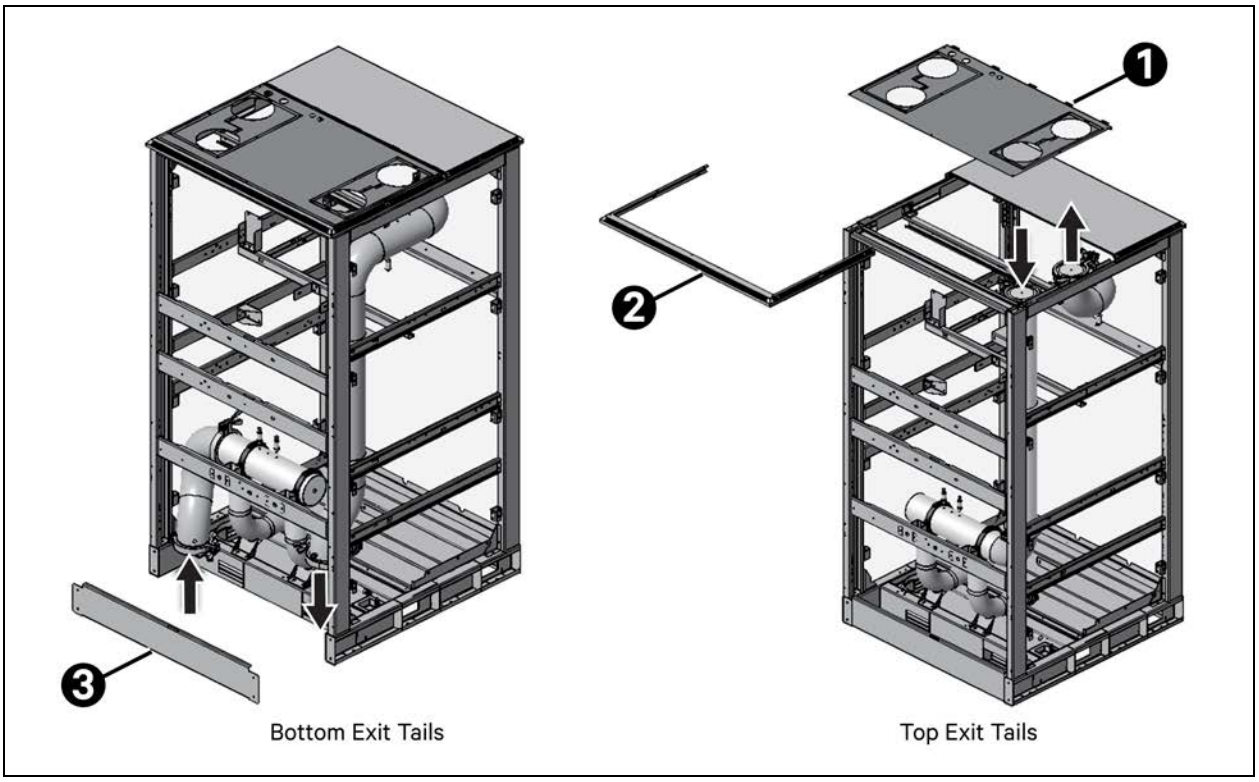
The Vertiv CoolChip CDU2300 secondary connections are 6 in. (DN150) sanitary flanges (to BS4825 Pt.3 or equivalent with 166.9 mm diameter flange).

The flanges are fitted with stainless steel blanking caps with schrader valve to ensure pipework remains contaminant free during transit. Blanking caps will need to be removed for installation.

The Vertiv CoolChip CDU2300 secondary connections are located at the rear of the unit and can be configured for bottom or top exit from the cabinet as illustrated, which should be specified at time of order.

External isolation valves should be fitted by the installer to both supply and return pipes as close as possible to the Vertiv CoolChip CDU2300 for maintenance purposes. Care should be taken that all inter-connecting pipework to/from the Vertiv CoolChip CDU2300 is adequately supported, as the Vertiv CoolChip CDU2300 is not designed for any external pipe loads.

**Figure 5.3 Secondary Circuit Connections**




| Item | Description |
|---|---|
| 1 | Rear roof panel discarded for top exit tails |
| 2 | Removable upper transom and roof panel for ease of access |
| 3 | Removable lower transom and roof panel for ease of access |

## 5.6 Thermal Expansion

**NOTICE**

Expansion vessels are required in the TCS. If the Vertiv™ CoolChip CDU2300 is configured without expansion vessels, install an expansion vessel in the secondary pipework to protect the TCS from overpressure.

The Vertiv CoolChip CDU2300 is fitted with two 18 liter expansion vessels and have these functions:

- To provide a cushion when filling the system to a static fill pressure. During the fill operation after the system air has been expelled and pressure rises above the air charge pressure over the expansion vessels, the cushion allows the pressure to rise gradually in a controlled manner to the required fill pressure.
- During normal operation, the expansion vessels are design to hold a small amount of system fluid. This allows some fluid to be fed back into the system with minimal pressure loss should pressure go down for any reason, such as trapped air in the system percolates out over time through the automatic air vents.
- Spare capacity in the expansion vessels accommodate an amount of thermal expansion in the system due to fluid temperature rise. This does have limitations; however, depending on the maximum expected fluid temperature and the volume of fluid in the secondary fluid network.

The expansion vessel is factory pressurized at 0.8 bar. Contact a Vertiv representative to determine if additional expansion vessels will be required.

## 5.7 Electrical

### 5.7.1 Power Wiring

**WARNING! This unit is powered by high voltage. Serious injury or death can occur. All electrical work must be carried out only by a qualified engineer.**

**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.**

**NOTICE**

Risk of improper power supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. 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 power supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. Also, ensure that no three-phase sources are single-phased at any time.

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

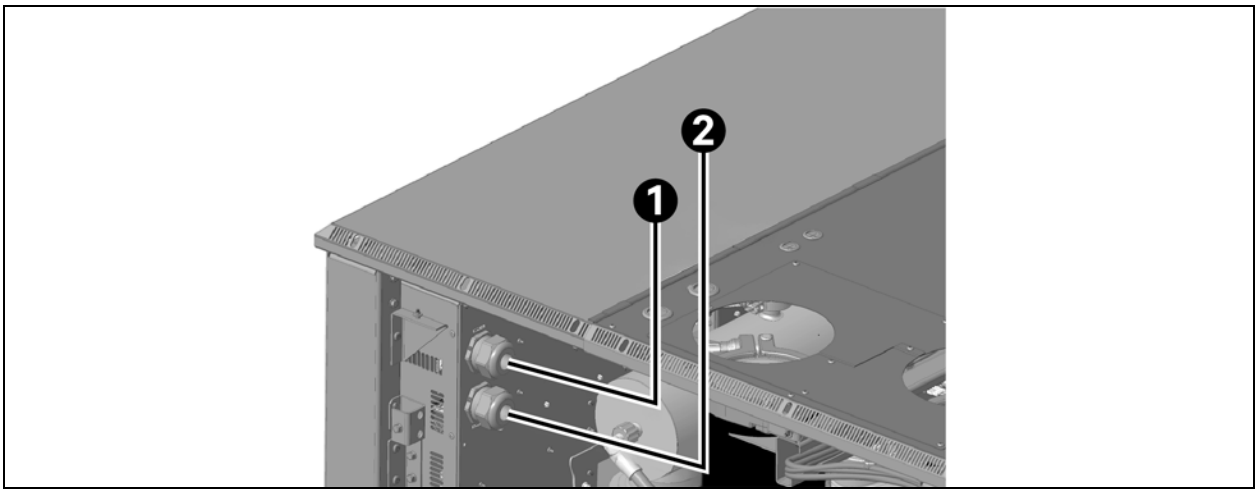
**NOTICE**

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

Incoming power cables can be routed into the unit via the floor void or through the cabinet rear roof panel. See Figure 5.4 on the next page.

If no automatic transfer switch (ATS) has been specified, there will be just one power cable, which should follow the route of Supply A.

**Figure 5.4 Power Cable Route—Top Entry**

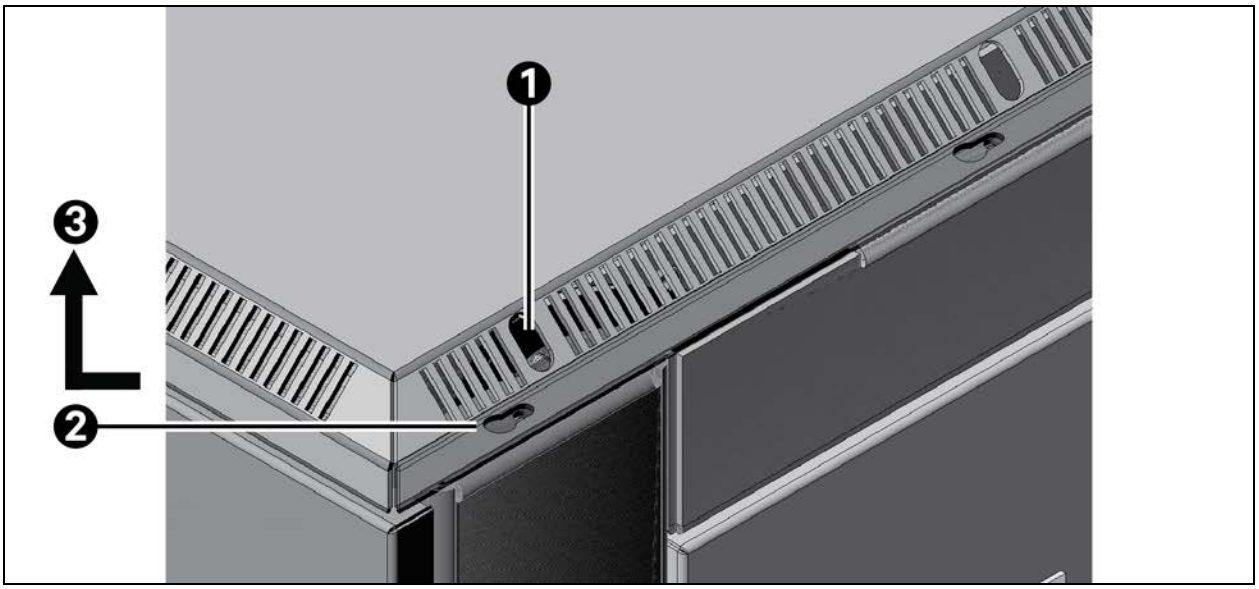



| Item | Description |
|---|---|
| 1 | Supply A |
| 2 | Supply B (optional-with ATS) |

The enclosure in the front roof section of the cabinet contains either terminals for a single incoming power supply (if no ATS has been specified) or terminals for both A and B supplies with additional components if an ATS was specified as part of the overall unit configuration.

Access to the power cable termination enclosure will require removal of the front roof panel. The front and rear roof panels are held in place with 4 x M4 screws. Screwdriver access to these screws is shown in Figure 5.5 on the facing page.

**Figure 5.5 Roof Panel Removal**




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

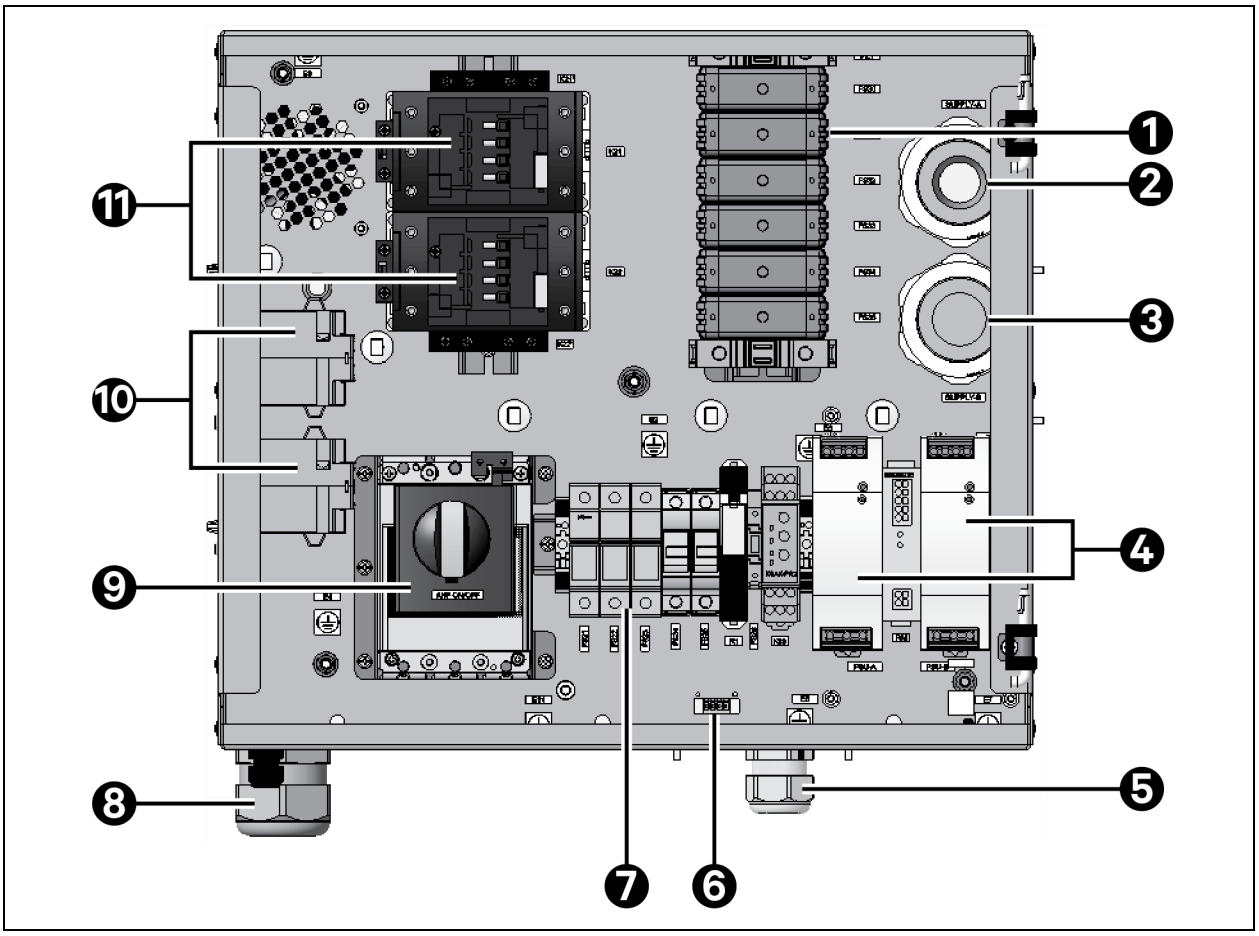
**NOTICE**

It is not necessary to completely remove the roof panel retaining screws. There are keyhole slots in the bottom face of the roof panel, so screws may be loosened but left in place when removing the panel.

