

Vertiv™ CoolChip CDU 600/1350 Row-Based Coolant Distribution Unit GUIDE SPECIFICATIONS

1.0 GENERAL

1.1 Summary

These specifications describe requirements for a Coolant Distribution Unit (CDU). The CDU is designed to control supply fluid temperature, flow and pressure to cabinets containing fluid cooled electronic equipment. The manufacturer has designed and furnished all equipment to be fully compatible with all requirements of the fluid cooled electronic equipment cabinet.

1.2 Design Requirements

The CDU is a Vertiv self-contained, factory assembled unit. The standard unit is cULus certified to the harmonized U.S. and Canadian product safety standards: UL 60335-2-40, 4th Ed.; UL 60335-1, 6th Ed.; CSA C22.2 No. 60335-2-40, 4th Ed.; and CSA C22.2 No. 60335-1:16, 2nd Ed., for household and similar electrical appliances. Units are marked with the cULus label. Vertiv products, when installed and operated in compliance with this document, the operation and maintenance guide, and the installation and commissioning guide, conform to the Machinery Directive 2006/42/EC, the Low Voltage Directive 2014/35/EU, the EMC Directive 2014/30/EU, and the Pressure Equipment Directive 2014/68/EU. Vertiv declares that this product, manufactured and supplied by Vertiv, is fully REACH and RoHS compliant in accordance with EC REACH Directive 1907/2006 and EU RoHS Directive (EU) 2011/65/EU.

1.3 Submittals

Submittals are provided with the proposal, including dimensional drawings single line diagrams and piping connection drawings.

1.4 Acceptable Alternatives

Acceptable alternatives are permitted with engineer's prior approval only. Contractor to submit a detailed summary form listing all variations to include size deviations, electrical load differences, functional and component changes, and savings to end user.

1.5 Quality Assurance

The specified system is factory tested before shipment. Testing includes but not limited to quality control checks, Hi-Pot, and full function system test. The system is designed and manufactured according to world class quality standards. The manufacturer is ISO 9001 certified. The system is flushed prior to shipment and given a charge of Nitrogen.

2.0 PRODUCT

2.1 Cooling System

2.1.1 Heat Exchanger

The heat exchanger is a compact, highly efficient S304/S316 stainless steel, copper brazed plate liquid to liquid heat exchanger. The heat exchanger is AHRI certified. The heat exchanger will be self-cleaning, gasket free, and maintenance free. Performance is calculated to provide a minimum of 5% over surfacing (margin). The fluid circuit is designed to distribute fluid into the entire heat exchanger face area on both FWS and TCS sides.

2.1.2 Pipe Work and Fitting

The heat exchanger is connected to the pipe work with stainless steel hygienic fittings and is quickly removeable without special tools or fixtures. All internal pipe work is S304/S316 stainless steel and is put through a chemical cleaning and passivation process. Wetted materials list is provided in the manuals. All wetted material is OCP and ASHRAE approved and compatible with a Propylene Glycol water-based mixture or treated water as the TCS coolant. Both Facility Water system (FWS) and Technology Cooling System (TCS) pipework is provided with automatic air vents and self-sealing, rotating head drain valves within the unit.

2.1.3 Facility Water System Side (Facility Circuit) Insulation

The FWS pipework of the CDU and heat exchanger is insulated with flexible Class O insulation for reliable and continuous condensation control with no additional vapor barrier required. The thermal insulation has a very low thermal conductivity, extremely high resistance to water vapor transmission, and excellent fire performance.

2.1.4 Pressure Relief Valves

The WRAS certified pressure relief valve (PRV) is factory installed in the CDU TCS piping with ratings for 3, 4, 5, or -6 bar based on customer TCS requirements.

2.2 Pumps

2.2.1 Main Pumps

The CDU utilizes a horizontal end-suction pump with a compact, modular, multi-stage design with close-coupled motor for high energy efficiency. The pump is constructed of stainless-steel wetted components within the fluid path. The pump is dynamically balanced with multiple impellers for quiet, reliable, low vibration operation. The pump speed is variable and automatically regulated to setpoint by the Vertiv controller including weekly automatic seamless changeover control to even run time and improve pump life. Each pump has an integral check valve, dedicated motor, and speed controller with fault monitoring circuitry. The inverter parameters such as current, output voltage, frequency, and power are reported at the unit display. Pumps are direct coupled with the motor and have at least IE3 efficiency rating. Pumps, inverters, and power trains are suitably sized to allow simultaneous, multi-pump, operation. Pumps are connected to the power train via EMC shielded plug/socket connection and fitted with isolation valves in the pipe work at inlet and outlet to allow for concurrent maintainability. Flow is monitored by flow meter and differential pressure (DP) sensors.

- Vertiv™ CoolChip CDU 600

- Twin pumps are provided as standard, configurable for either run/standby (N+N) or simultaneous operation for maximum TCS flow.
- Vertiv™ CoolChip CDU 1350
 - Triple pumps are provided as standard, configurable for either run/standby (N+1) or simultaneous operation for maximum TCS flow.

2.3 Filter

2.3.1 Technology Cooling System Filtration

The unit can be equipped with a large capacity, removeable, and washable TCS filter assembly on each pump providing filtration to either 25 microns (μ) or 50 microns (μ). The filters are concurrently maintainable. The filters are designed with sufficient face area to enable a filter media velocity of <0.5 m/s (1.6 ft/s) and enables zero filter media bypass. The filters are fitted with differential pressure monitoring used to report state of cleanliness of the filters and trigger an alarm when cleaning is required.

2.4 Wired Temperature Sensors

2.4.1 Fluid Temperature Sensors TCS Circuit

Each unit has triple redundant factory installed and connected TCS supply temperature sensors that are used to set the FWS control valve position and maintain supply temperature. A temperature sensor also measures the TCS return temperature and an indicative value for heat transfer in kW is displayed at the controller.

2.4.2 Room Temperature/Humidity Sensor

A temperature and humidity sensor is mounted on the front door to enable monitoring of the local environment. These values are used to calculate IT environment dewpoint. Dewpoint control is a standard feature of the control system to enable automatic setpoint override in the event of a risk of condensation.

2.4.3 Facility Water System Supply/Return Temperature Sensors

The CDU has factory installed and connected temperature sensors on the FWS supply and return lines used for monitoring and reporting.

2.5 Flow Meters

Each unit has one water flow meter monitoring fluid provided at the discharge of the TCS circuit and one flow meter monitoring the fluid circulating at the inlet of the FWS circuit.

2.6 Pressure Sensors

Each unit has redundant pressure sensors for both supply and return on the TCS circuit. The TCS supply and return sensors are used to determine pump speed in differential pressure mode of operation.

2.7 Single Locking Disconnect Switch

A manual disconnect switch is mounted in the electrical panel to disrupt the flow of power to the electrical panel. The electric panel compartment is accessible only with the disconnect switch in the Off position.

The switch is located behind the unit front door for quick access. The disconnect switch is lockable in the off position.

2.8 Short Circuit Current Rating (SCCR)

The electrical panel can provide 65 kA SCCR or 5 kA SCCR depending on customer selection.

2.9 Cabinet Construction and Accessibility

2.9.1 Cabinet Construction

The exterior panels are 18-gauge steel and powder coated to protect against corrosion. The unit is mounted on an integral base with castors or forklift cutouts for quick installation and provided with holes for bolting down.

2.9.2 Serviceability

The cabinet is designed so that all components are easily accessible for service and maintenance through either the front or rear of the unit.

2.9.3 Tie-Down Bracket

The CoolChip CDU 600 ships with an angle bracket allowing the CDU to be bolted to the floor. This tie-down bracket ships loose on the CoolChip CDU 600 and is to be installed by customer as directed by Engineer of Record.

3.0 CONTROL

3.1 Vertiv Controller Microprocessor Control with 7-inch Color Touch Screen

The Vertiv controller is microprocessor based with a 7-inch, high definition, resistive, color touch screen display and is mounted on the CDU front door. The controls are menu driven.

The system displays user menus for:

- Status
- Data curves
- Alarms
- Setup
- Configuration
- Service and diagnostics (including the monitoring of room conditions, operational status of each function, date, and time)
- Total run hours
- All sensors
- Display setup

Service menu includes:

- Setpoints, standby settings (lead/lag)
- Timers
- Alarm setup
- Maintenance and alarm threshold settings
- Options setup
- System/network setup
- Diagnostics/service mode

3.1.1 Communications

The Vertiv controller provides redundant Ethernet/RS-485 ports dedicated for BMS connectivity (communications). RS-485 communications includes Modbus RTU. TCP/IP communications and features include Modbus over IP, SNMP, FTP, web server, and NTP with automatic daylight saving offsets. A BACnet gateway will provide both BACnet IP and BACnet MSTP client/master devices to read all configured Modbus signals.

3.1.2 Password Protection

The Vertiv controller contain four unique password levels to protect against unauthorized changes. A password is required to make system level changes. An auto hide/show feature allows the user to see/edit applicable information based on the login used.