The ATS enclosure has 2 × M50 cable glands on the rear face to accept power cables for supplies A and B with an outer diameter range of 27–34 mm (1.06–1.34 in.).

See Figure 5.6 on the next page or front panel operation and for manual supply A and supply B changeover simulation.

**Figure 5.6 Automatic Transfer Switch**




| Item | Description |
|---|---|
| 1 | Supply A and B fuses |
| 2 | Cable gland entry for supply A |
| 3 | Cable gland entry for supply B |
| 4 | DC PSU |
| 5 | Cable gland exit to AHF optional — If AHF configured |
| 6 | ATS status signal |
| 7 | Fuses for DC PSU |
| 8 | Cable gland exit supply to EP (cable pre-fitted) |
| 9 | AHF isolator |
| 10 | CTs optional — If AHF configured |
| 11 | Contactors |

There is also a 4-way connector on the back of the enclosure used for an ATS status signal to the Vertiv™ CoolChip CDU2300 (pre-wired at factory).

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

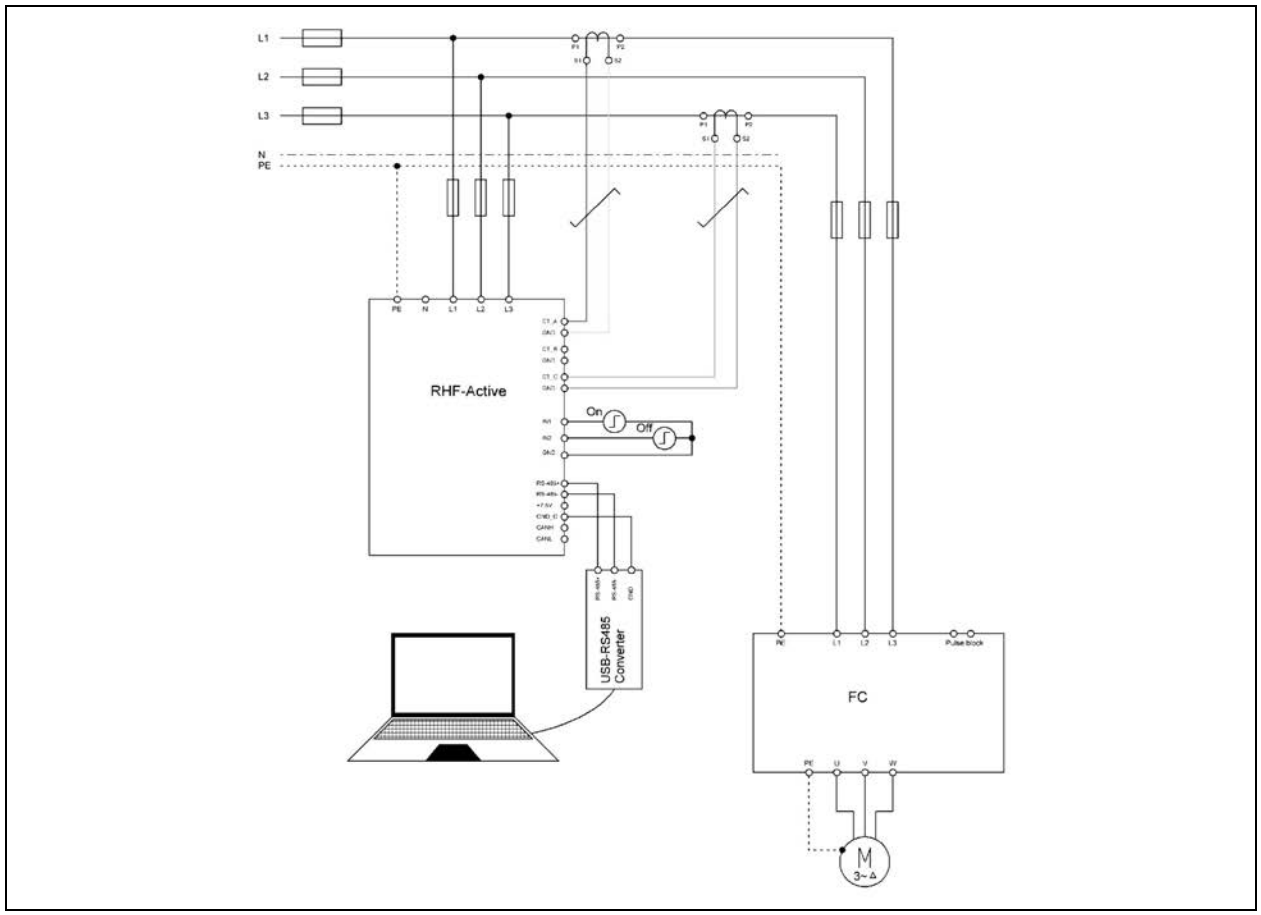
The Vertiv™ CoolChip CDU2300 units are configured for the required voltage option stated in Electrical Data on page 16. This is specified at the time of order. Check data plate information for compatibility before installation.

## 5.8 Commissioning of AHF Filter

### 5.8.1 Required Hardware

For connection of the RHF-Active, an RS485 to USB converter is required.

**Figure 5.7 Connection of the RHF-Active**




**NOTE: If the RHF-Active has not been powered up for more than 4 months, wait for 1 hour before starting it (RUN).**

### 5.8.2 Software

For connection of the RHF-Active to the PC the latest RHF-Active PC software should be used.

This can be downloaded from http://www.revcon.de or requested from info@revcon.de.

During download of the software, please ensure your antivirus software is not changing the name or delating the exe file: “RHF-Active-SiC.exe”. Execute this exe to start the software. The following Login for easy access can be used:

Login: 001
Password: 010101

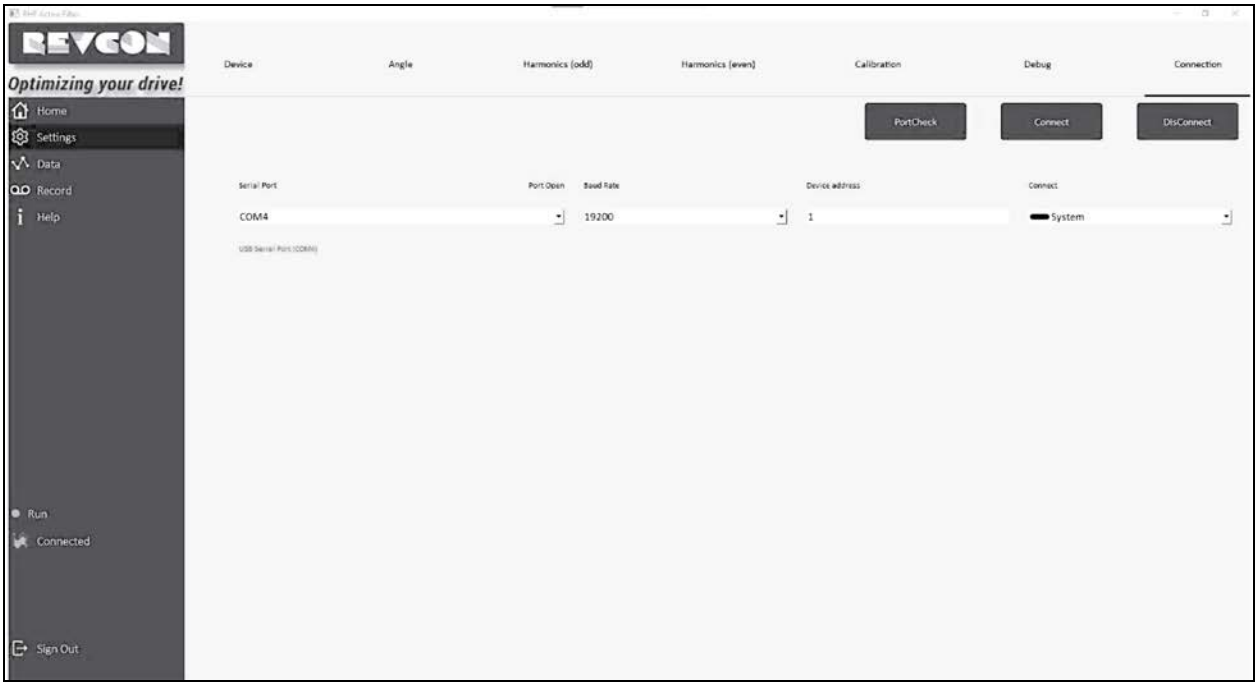
Higher access level can be requested from REVCON.

**NOTE: While entering values in the RHF-Active configuration software, the values must be confirmed by pressing enter! Without this step, the value will not be written into the RHF-Active.**

### 5.8.3 Connection—PC to Filter Module

For connection of the RHF-Active to the PC the latest RHF-Active PC software should be used. In order to establish the connection to the filter module. Got to: “Settings” → “Connection”.

**Figure 5.8 Settings—Connection**




1. Click the *Port Check*.
2. Choose the correct *Serial Port*.
3. “Baud rate” should be set to 19200.
4. “Connect” with either individual filter or system level.
5. Press *Connect*.
6. Verify: “Disconnected” turns to green “Connected”.

### 5.8.4 Home Page

The first page of the RHF-Active is “Home” This page gives an overview of considered interesting values, such as “Voltage”, “Grid Power”, Grid current” and “Load current”.

**Figure 5.9 Home Page**

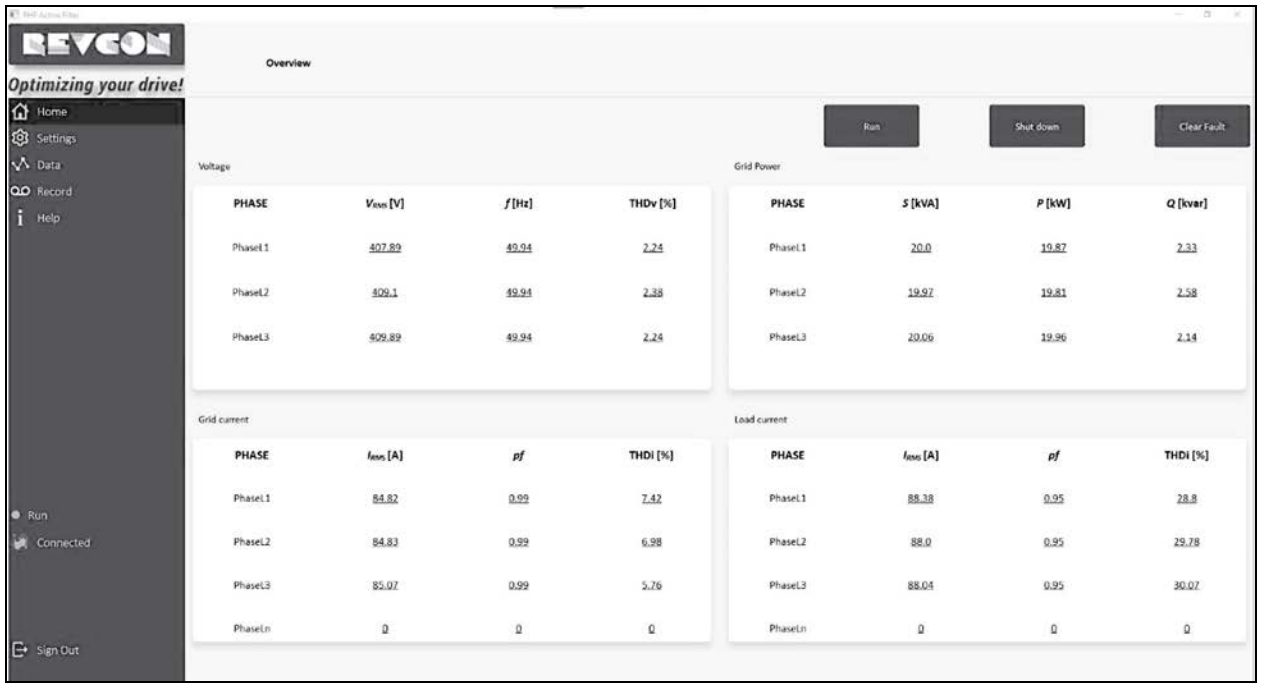



**Table 5.1 Basic Operational Commands**

| Command | Description |
|---|---|
| Run | Set the unit into operation. |
| Shut down | Turn of operation. |
| Clear fault | Delete fault (e.g. after EPO – Emergency Power Off). |

## 5.8.5 Settings—Angle

The RHF-Active is injecting harmonics of opposite angle, compared to the measured value. Deviation between measured value and injected value can be adjusted in the “Angle” settings. Values are referring to degree (2.20 correspond to an offset of 2.2° [injection angle 180°+2.2°]). Negative values are possible. These settings can be changed during operation on the RHF-Active.

**NOTE: Do not enter the value -0.1 in any angle parameter.**

**Figure 5.10 Settings—Angle**


**Table 5.2 Basic Operational Commands**

| Command | Description |
|---|---|
| Run | Set the unit into operation. |
| Shut down | Turn of operation. |
| ↓ CSV | Download - Saves the current parameters into a CSV to be stored on PC. |
| ↑ CSV | Upload – Uploads a CSV parameter list into the machine. |
| Fundamental angle | Angle offset of fundamental angle compensation. |
| Phase A angle | Angle offset of complete signal measured via L1. |
| Phase B angle | Angle offset of complete signal measured via L2. |
| Phase C angle | Angle offset of complete signal measured via L3. |
| 3rd angle | Angle offset of 3rd harmonic for L1-L3. |
| 5th angle | Angle offset of 5th harmonic for L1-L3. |
| 25th angle | Angle offset of 25th harmonic for L1-L3. |

## 5.8.6 Settings—Harmonics (Odd)

The RHF-Active is injecting harmonics of same amplitude as measured value. Deviation between measured value and injected value can be adjusted in the “Harmonics (odd)”. Values are referring to a factor of the individual harmonic amplitude (1.05 correspond to compensation of 105%). This setting is used to fine-tune the performance of the RHF-Active. These settings can be changed during operation on the RHF-Active.

**Figure 5.11 Settings—Harmonics (Odd)**


**Table 5.3 Basic Operational Commands**

| Command | Description |
|---|---|
| Run | Set the unit into operation. |
| Shut down | Turn of operation. |
| ↓ CSV | Download - Saves the current parameters into a CSV to be stored on PC. |
| ↑ CSV | Upload – Uploads a CSV parameter list into the machine. |
| 3rd | Compensation of the 3rd harmonic order as a factor. Values from 0.00-1.10 are allowed. (0-110% compensation current). |
| 5th | Compensation of the 5th harmonic order as a factor. Values from 0.00-1.10 are allowed. (0-110% compensation current). |
| 61st | Compensation of the 61st harmonic order as a factor. Values from 0.00-1.10 are allowed. (0-110% compensation current). |

## 5.8.7 Settings—Harmonics (Odd/Even)—Fine-Tuning Harmonics

In order to achieve the best possible performance, fine-tuning of individual harmonics is recommend. The following procedure can be used:

1. Install PQ-Analyser upstream of the RHF-Active.
2. Start RHF-Active and view result in bar graph mode.
3. Identify harmonic content on 5th Harmonic on PQ analyser or start with 3rd Harmonic if relevant content (e.g. in 3P4W system)
4. Add +0.01 to the angle of the corresponding harmonic value in the RHF-Active software.
5. Review the result:
   - If harmonic content is less than before, move on to step 6.
   - If harmonic content is higher, move on to step 8.

6. Add +0.01 to the angle of the corresponding harmonic value in the RHF-Active software.
7. Review the result:
   - If harmonic content is less than before, repeat step 6.
   - If harmonic content is higher, insert previous value and move on to step 12.
8. Add -0.01 to the angle of the corresponding harmonic value in the RHF-Active software.
   Do not insert the value -0.1 into any angle parameter.
9. Review the result:
   - If harmonic content is less than before, move on to step 10.
   - If harmonic content is higher move back to initial value and move on to step 12.
10. Add -0.01 to the angle of the corresponding harmonic value in the RHF-Active software.
11. Review the result:
    - If harmonic content is less than before, repeat step 10.
    - If harmonic content is higher, insert previous value and move on to step 12.
12. Repeat steps 4 to 11 with next odd harmonic order until all harmonics are within the considered limits.

## 5.8.8 Settings—Harmonics (Even)

The RHF-Active is injecting harmonics of same amplitude as measured value. Deviation between measured value and injected value can be adjusted in the “Harmonics (even)”. Values are referring to a factor of the individual harmonic amplitude (e.g. 1.05 correspond to compensation of 105%). This setting is used to fine-tune the performance of the RHF-Active. These settings can be changed during operation on the RHF-Active. Even order harmonics may be caused by unbalance in the load. For symmetrical load, compensation of the even order harmonics should not be required and settings of 0.00 is recommended.

**Figure 5.12 Settings—Harmonics (Even)**

**Table 5.4 Basic Operational Commands**

| Command | Description |
|---|---|
| Run | Set the unit into operation. |
| Shut down | Turn of operation. |
| ↓ CSV | Download - Saves the current parameters into a CSV to be stored on PC. |
| ↑ CSV | Upload – Uploads a CSV parameter list into the machine. |
| 2nd | Compensation of the 2nd harmonic order as a factor. Values from 0.00-1.10 are allowed. (0-110% compensation current). |
| 5th | Compensation of the 5th harmonic order as a factor. Values from 0.00-1.10 are allowed. (0-110% compensation current). |
| 61st | Compensation of the 61st harmonic order as a factor. Values from 0.00-1.10 are allowed. (0-110% compensation current). |

### 5.8.9 RF Earth Connection

RF earth connection for EMC compliance is two M6 earth studs provided at the rear of the cabinet (one at the top and one at the bottom) to connect a braided EMC earth strap at either point.

### 5.8.10 Controls Wiring

Terminals 13 and 14 on SK11 is a volt-free contact for alarm remote indication. This is configurable as normally open (default) or normally closed.

A leak detection tape can be connected to terminals 15 and 16 on SK11 for leak detection under the floor. See Figure 5.13 on page 38 for the location of SK11.

## 5.9 Pre-Commission Checks

### 5.9.1 Site Check

Ensure the site contact has made preparation for incoming Vertiv Service Representative to be on the premises.

1. Check whether the site requires protection equipment such as safety boots.
2. Check that deionized water (biocide and corrosion inhibitors required) or PG-25 has been delivered to the site.
3. Ensure that the site contact is aware of the Vertiv™ CoolChip CDU2300 power supply fuse circuit board and circuit breakers.
4. Ensure that the site is aware of the location of the primary chiller and building services cold water supply and the associated isolation valves.

### 5.9.2 Mechanical Installation Check

1. Confirm that the Vertiv CoolChip CDU2300 has been successfully unloaded from its crate and thoroughly inspected for damage. Pay particular attention to external cabinet panels and fluid circuit pipe work.
2. Check that the Vertiv CoolChip CDU2300 has been positioned and secured in the correct location.
3. If the unit has bottom exit pipework or manifold and hoses, confirm that floor tiles have been cut away as required and ideally fitted with brush strip grommets to allow hoses or pipes to run neatly into the underfloor void.
4. Check that cable baskets, cable trays, drip trays, etc have been installed to provide adequate support for the hoses or manifold.

5. Ensure all secondary fluid network piping and facility water supply piping is installed and ready for Vertiv™ CoolChip CDU2300 commissioning.
6. Confirm that sufficient space has been allowed at the top, front and rear of the unit to fully open the access doors.
7. Ensure that the unit has been raised and leveled with the jacking feet into its final permanent position.

### 5.9.3 Electrical Installation Check

1. Confirm that the Vertiv CoolChip CDU2300 is suitable for the site supply voltage.
2. Check that the Vertiv CoolChip CDU2300 has been connected to power supply routed through the ATS enclosure 32 mm cable glands.
3. Verify that the rating of the circuit breaker/fuses supplying the VertivCoolChip CDU2300 meets the specification and rating indicated in the latest wiring diagram.
    a. If this rating differs from the Vertiv CoolChip CDU2300 specification, note the specification and confirm acceptability.
4. Check and record the voltage available across each of the three-phases meets the Vertiv CoolChip CDU2300 model requirements.
5. If the Vertiv CoolChip CDU2300 is in a different location to the IT racks, confirm the remote room temperature/RH sensor has been installed on a wall adjacent to the data racks at a height of approximately 1.8 m (72 in.) using the correct extension cable.
6. Confirm any required external peripheral sensors are correctly fitted.

**NOTICE**

The main controller PCB is fitted with a type CR2032 coin battery. The sole purpose of this battery is to maintain the real time clock in the event of power down and its absence will not generally affect the overall operation and running of the unit.

Although the touchscreen display also has a receptacle for a battery, there is no requirement to fit one to this PCB.

### 5.9.4 Primary Fluid Specification

**NOTICE**

Risk of piping system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Heat exchangers and piping systems are at high risk of freezing and premature corrosion. Refer to Technical Data on page 15 for details concerning storage conditions. Automotive antifreeze is unacceptable and must NOT be used in any fluid system. Use only coolant fluid solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

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

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

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

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

Consult fluid manufacturer for testing and maintenance of inhibitors.

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

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

The Vertiv™ CoolChip CDU2300 is designed for use with a primary fluid supply from a chilled water system (either dedicated or from building system), fluid cooler, cooling tower or dry air cooler. A
20 % glycol concentration will give frost protection to approx. -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 Vertiv for advice).

It is the responsibility of the installer to make sure all fluid in contact with the heat exchanger is filtered to a level of at least 500 micron.

### 5.9.5 Secondary Fluid Specification

**NOTICE**

Risk of piping system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Heat exchangers and piping systems are at high risk of freezing and premature corrosion. Refer to Technical Data on page 15 for details concerning storage conditions. Automotive antifreeze is unacceptable and must NOT be used in any fluid system. Use only coolant fluid solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

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

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

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

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

Consult fluid manufacturer for testing and maintenance of inhibitors.

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

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

The fluid used in the secondary circuit is to be either PG-25 heat transfer fluid or particulate free deionized water, treated with suitable corrosion inhibitors and biocides for the cooling application.

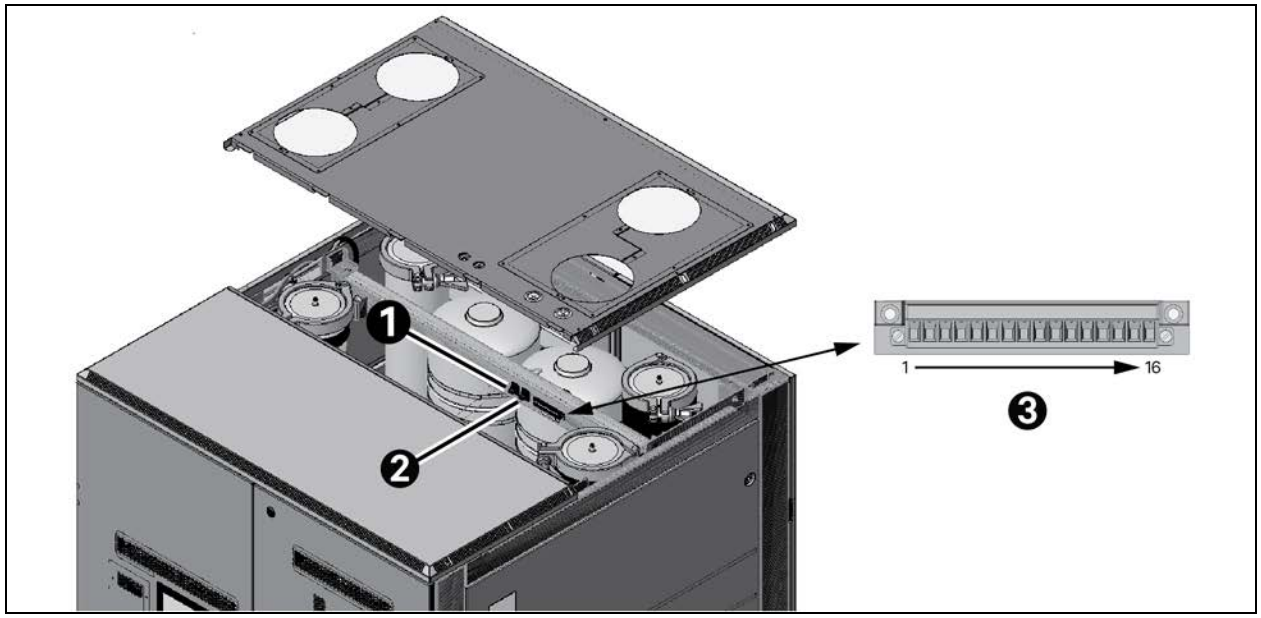
Failure to use proper water treatment can result in decreased system performance and reliability due to corrosion, scaling, fouling and microbiological growth and may invalidate the unit warranty.

## 5.10 Communications

### 5.10.1 Ethernet Communications

Two Ethernet redundant communication ports (RJ45) are provided at the top and rear of the unit: ETH A and ETH B. Use Cat5e shielded cable when wiring to these ports. Connector SK11 is also in the same location for RS485 Modbus communication and CANbus in/out for group control communication.

**Figure 5.13 Communication Options and Locations**




| Item | Description |
|---|---|
| 1 | Ethernet A |
| 2 | Ethernet B |
| 3 | Connector SK11 (with CANBUS terminals for group control) |

### 5.10.2 Group Control

Group control needs to be implemented only if there is more than one Vertiv™ CoolChip CDU2300 unit per system installation.

It is recommended that CANbus and unit setup for group control is carried out only after the CoolChip CDU2300 units have been commissioned as standalone units. For more information refer to Vertiv™ CoolChip CDU2300 Operation and IP communication Manual SL-80096.

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# 6 Commissioning

## 6.1 Unit Configuration

Prior to running the Vertiv™ CoolChip CDU2300, the configuration should be checked to ensure the unit is set up according to the site requirements.

- **Date and time:** See Setup menu, Date and Time. Set as the time required for the location. Set the Date Format (P021) and Daylight Saving (P022). Alternatively, you can enable NTP Synchronisation (P023) along with associated parameters.
- **DP Control:** See Configuration menu, Pump Control or DP (P201). This controls the pump speed according to the required differential pressure.
- **DP Setpoint:** See Configuration menu/Differential Setpoint (P203). This will set the required differential pressure to be achieved.

**NOTICE**

Leave the DP setpoints at the default values initially. Then set these at the final states of commissioning.