3.1.3 Unit Backup and Restore

The controller creates safe copies of control parameters. A log file is accessible which allows the end user to download and view unit level settings, parameter names, default values, triggered alarms, newly adjusted values, and performance history. Log files of all parameter values are stored on an SD card daily. Additionally, all alarms and events are stored in an alarm log and any user changes by whatever method are stored in a syslog file.

3.1.4 Unit Status

The Vertiv controller shows the CDU's operating status on the controller home page. The screen indicates if the unit has an active alarm, and/or if the unit is On, Off, or in standby status.

3.1.5 Event Log

The Vertiv controller automatically stores the syslog, alarm log, and parameter data logs for the lifetime of the unit.

3.1.6 Firmware Updates

Vertiv controller upgrades are performed through a local USB connection or SD card.

3.1.7 Automatic Start/Stop

The menu allows various customer settings for turning the unit On or Off locally at the display, or in response to certain critical alarms.

3.2 User Menu

3.2.1 Home Menu

The unit home menu displays the CDU's current operating conditions on the screen:

- FWS circuit flow
- FWS circuit supply temperature
- FWS circuit return temperature
- Cooling valve position and feedback
- Pump speed demand
- TCS circuit flow
- TCS circuit supply temperature
- TCS circuit return temperature
- TCS circuit differential pressure
- Ambient temperature, humidity, and dew point
- Unit status
- Unit mode
- Alarm status
- Firmware name and revision
- A and B IP addresses

3.2.2 Submenus

The menu is sub-divided into eight main sections:

- **Login screen:** Allows access to further information and to adjust various parameters and settings when logged in at service or engineer level.
- **Status screen:** Displays read-only comprehensive information on the operating condition of the unit.
- **Data curves screen:** Displays a graphical representation of two pieces of variable data—a red trace for cooling demand and a yellow trace for TCS supply temperature. Both traces update in real time.
- **Alarms screen:** Displays new or active alarms and allows acknowledgement of these events.
- **Setup screen:** The setup screen displays read-only information with user level access with factory settings or parameters set at commissioning. Adjustments to the settings are made with higher level access.
- **Configuration screen:** Sets specific parameters and control functions when logged in at the appropriate user level.
- **Service screen:** Used to set selected parameters and to assist in commissioning. Accessible only with service and engineer login codes.
- **Diagnostics screen:** Provides information and conversion factors for the status for all universal inputs, resistive inputs, digital inputs, digital outputs, and analogue outputs.

3.3 Alarms

Active alarms are shown on the home screen, recorded in a log file and, if configured to do so, flagged through an external building management system (BMS) connection.

Alarms to include:

- Flow, pressure, and temperature alarms
- Inverter and controller fault alarms
- Leak detection alarms
- Communication fault alarms
- Filter condition alarms
- Leak Detection (if installed by customer)

3.4 BMS Connectivity

The Vertiv controller communicates over the following protocols:

- Modbus RTU (standard)
- Modbus TCP/IP (standard)
- Web server
- SNMP
- BACnet IP and MSTP

3.5 System Auto Reset

The unit restarts pumps within 5 seconds after a system reboot. The system pumps return to running at the last known speed after a reboot, and the FWS CDU control valve returns to its last known position to maintain desired user defined setpoints.

3.6 Controller

The Vertiv controller is factory set to allow precise monitoring and control of the fluid flow and temperature leaving the unit.

3.6.1 TCS Temperature Control

TCS supply temperature is manually set from the Vertiv controller based on the demand of equipment being served by the unit. Once set, the controller precisely monitors and modulates the FWS CDU cooling control valve to maintain the TCS supply temperature. The unit is configured to run in fixed set point or dew point override. Dew point override is to allow the unit to automatically raise the TCS supply temperature if the ambient conditions are such that there is a risk of condensation in the TCS circuit.

3.6.2 Group Control

Up to 16 CDUs can be configurable to operate in group control mode, enabling multiple units to contribute to the total flow and duty requirement and provide redundancy on a system level. Once each unit has been assigned a unique address, the system becomes self-organizing with one unit automatically assuming the role of the master and coordinating the running state of the other units based on the configured level of redundancy, the system pressure requirements, and any alarm conditions.

It is possible to make changes to the group settings (for example, number of run units) or system settings (for example, DP setpoint) via any unit touchscreen user interface.

3.7 Remote Device Interfaces

3.7.1 Remote Shutdown

The CDU supports remote start/stop options available over Modbus, BACnet, and SNMP.

3.7.2 Leak Detection Sensors

Internal Leak Detection

The unit is fitted with an internal drip tray and leak detection. If a leak is detected, an alarm is generated at the unit and configured by the customer to alarm only or alarm & shutdown.