- **Over Pressure Action:** See Configuration menu, Pump Control, Over Pressure Action (P212)/Alarm, Alarm + Shutdown. This will either keep the secondary supply temperature at a fixed temperature or allow it to rise if there is a danger of condensation.
- **Leak Detection:** See Configuration menu, Leak Detection—Flood Tray (601) and Leak Detection—Underfloor (P602)/Alarm or Shutdown and Alarm.
- **Power Failure Option:** See Configuration menu, Miscellaneous, Power Failure Options (P904)/Run or Standby. This determines if the unit automatically re-starts or remains in standby after a power outage.
- **Coolant:** See Configuration menu, Coolant, Secondary Loop Coolant Type (P1101), Water or PG25 and Configuration menu, Primary Loop Coolant Type (P1102), Water or PG25. These selections ensure accurately reported flow rates from the flow sensors.
- Temperature Control Mode: See Configuration menu/Temperature Control/Control Mode (P302)/Fixed Setpoint or Fixed Setpoint and Dew Point Override. This will either keep the secondary supply temperature at a fixed temperature or allow it to rise if there is a danger of condensation.

## 6.2 Primary Circuit

For the detailed view of component location, refer to the Component Location Diagram in Submittal Drawings on page 61.

### 6.2.1 Primary Pipework Installation

Confirm that the installed primary circuit pipework that has been fitted is externally supported and secure.

1. Confirm that the installed primary circuit pipework has been fitted with valves for unit isolation and maintenance.
2. Confirm that the newly installed primary pipework has been flushed to remove particles larger than 500 microns.
3. Check supply/return connections are correctly installed.
4. Check that all pipe joints are tight.
5. Verify that newly fitted primary pipework and connections have been leak tested.
6. Check that all primary circuit pipework, hoses, and valves have been insulated as per installation requirements.

7. Check that the external primary circuit has the means to vent air from the system either automatically (preferable) or manually.
8. Verify that the fluid leak detection is properly installed around all units.

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

### 6.2.2 Primary (Facility) Fluid Supply

1. If the primary (facility) fluid supply is from a dedicated chiller, confirm that the chiller has been fully commissioned at least 24 hours before the Vertiv™ CoolChip CDU2300 was commissioned.
2. Check that the primary (facility) fluid supply has been connected to the Vertiv CoolChip CDU2300 primary fluid circuit.
3. Confirm that the primary (facility) fluid supply is available.
4. Confirm that there are no potential issues with low flow switches in the primary (facility) fluid circuit.
5. Verify that the correct specification external filter is installed and equipped with isolation valves for maintenance. Refer Primary Fluid Specification on page 36.
6. Verify that the primary fluid supply is fully operational and is providing sufficient flow rate/temperature at <10 bar pressure, as per the original installation specifications.

**NOTICE**

Although the primary circuit is rated for up to 10 bar, the pressure sensors are rated 1 bar to 8 bar so they may not register the full primary pressure.

### 6.2.3 Primary Control Valve

Vertiv CoolChip CDU2300 is supplied with a two-way modulating control valve on each plate heat exchanger. Ensure that the installation includes a suitable external bypass facility in case both the control valves are closed.

**NOTICE**

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

### 6.2.4 Primary Circuit Filling

1. Open the supply and return valves fitted in the pipework connected to the Vertiv CoolChip CDU2300 unit to allow the primary circuit within the cabinet to gently fill from the primary fluid supply.
2. Check the circuit for leaks.

**NOTICE**

Check that the installed primary fluid supply system has an automatic fluid make up facility and that filling the Vertiv CoolChip CDU2300 unit will not result in the fluid system (chiller) shutting down due to loss of fluid.

### 6.2.5 Primary Flow Setup

**NOTICE**

Before attempting to monitor and adjust the primary circuit flow, the operator should be fully conversant with the operation of the Vertiv™ CoolChip CDU2300. See **Vertiv™ CoolChip CDU2300 Operation and IP communication Manual SL-80096** for further information.

1. For optimum performance, the primary fluid flow should be set to match The required heat load transfer according to the primary inlet temperature and level of glycol.
2. If the fluid flow is below the necessary requirement, there will be insufficient cooling and the load temperatures will start to rise. If there is too much flow, then temperature control could become unstable.
3. An external means of restricting or bypassing excessive primary flow should be available in the external pipework.
4. To adjust the primary flow rate:
    a. Set the controller to Overrides.
    b. Adjust Cooling Valve to 100% to force the cooling valve to open fully for maximum flow through the heat exchanger.
    c. Go to the Status screen or Home screen view to view the primary flow rate.
5. Adjust the external valve to regulate the flow through the CDU to the required approximate setting.

## 6.3 Secondary Circuit

For the detailed view of component location, refer to the Component Location Diagram in Submittal Drawings on page 61.

### 6.3.1 Secondary Pipework Connections

Confirm that the installed secondary circuit pipework that has been fitted is externally supported and secure.

1. Check that the external secondary fluid network supply/return connections are correct (not backwards).
2. Check that the drip tray has been installed in the correct location, if applicable.
3. Check the site-installed secondary fluid network has been flushed down to the particle level needed for application, especially if any hot works have been carried out.

**NOTE: Vertiv does not recommend use of the CDU for flushing external secondary external pipework.**

4. Verify that the secondary fluid network and Vertiv CoolChip CDU2300 connections including hoses have been tested for leaks using an appropriate pressure testing method and ensure certification can be provided.
5. Check the leak detection tape, if applicable, has been installed into drip trays.
6. Check that all hose ends have been adequately labeled to ensure correct identification. For example, flow/return and rack/IT load served.

### 6.3.2 Unit Secondary Circuit Filling

**NOTICE**

When filling and running the secondary circuit, the operator must be fully familiar with operating the Vertiv CoolChip CDU2300.

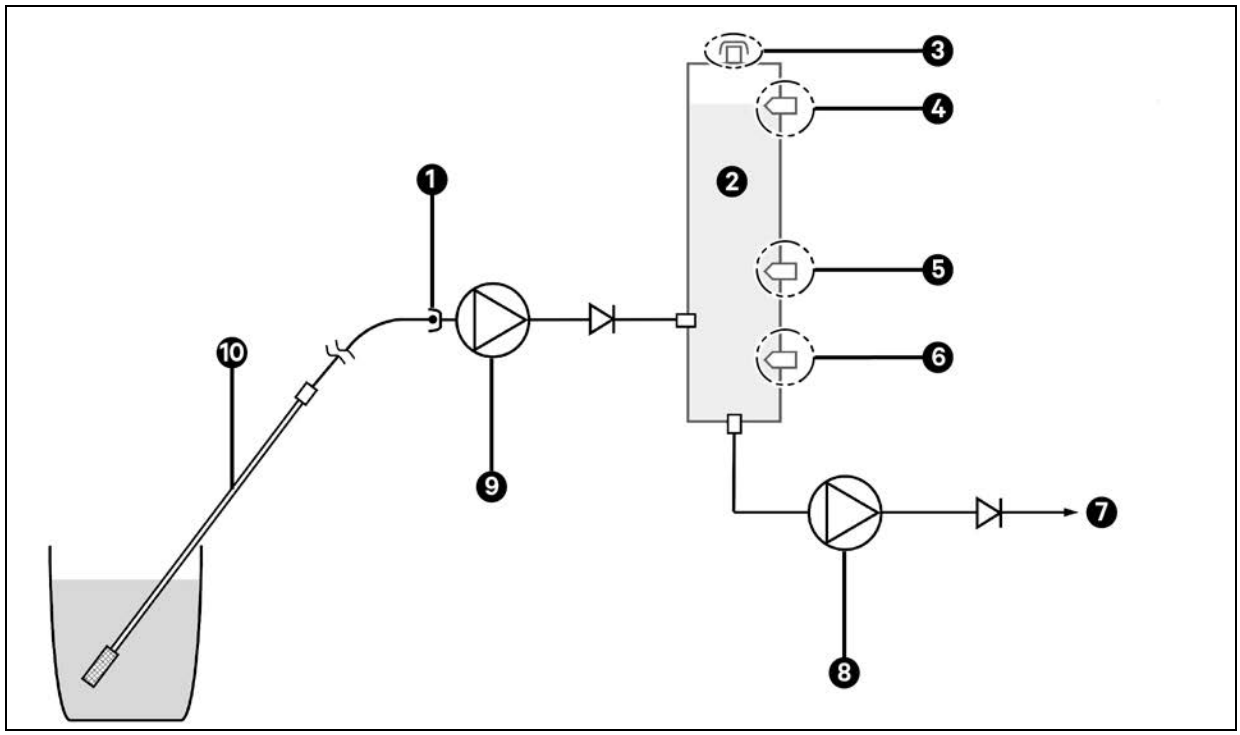
1. Position the container of pre-treated deionzed water or PG-25 in front the Vertiv CoolChip CDU2300.

2. Ensure that all automatic air vent bleed screws are loose but not removed. These screws are located at the top of each filter housing and on the pump inlet header.
3. Ensure that all drain valves are closed.
4. Insert the filling wand into the container of fluid and then connect fill wand hose to the fill pump P5 quick release coupling. See Figure 6.1 below.
5. Log onto the controller with the Service access code. Go to the Service screen and select Fill Pump Request.
6. Select Fill Pump P5 and then ON. The fill pump will start pumping the fluid into the unit reservoir tank at the rate of approximate rate of 4 liters per minute.
7. The reservoir level sensors can be monitored during the filling process while in the Fill Pump Control screen. See Figure 6.2 on the facing page.
8. Ensure that the fluid container with the filling wand does not run dry during this process. Fill pump P5 will switch OFF automatically when the reservoir tank is full or can be manually switched OFF at any time using the OFF command as shown in Figure 6.2 on the facing page.

**NOTICE**

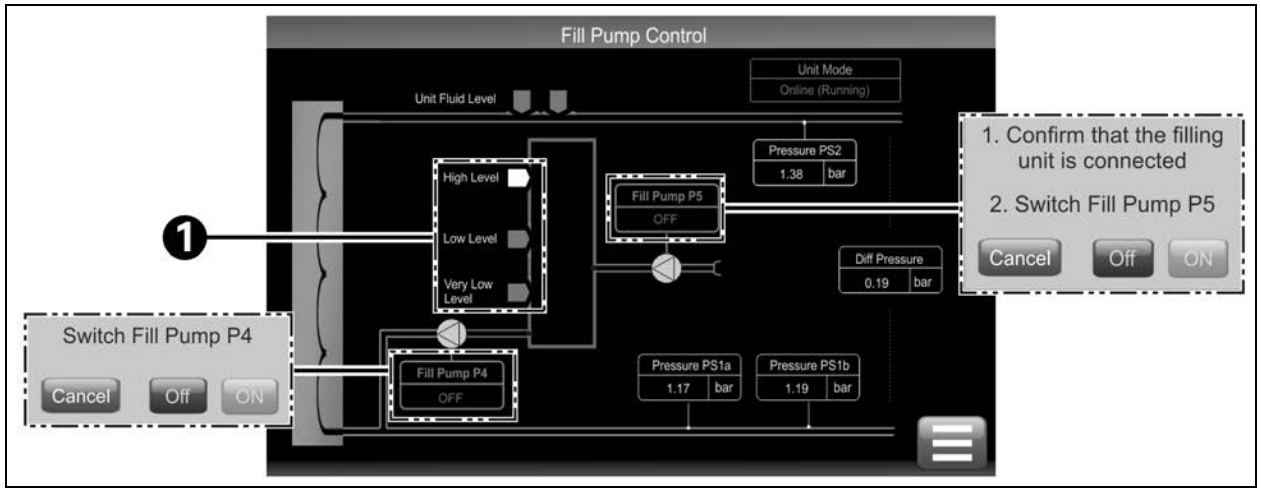
Fill pumps P4 and P5 are interlocked and cannot run at the same time. When pump P5 is running, P4 shows as Disabled. When pump P4 is running, P5 shows as Disabled.

**Figure 6.1 Fill Pump Operation**



| Item | Description | Item | Description |
|---|---|---|---|
| 1 | Self sealing quick connect | 6 | Very low level (empty) - alarm A55 Reservoir Tank Empty and fill pump P4 disabled |
| 2 | 20 liters reservoir tank | 7 | CoolChip CDU2300 Secondary Circuit |
| 3 | Breather | 8 | Fill Pump P4<br>Automatic start/stop to maintain system pressure set point |
| 4 | High level (full) - fill pump P5 disabled when wet and enabled when dry | 9 | Fill Pump P5<br>Manual start/stop + automatic stop when reservoir tank full |
| 5 | Low level (water required) - alarm A54 Reservoir Tank Fluid Required | 10 | Filling wand - connected to fill pump P5 when reservoir tank needs to be replenished. |
| **NOTE: Fill pumps P4 and P5 interlocked to prevent both running at the same time.** | | | |

**Figure 6.2 Fill Pump Control Screen for Fill Pump P4 and P5**

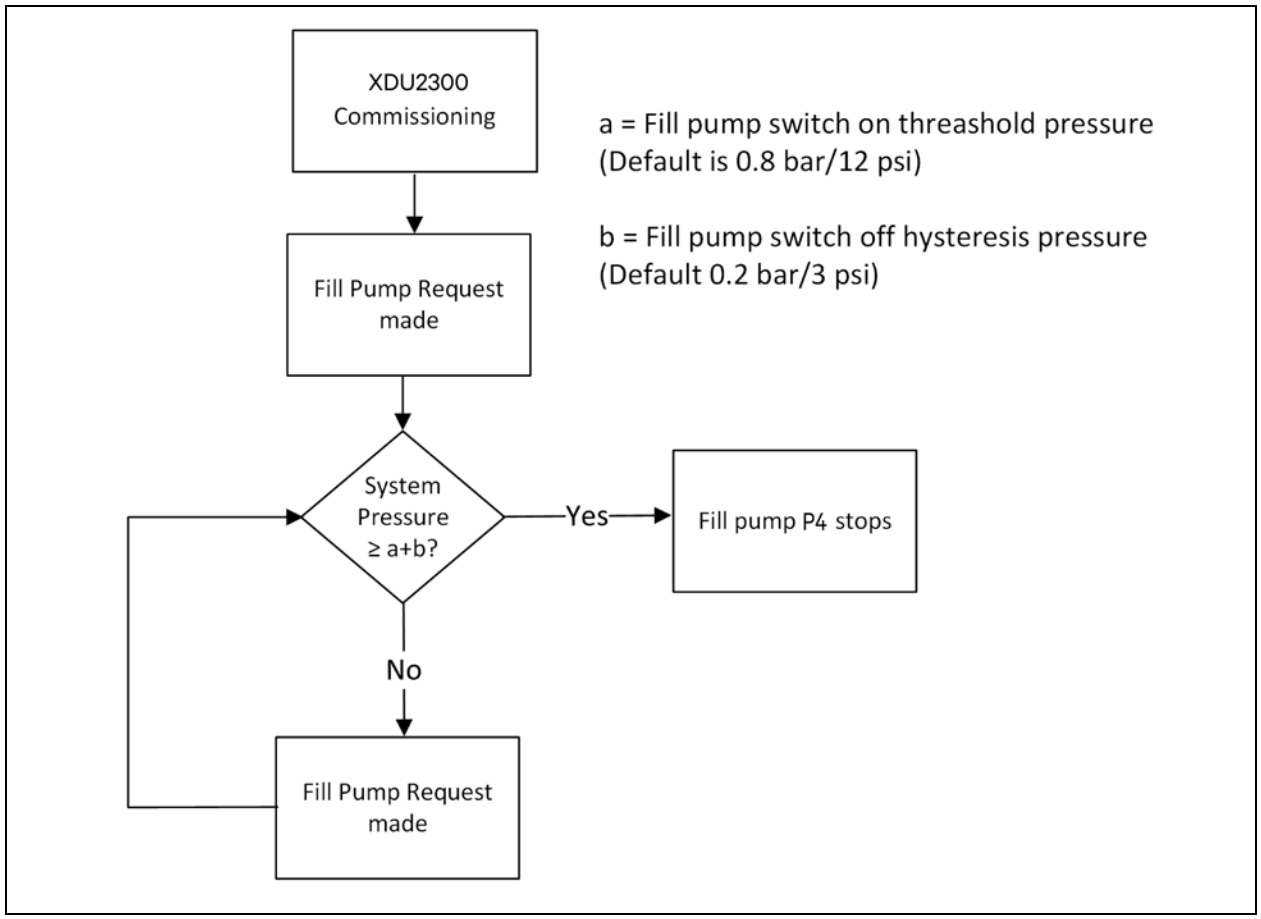



| Item | Description |
|---|---|
| 1 | Level indicators change from white to green when wet |

9. After the reservoir tank is full, it can be emptied into the Vertiv™ CoolChip CDU2300 system using fill pump P4. Select Fill pump P4 and then ON.
10. Fill pump P4 will switch OFF automatically when the reservoir tank reaches the very low-level sensor or it can be manually switched OFF at any time using the OFF command.
11. Repeat the process of filling the reservoir tank with pump P5 when pumping reservoir contents into the system with pump P4 until fill pump P4 stops automatically when system static fill pressure is ≥1.0 bar. The system pressure (PS1a and PS1b) can be monitored on the Fill Pump Control screen as shown in Figure 6.2 above.
12. Once the system is at the required static fill pressure, go back to fill pump P5 and ensure that the reservoir tank is fully topped up.
13. Leave the filling wand connected and in the container as more fluid will be required as air is expelled from the system during the initial operation.

Figure 6.3 on the next page shows the unit pressure monitoring and fill pump P4 control during system filling operation as part of commissioning (unit offline).

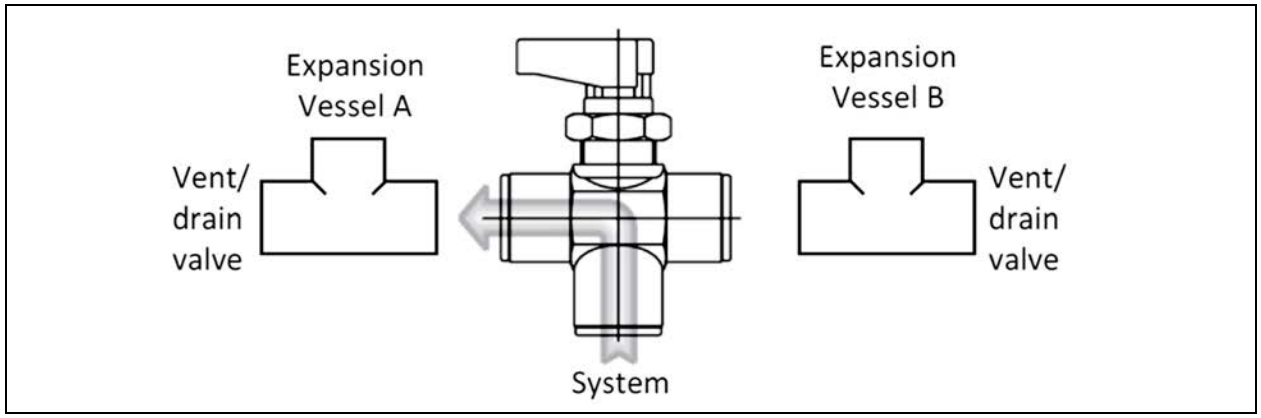
**Figure 6.3 Pressure Monitoring and Filling Operation Fill Pump 4**




### 6.3.3 Expansion Vessel Venting

1. While the system is filling, the common feed hose and pipework leading to the expansion vessels should be manually vented. Set the handle on the 3-way valve between the expansion vessels to vessel A as shown Figure 6.4 below.

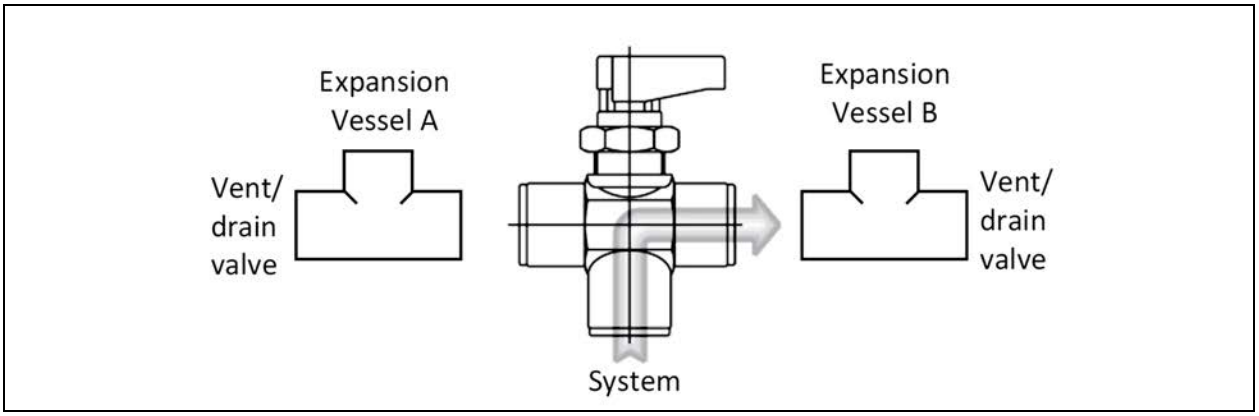
**Figure 6.4 3-Way Valve Handle Set to Expansion Vessel A**



The commissioning/maintenance position of the valve handle is set to vessel A for venting during commissioning (via drain valve) or to leave expansion vessel A in service while expansion vessel B is drained for air pressure check/adjustment without losing system pressure.

2. Open the vent value using the key provided to allow trapped air to vent. See Figure 6.7 on the next page. Close the drain valve as soon as fluid starts to emerge. The hose provided may be used to avoid fluid spillage in the unit. It is recommended that during venting, the drain valve is swivelled so that hose barb connection is pointing upwards to ensure all air is purged and again for step 3.
3. After the drain valve is closed, set the valve handle as shown in Figure 6.5 below to vent expansion vessel B. The released air quality will be small as the main feed hose has already been vented in step 2.

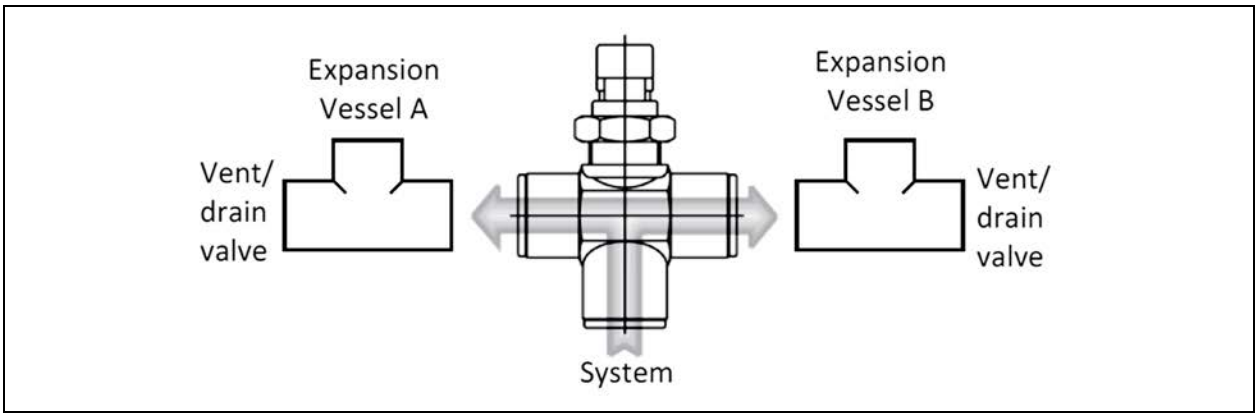
**Figure 6.5 3-Way Valve Handle Set to Expansion Vessel B**




The commissioning/maintenance position of the valve handle is set to expansion vessel B for venting during commissioning (via the drain valve) or to leave the expansion vessel B in service while expansion vessel A is drained for air pressure check/adjustment, without losing system pressure.

4. After venting is complete, set the valve handle to the center position for normal operation.

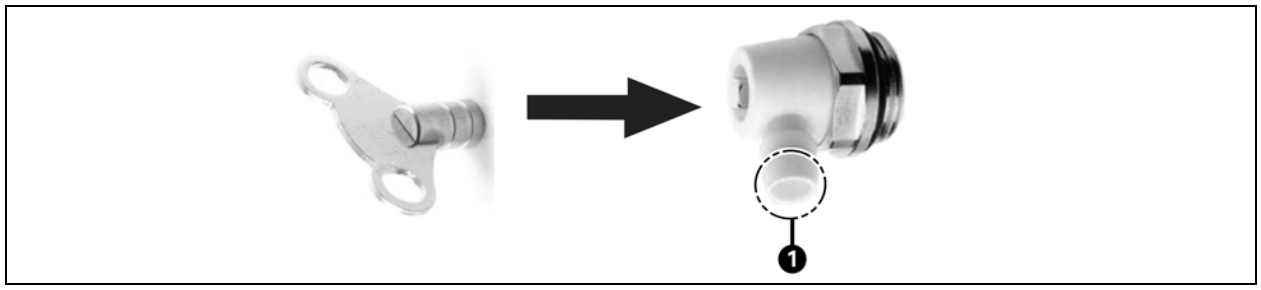
**Figure 6.6 3-Way Valve Handle Set to Normal Operation**




Normal operating position is when the valve handle is set to the center position to connect both expansion vessels to system pressure.

While the system is filling, any trapped air in the expansion vessel supply hose and pipes can be manually vented at the vent valves that are located under each vessel. See Figure 6.7 on the next page.

**Figure 6.7 Vent Valve (with Key)**




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

## 6.4 Pump Rotation

After the initial fill process, the pump rotation direction should be checked.

Start the unit by pressing the green start icon on the Home screen of the display. (Refer to the Vertiv™ CoolChip CDU2300 Operation and IP Communication Guide SL-80096.) If the setpoints are set to default, then the pumps run at reduced speed. Switch unit off again at the display and observe fan rotation at the end of each pump. Rotation should be clockwise when viewed from the motor end.

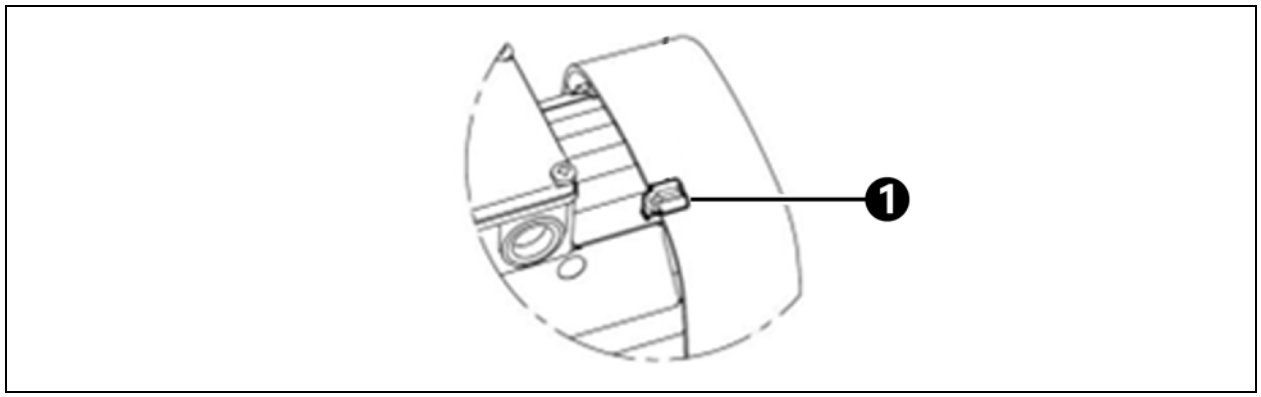
**WARNING! This unit is powered by high voltage. Serious injury or death can occur. All electrical work must be carried out only by a qualified engineer.**

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

**NOTICE**

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

**Figure 6.8 Indicator Flat (Located on Fan Cowl)**




| Item | Description |
|---|---|
| 1 | Indicator |

## 6.5 Unit Low Speed Circulation

It is advisable to continue running the unit at a reduced pump speed to gently circulate the fluid, enabling any trapped air to vent out through the auto air vents. If the setpoints have been left at the default values, then this will happen naturally as these values have been deliberately set quite low. Manually vent the expansion vessels at the Schrader points.