External Leak Detection—Optional

A Leak Detection cable that can sense water anywhere along its length is connected to the unit controller. This sensor provides external leak detection along the length of the TCS or hose run. If a leak is detected, an alarm is generated. Upon leak detection, the CDU can be configured to alarm only or alarm + shutdown.

4.0 MISCELLANEOUS OPTIONS

4.1 External Leak Detection Tape—Optional (Ship Loose)

A twisted pair leak detection cable can be field installed along the length of the TCS circuit or hose run. If a leak is detected, alarms are generated at the CoolChip CDU and the unit can be configured to alarm only or alarm + shutdown.

4.2 FWS Stainless Steel Facility Hose Set—Optional (Ship Loose)

FWS hoses allow for flexibility in the positioning of the CoolChip CDU unit when installing and connecting the facility circuit to the CoolChip CDU FWS inlet and outlet tails. The hoses are constructed from stainless steel overbraid, with hygienic flange on unit connection, and ANSI 150 lb. flange on the FWS connection. The hose gaskets are included with the hose set.

4.3 TCS Stainless Steel Hose Set—Optional (Ship Loose)

TCS hoses allow for flexibility in the positioning of the CoolChip CDU unit when installing and connecting to the TCS loop that feeds the fluid cooled equipment. The hoses are constructed from stainless steel overbraid, with hygienic flange on unit connection, and ANSI 150lb. flange on the TCS connection. The hose gaskets are included with the hose set.

4.4 Stainless Steel 10-liter Volume Make-Up Tank—Optional (Factory Fitted)

A stainless-steel tank is provided to monitor and maintain the fluid levels in the system. The tank is equipped with three level sensors to detect fluid levels and trigger appropriate notification and/or alarms as fluid levels drop. The pump of the tank is integrated into the fluid system to automatically add fluid as needed.

4.5 Automatic Transfer Switch ATS—Optional (Factory Fitted)

The ATS allows the CoolChip CDU to be connected to A and B electrical supplies. Supply A will be the default power source, but should this supply fail for any reason, the ATS will seamlessly switch over to supply B, without any stoppage or function loss in the CoolChip CDU. When supply A comes back online, the ATS will automatically switch back to this supply as the default.

4.6 TCS Fluid Monitoring—Optional (Factory Fitted)

The TCS fluid monitoring system contains three sensors: conductivity sensor, turbidity sensor, and pH sensor. These sensors monitor each of the parameters on regular intervals. The CDU contains an auxiliary IO module that receives a feedback signal from each of the sensors which is communicated to the main controller through the Modbus RS485. An alarm is generated if any of the set values are out of threshold limits.

5.0 EXECUTION

5.1 Installation of Thermal Management Units

5.1.1 General

Install cooling units in accordance with manufacturer's installation instructions. Install units, plumb and level, firmly anchored in locations indicated and maintain manufacturer's recommended clearances.

5.1.2 Electrical Wiring

Install and connect electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish a copy of manufacturer's electrical connection diagram submittal to the electrical contractor.

5.1.3 Piping Connections

Install and connect devices furnished by manufacturer but not specified to be factory mounted. Furnish a copy of the manufacturer's piping connection diagram submittal to piping contractor.

5.1.4 Field Quality Control

Startup cooling units in accordance with manufacturer's startup instructions. Test the controls to demonstrate compliance with requirements. These specifications describe requirements for a computer room environmental control system. The system is designed to maintain flow and temperature conditions for fluid cooled electronic equipment.

The manufacturer has designed and furnished all equipment to be fully compatible with heat dissipation requirements.

5.1.5 Supply and Return Fluid Piping

Connect flushed and cleaned FWS and TCS circuit supply and return to the Coolant Distribution Unit.

5.1.6 Warranty Start Up and Control Programming

The unit is installed in accordance with manufacturer's installation instructions provided with seismic option to be firmly anchored to maintain manufacturer's recommended clearances. Mounting requirement details such as anchor brand, type, embedment depth, edge spacing, anchor-to-anchor spacing, concrete strength, special inspection, and attachment to non-building structures must be outlined and approved by the engineer of record for the projection or building. Electrical, pipe, and duct connections must permit movement in three dimensions and isolate the unit from field connections. Electrical conduit shall be flexible, having at least one bend between the rigid connection at the unit cabinet and the connection to rigid conduit or foundation. The piping flexible connection or loop must be suitable for the operation pressure and temperature of the system. Furnish copy of manufacturer's piping connection diagram submittal to piping contractor.

Engage the manufacturer's field service technician to provide warranty start up supervision and assist in programming of units' controls and ancillary panels supplied by them.