To adjust the pump speed with the Override function, start the unit in normal automatic mode. Allow the pump speeds to settle at the default DP setpoint. See Overrides and Full Speed Operation below.

**NOTICE**

The minimum allowable pump speed is 25%. This enables adequate motor fan cooling and the default DP may not be achieved if it requires the pump to operate below this speed, depending upon system impedance.

Leave the unit running like this for approximately 30 minutes. This allows any trapped air to vent.

**NOTICE**

While the main pump is running, the fill pressure at PS1 may drop as air is purged from the system and the fill pump automatically re-activates.

## 6.6 Overrides and Full Speed Operation

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

To ramp up pump speeds to 100%, follow these steps:

1. Go to the Logon screen and enter the Service code.
2. Go to the Service menu and select Overrides.
   - Select either Pump 1 speed or Pump 2 speed.
   - Enter the desired speed as a percentage of full 60Hz operation.
   - Select OK.

The entire time that this function is operational, the following icon is displayed on the Home screen.

**IMPORTANT! The controller reverts back to full automatic mode if there is no interaction with the touchscreen for 15 minutes (default).**

After all air has been expelled from the system and the Vertiv™ CoolChip CDU2300 maximum performance has been achieved, pump operation can be set back to automatic control. To return to automatic control:

1. Go to Overrides and set the pump speed to 0%. This puts the control back into automatic mode.
2. Set the required final flow rate or DP in the Configuration menu, Pump Control, Differential Pressure Setpoint (P203).

## 6.7 Full Manual Control

Access Full Manual Control from the Service screen when logged on at the Engineering level.

Use Full Manual Control to control one or more outputs in total isolation from the automatic operation of the rest of the unit.

Full Manual Control puts the unit into a dumb mode where all outputs are inactive unless they are manually set. All alarm conditions are ignored.

This function is typically not used during commissioning. Full Manual Control is typically used for fault finding.

**IMPORTANT! If the units was previously running in Automatic mode, the unit will completely shut down when placed in Full Manual Control.**

## 6.8 Subsequent Filling

After the unit is fully commissioned, ensure that the reservoir tank is filled to the maximum level. Refer to Figure 6.2 on page 45 and then disconnect the filling wand and return to the storage location on the left hand cabinet corner post.

The reservoir tank contains approximately 20 liters of fluid. This allows the unit to self fill while unattended in the event of a minor water loss or when remaining trapped air is purged out of the system.

Reservoir tank status should be inspected regularly during service visits and refilled, if required, through manual activation of fill pump P5. Refer to Figure 6.2 on page 45. When reservoir fluid level drops to the middle level sensor, a low level A06—Reservoir Fluid Tank Fluid Required alarm will be raised. If fluid level drops further to the lowest level sensor, an A09—Reservoir Fluid Tank Fluid Required alarm will be raised and system fill pump P4 will be inhibited until the reservoir is re-filled.

# 7 Maintenance

## 7.1 Fluid Specifications

**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.**

**CAUTION: The Vertiv™ CoolChip CDU2300 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 the supplier - detail in the Technical Support and Contacts on page 59.**

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

**NOTICE**

Risk of 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 corrosion. Refer to Technical Data on page 15 for details concerning storage conditions. 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.

- **Primary circuit:** The Vertiv™ CoolChip CDU2300 is designed for use with a facility supply of water or up to 20% glycol/water. A 20% glycol concentration will give protection to approximately 16 °F (-9 °C). If a higher concentration of glycol is used, then the cooling capacity of the unit may have to be de-rated. Contact Vertiv for advice.
- **Secondary circuit:** The secondary circuit should be filled either be PG-25 heat transfer fluid or particulate free deionized water treated with suitable corrosion inhibitors and biocides for the cooling application.

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

## 7.2 Planned Preventative Maintenance

Planned maintenance services should be carried out every 6 months following installation and commissioning.

### 7.2.1 Special Tools and Equipment

- Surface temperature measurement device
- Air temperature measurement device
- Clamp-on ammeter
- Drain tube (supplied with unit)
- Fluid sample kit (for fluid analysis)
- Micro-SD card reader and computer

### 7.2.2 Visual Checks for Damage and Leakage

- Pipework and hoses
- All temperature, level, flow, and pressure sensors
- Expansion vessels and Schrader valves
- Auto air vents and screw caps
- Drain valves
- Pumped clamped connections
- Pipe clamped connections
- Heat exchange pipework and connections

- Check running pump for abnormal noise.
- Record any damage to unit.

### 7.2.3 General Settings

- Record unit serial number on maintenance check lists.
- Record values from controller display home page.

### 7.2.4 Controller Checks

These checks look at setpoints, alarm actions, and group control.

- Check the sync date and time of the units (NTP may or may not be enabled).
- Check for any current alarms and take appropriate action as detailed within Vertiv™ CoolChip CDU2300 Operation and IP communication Manual SL-80096.
- Download the complete contents of the folder with the name of product and serial number from the micro-SD card. This folder contains historic alarm log, system log, parameter log, and data log files.
- Record parameters from the parameter log file that have changed from default since commissioning. These are signified by an asterisk adjacent to the parameter ID in the log file. Verify with the customer why values have changed since commissioned value.

### 7.2.5 Sensor Checks

- Check all fluid and ambient temperature/humidity sensors consistent with surface and air temperature measurement device readings.
- Check pressure and flow sensor readings are consistent with other units in the group (if multiple units) and with commissioned values.

### 7.2.6 Fluid Checks

- Take secondary circuit fluid sample as directed by fluid management partner and send to approved lab for analysis and report recommendations.
- Take action on any previous fluid report recommendations.
- Check supplementary filling operation and manual override if not automatically engaged when taking fluid sample.
- Check makeup reservoir tank is full, properly connected, and that the breather cap is functional.
- Record secondary fluid filter DP readings (PS5a and PS5b difference with PS2).
- Isolate and clean fluid filter(s) if necessary, and record new readings.

### 7.2.7 Functional Checks

Functional checks may require unit shut down.

- Check controller and display firmware status and upgrade if necessary.
- Carry out audible/visual checks on operational pump.
- Override operational pump speed to 100% and record temperature, current, and voltage.
- Override primary control valve to 100% and note feedback signal correponds.
- Check all cable connections and terminals for signs of damage or loose wire connections.

- Check for the fan running status on the EP and ATS.

## 7.3 Secondary Filter Service (if Fitted)

**NOTICE**

This procedure should be carried out by a trained individual or a member of the Vertiv Services team.

**IMPORTANT! The filters can be cleaned while the unit is running, provided that operation is switched to the pump/filter not being cleaned. Place the pump supplying the filter to be cleaned into the out of service state via the Service menu.**

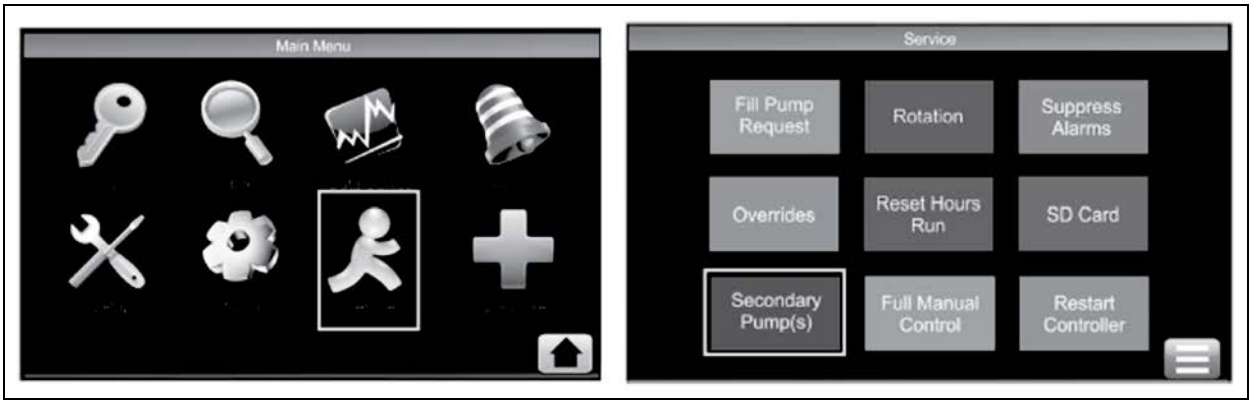
**Internal procedure for service of the filters:**

Turn OFF the entire unit if it is possible, this allow for the simultaneous cleaning of all installed filters.

Otherwise proceed as follows:

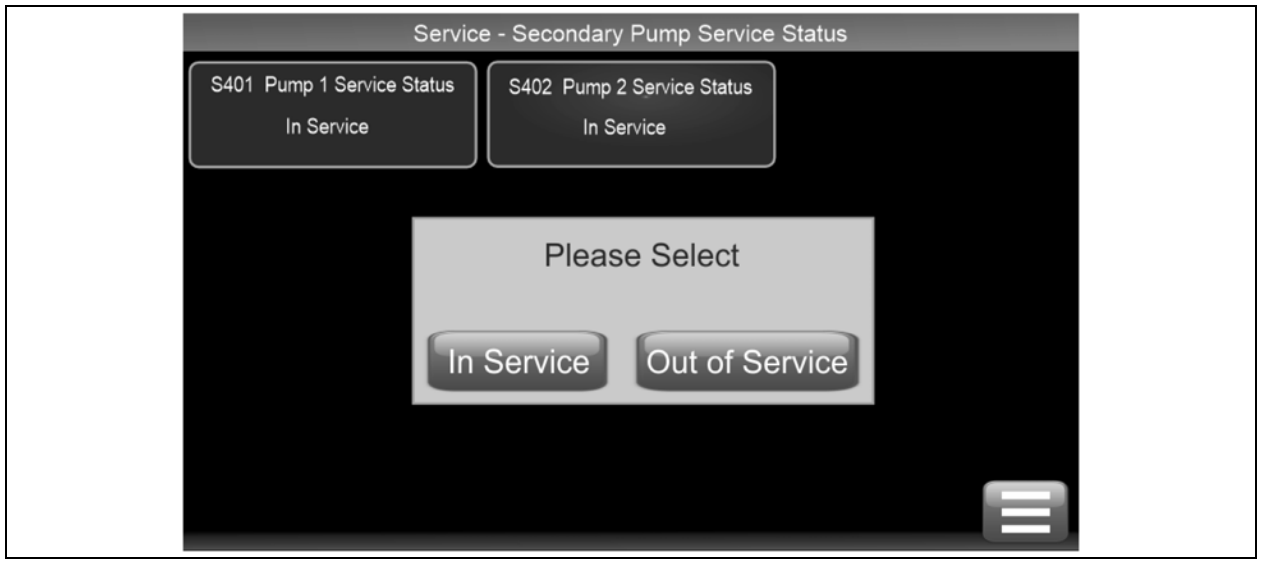
1. Enter the HMI display with Service Password and navigate to Service → Secondary Pumps → Pump 1, 2 or 3 (number of pumps present depends on the unit configuration). See Figure 7.1 below.

**Figure 7.1 Navigating to Secondary Pump(s)**




2. Set the pump present in the filter line to be cleaned (Pump 1, 2, or 3, it depends on the unit configuration) into Service mode through the HMI unit controller. This will ensure the pump will not be operational during the filter cleaning activity.

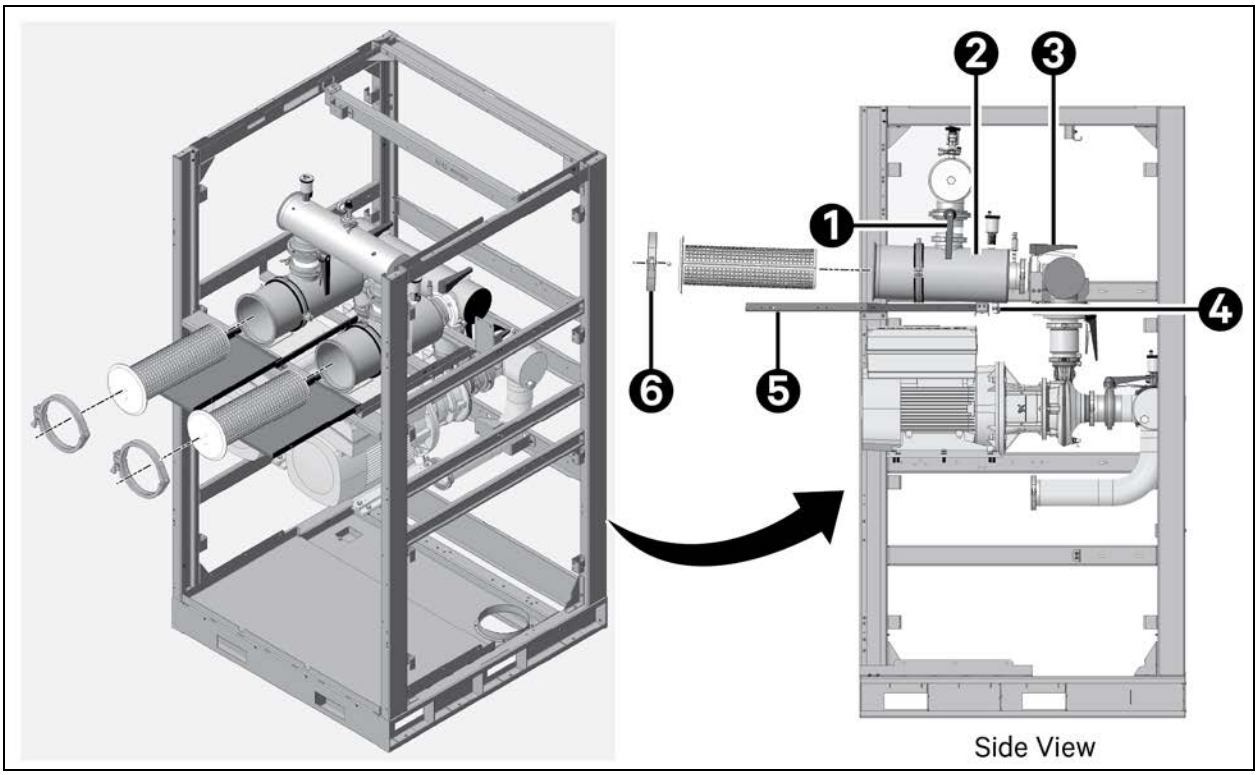
**Figure 7.2 Service - Secondary Pump Service Status**




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

1. Close filter isolation valves A and B as shown in Figure 7.3 on the next page (such as handles vertical/horizontal).
2. Connect hose to drain valve.
3. Drain the fluid from the filter housing using the drain valve and drain hose at the base of the filter housing. the filter housing. It is necessary to completely drain the filter housing before removing the filter screen.
4. After draining the filter we need to ensure that the bottom tray is slided out as shown in Figure 7.3 on the next page to avoid any dripping of water.
5. 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.
6. 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.

**Figure 7.3 Servicing Secondary Filters**




| Item | Description |
|---|---|
| 1 | Filter isolation valve (A) |
| 2 | Housing |
| 3 | Filter isolation valve (B) |
| 4 | Drain valve |
| 5 | Bottom tray |
| 6 | Filter clamp |

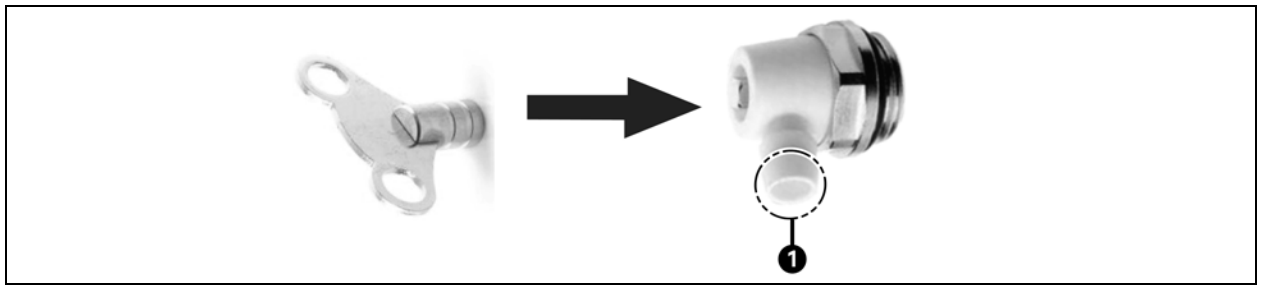
When opening the valves, crack open valve A initially until all contained air is purged out of the filter housing through the automatic air vent. Then fully open valve A and then open valve B. When valve A is opened, the loss of system pressure should automatically start the fill pump P4 to fill the filter housing and bring the system back to operating pressure.

## 7.4 Unit Draining

Drain valves are provided throughout the Vertiv™ CoolChip CDU2300 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 Vertiv CoolChip CDU2300 for maintenance purposes.

If the unit requires draining for service or maintenance, contact Vertiv.

**Figure 7.4 Drain Valve**




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

**Primary circuit drain valve locations:**

- 1 on underside of filter housing (if fitted)
- 1 on supply tail pipe (top or bottom exit)
- 1 on return tail pipe (top of bottom exit)

**Secondary circuit drain valve locations:**

- 1 in base of each pump
- 1 at base of each filter inlet
- 1 in supply tail pipe (bottom exist only)
- 1 in return tail pipe (top of bottom exit)
- 1 in return manifold pipe (if fitted) to heat exchanger

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# Appendices

## Appendix A: Technical Support and Contacts

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

Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2378

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

### A.2 Locations

United States

Vertiv Headquarters

505 N Cleveland Ave

Westerville, OH 43082

Europe

Victor-von-Bruns Strasse 21,

8212 Neuhausen am Rheinfall, Switzerland

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road, Wanchai

Hong Kong

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# Appendix B: Submittal Drawings

Submittal drawings referenced in this document are listed below and are presented in the order as mentioned within this document on the following pages.

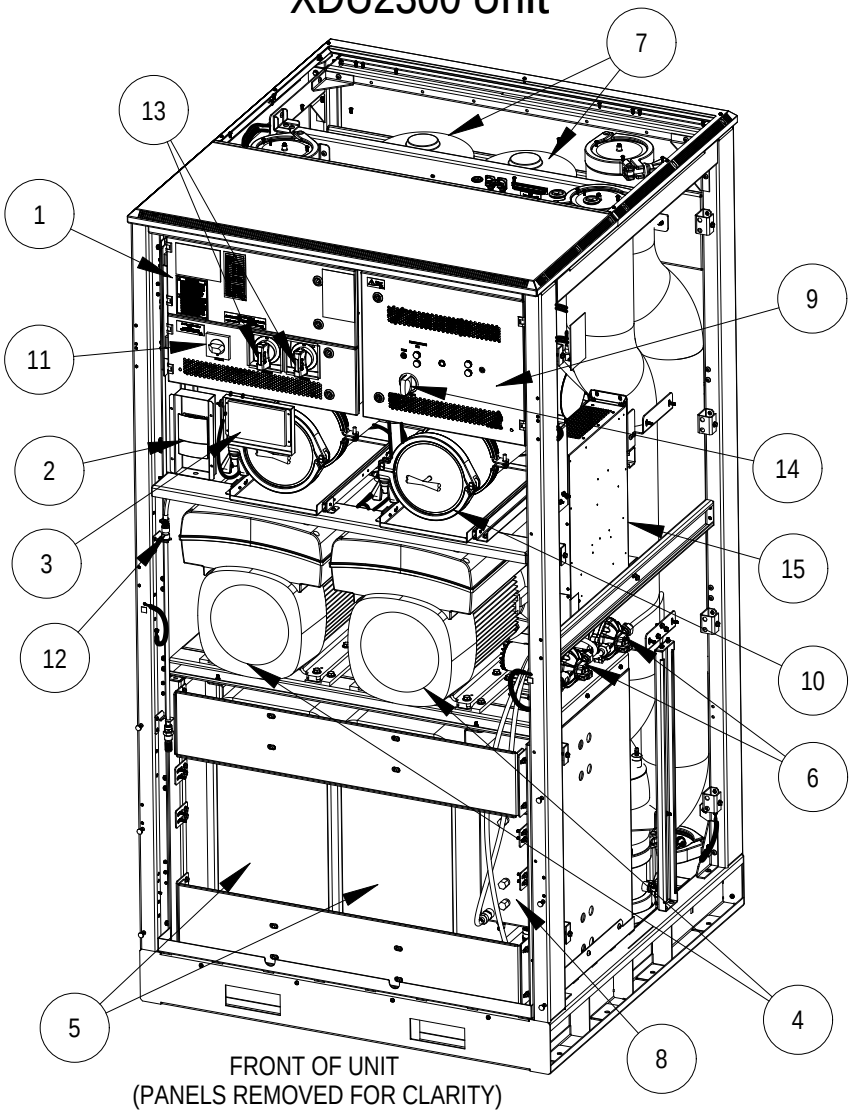
**Table B.1 Submittals**

| Submittal Number | Title |
|---|---|
| 20000262 | Vertiv™ CoolChip CDU2300 Component Location Diagram |
| 20000263 | Vertiv™ CoolChip CDU2300 Cabinet Dimensional Data |
| 20000266 | Vertiv™ CoolChip CDU2300 Piping Schematic |

# COOLCHIP CDU

## COMPONENT LOCATION DIAGRAM

### XDU2300 Unit




FRONT OF UNIT
(PANELS REMOVED FOR CLARITY)

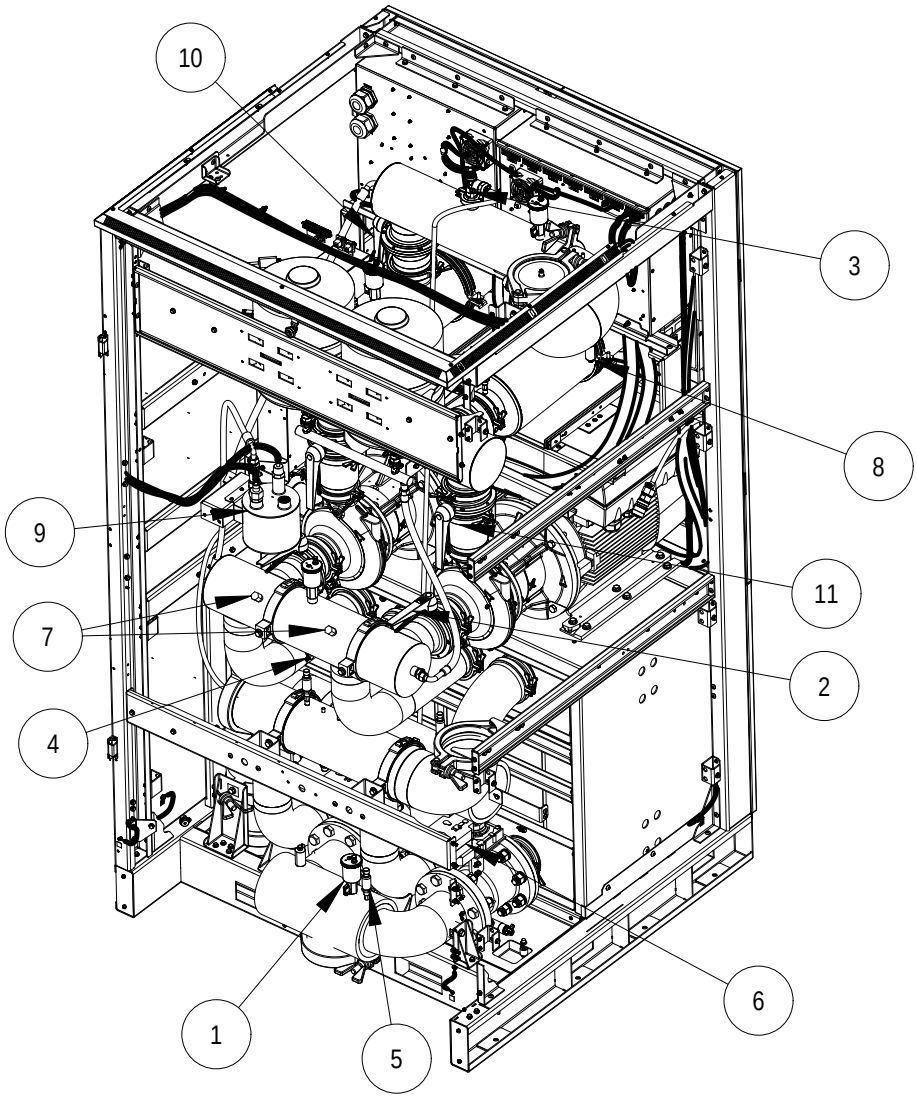
Notes:

1. Controller /Processor Board (Behind Low Voltage Control Panel)
2. Room Temperature & Humidity Sensor (Attached to door, door not shown for clarity)
3. Controller Touch Screen (Attached to door, door not shown for clarity)
4. Secondary Pump (Typ. 2)
5. Plate Heat Exchanger (Typ. 2)
6. Fill Pump (Typ. 2)
7. Expansion Vessel (Optional - Typ. 2)
8. Stainless Steel Reservoir Tank
9. Power Termination Enclosure with Optional ATS
10. Secondary Filter (Typ. 2)
11. Electrical Disconnect Switch
12. Filling Wand
13. Pump Isolation
14. AHF Isolation
15. AHF (Active Harmonic Filter)

# COOLCHIP CDU

## COMPONENT LOCATION DIAGRAM

### XDU2300 Unit




REAR OF UNIT
(PANELS REMOVED FOR CLARITY)

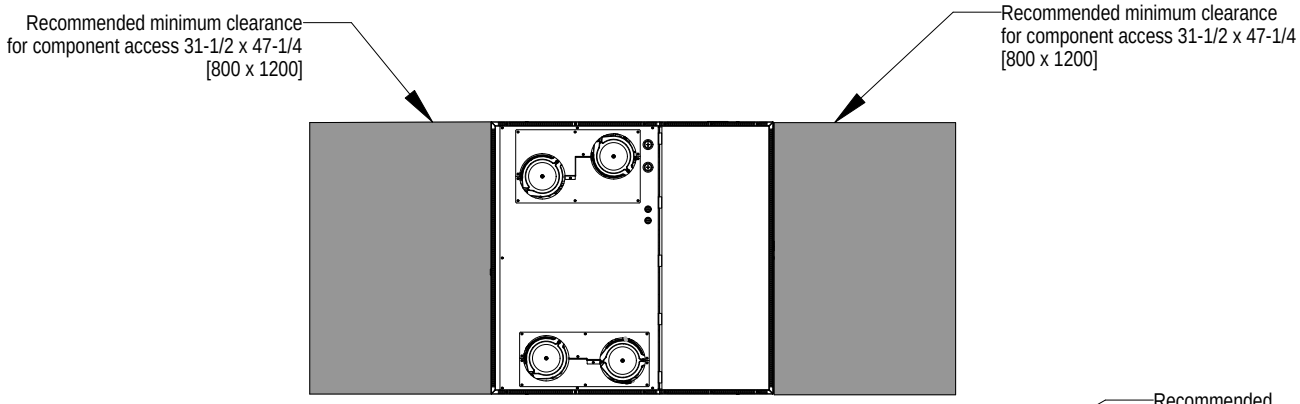
Notes:

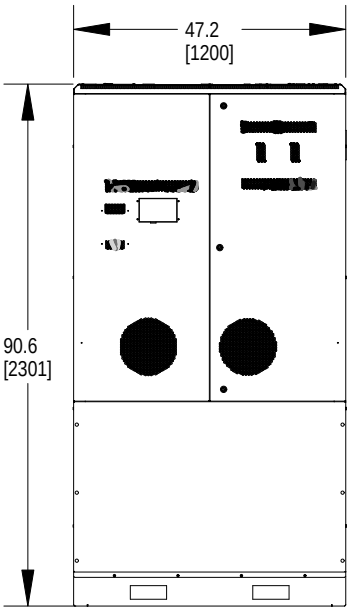
1. Auto Air Vents (Typ. 5)
2. Pump Isolation Valves (Typ.4)
3. Pressure Relief Valve
4. Drain Valves
5. Pressure Sensor
6. Primary Two-Way Control Valve (Typ. 2)
7. Level Sensor
8. Flow Sensor
9. Secondary Fluid Monitoring Package (Optional)
10. Filter Isolation Valves (Typ.4)
11. Check Valves (Typ. 2)

# COOLCHIP CDU

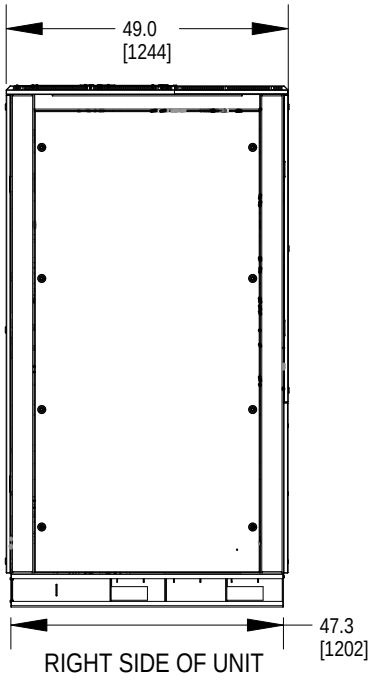
## CABINET DIMENSIONAL DATA

### XDU2300 Unit

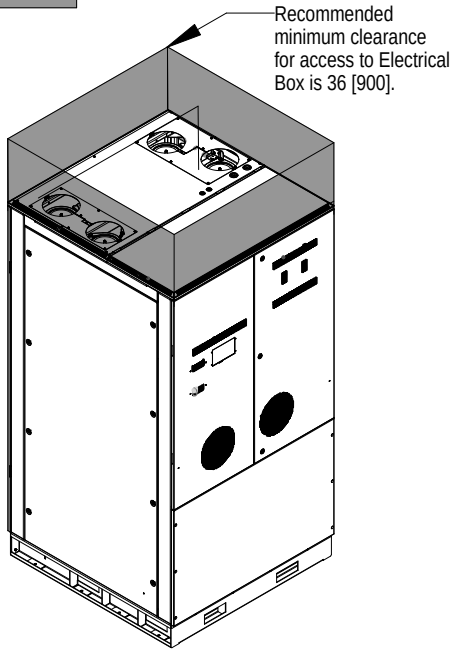


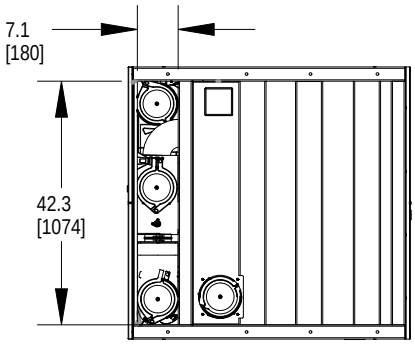




FRONT OF UNIT




RIGHT SIDE OF UNIT




BOTTOM OF UNIT

Notes:

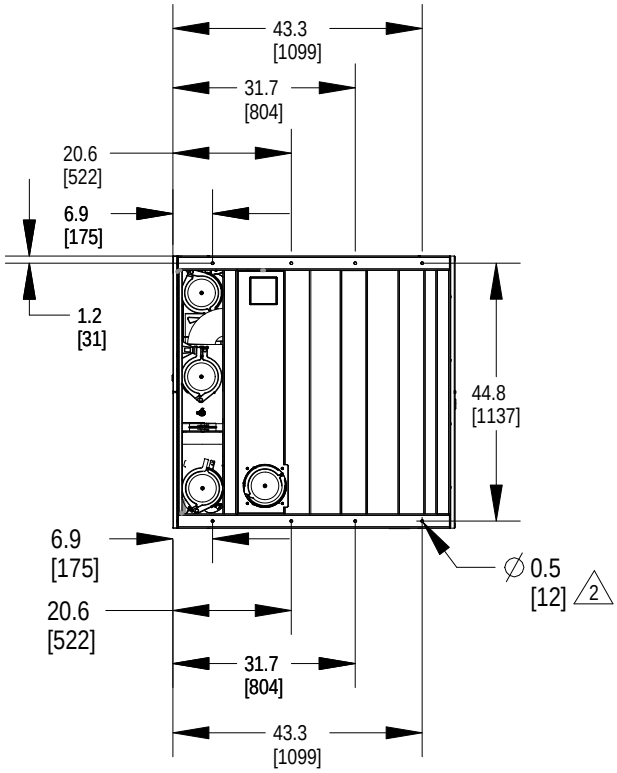
1. Dimensions are in. [mm].
2. Lifting and anchoring dimensions on page 2.

# COOLCHIP CDU

## CABINET DIMENSIONAL DATA

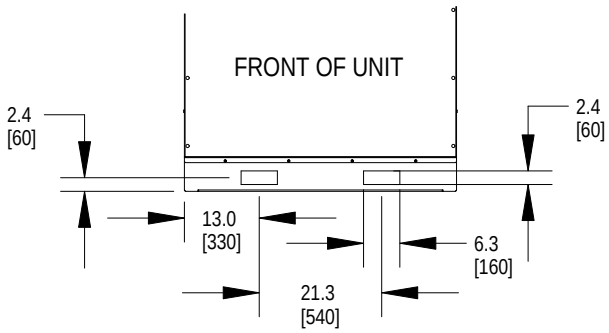
### XDU2300 Unit

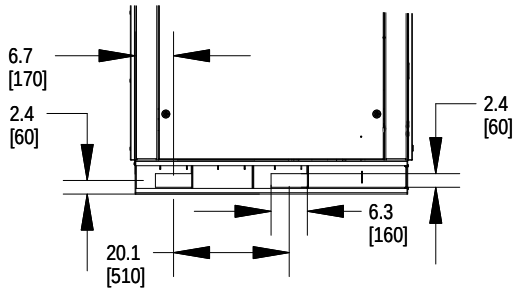
ANCHORING DIMENSIONS




BOTTOM OF UNIT

LIFTING DIMENSIONS




RIGHT SIDE OF UNIT

| Unit Weight 3 | | | | | | |
|---|---|---|---|---|---|---|
| Base Unit | Dry Weight | | Operating Weight | | Shipping | |
| | lbs. | kg | lbs. | kg | lbs. | kg |
| | 3130.5 | 1420 | 4345 | 1971 | 3505 | 1590 |

| Shipping Dimensions | | | | | | |
|---|---|---|---|---|---|---|
| Base Unit | Width | | Depth | | Height | |
| | in. | mm | in. | mm | in. | mm |
| | 54.6 | 1387 | 52.7 | 1340 | 97.9 | 2486 |

Notes:

1. Dimensions are in. [mm].

2. Anchoring holes (Typ. 8 Plcs.) will use field supplied hardware.

3. Additional weight of unit with ATS is 4.4lbs. (2kg).

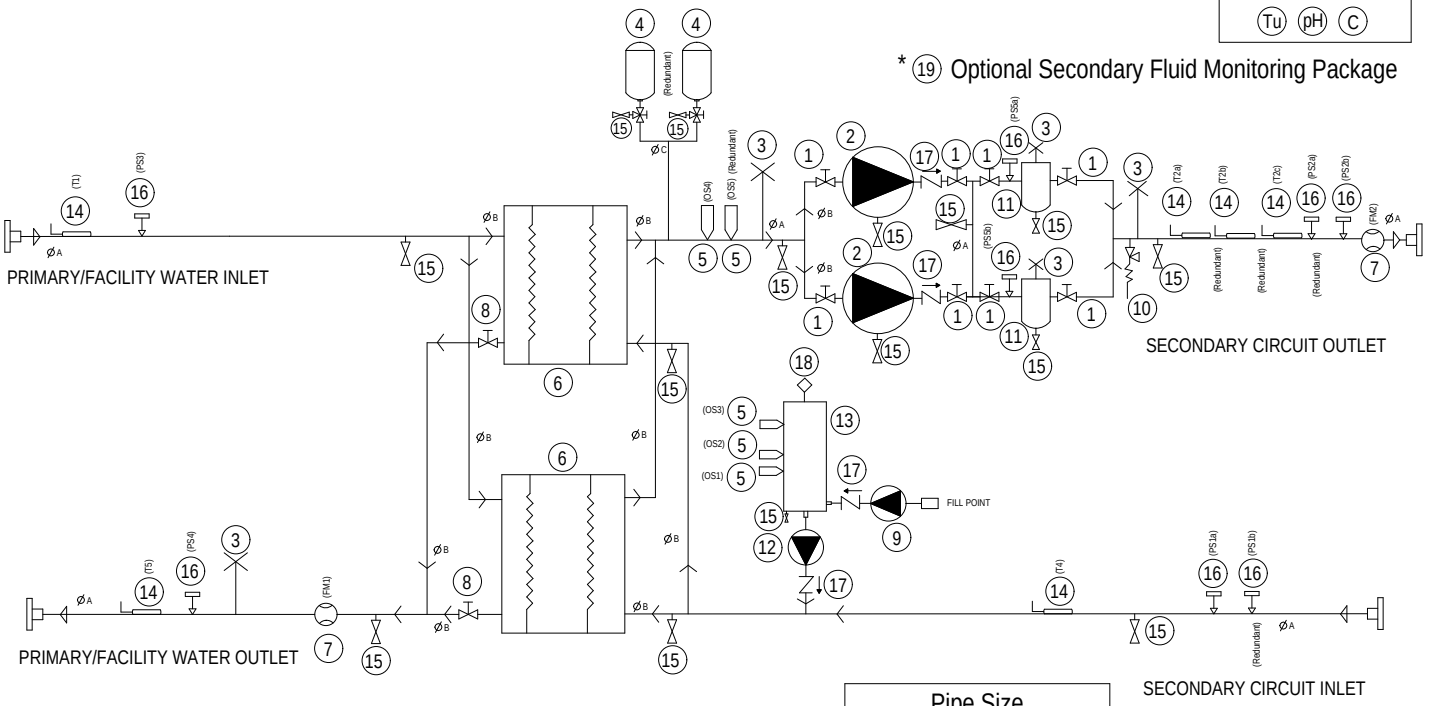
# COOLCHIP CDU

## PIPING SCHEMATIC

### XDU2300 Unit

**Secondary Fluid Monitoring System
Tu pH C

* 19 Optional Secondary Fluid Monitoring Package




| Pipe Size | |
|---|---|
| ∅ A | 152.4mm (6 in) |
| ∅ B | 101.6mm (4 in) |
| ∅ C | 25.4 (1 in) |

* Connection location is on Secondary inlet and outlet manifolds
** Optional Secondary Fluid Monitoring Package

| Ref. | Description | Ref. | Description | Ref. | Description |
|---|---|---|---|---|---|
| 1 | Shut Off Valve | 9 | Reservoir Fill Pump P5 | 17 | Check Valve |
| 2 | VFD Pump | 10 | Pressure Relief Valve | 18 | Breather |
| 3 | Auto Air Vent | 11 | Secondary Filter | 19 | Secondary Fluid Monitoring System |
| 4 | Expansion Tank | 12 | System Fill Pump P4 | | |
| 5 | Water Level Sensor | 13 | Reservoir Tank | | |
| 6 | Brazed Plate Heat Exchanger | 14 | Temp. Sensor | | |
| 7 | Flowmeter | 15 | Drain Valve | | |
| 8 | 2-Way Modulating Control Valve | 16 | Pressure Sensor | | |

Notes:
1. Arrangement Diagram representation shown. Do not use for specific connection locations.
2. For each CoolChip XDU unit, a seprate 500 micron filter is required in the chilled water supply from the chilled water source. The filter is field supplied and installed. The maximum distance of the filter is 10 feet from the CoolChip XDU.
3. Field installed 50 micron filter required in the secondary retun line to CoolChip XDU for direct to chip applications, recommended for rear door applications. Vertiv recommends bypass piping arrangement to allow for cleaning the filter without disrupting unit operation. Also, pressure taps across the filter to check pressure drop. Three full port ball valves and piping are supplied by the field, please refer to Field Supplied Equipment and Materials document (20000284) for more information. The maximum distance of this asembly is 10 feet from the CoolChip XDU Unit.
4. Unit isolation valves are required in the field piping of facility and secondary fluid connections to facilitate service. The isolation valves are field supplied and installed.

# Appendix C: Notes

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# Appendix D: Disposal Procedure

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

Decommissioning 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 an approved recycling facility.

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