

Vertiv™ Liebert® XDU

Row Based Environmental Control System

Guide Specifications

1.0 GENERAL

1.1 Summary

These specifications describe requirements for a Thermal Management system. The system shall be designed to control supply fluid temperature to cabinets containing fluid cooled electronic equipment. The manufacturer shall design and furnish all equipment to be fully compatible with the heat dissipation requirements of the fluid cooled electronic equipment cabinet.

1.2 Design Requirements

The Thermal Management system shall be a Liebert self-contained, factory assembled unit.

1.3 Product Standards and Approvals

The XDU Thermal Management system complying with North American requirements shall be Certified/Listed to one of the following harmonized US and Canadian product safety standards. Units are marked with the CSA logo with “c” and “us” country identifiers.

- CSA C22.2 No. 236/UL 1995 Heating and Cooling Equipment; or
- CSA/UL 60335-2-40 Household and similar electrical appliances - Safety - Particular requirements for electrical heat pumps, air-conditioners, and dehumidifiers, in conjunction with CSA/UL 60335-1 Household and similar electrical appliances - Safety - Part 1: General requirements

The XDU Thermal Management system complying with CE requirements shall conform to the following Directives, Standards and Regulations. Units are marked with the CE Mark and come with Declarations of Conformity.

- Machinery Directive 2006/42/EC and Low Voltage Directive 2014/35/EU:
 - EN 60335-2-40 Household and similar electrical appliances - Safety - Particular requirements for electric heat pumps, air conditioners and dehumidifiers, in combination with
 - EN 60335-1 Household and similar electrical appliances - Safety - Part 1: General requirements
- EMC Directive 2014/30/EU:
 - EN 61000-6-2 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments
 - EN 61000-6-3 Electromagnetic compatibility (EMC) Part 6-3: Generic standards - Emission standard for residential, commercial, and light industrial environments
- Directive 2011/65/EU - Restriction of Hazardous Substances in Electrical and Electronic Equipment and Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU
- REACH Regulation EC No. 1907/2006 - Registration, Evaluation, Authorization and Restriction of Chemicals

1.4 Submittals

Submittals shall be provided with the proposal and shall include: Single Line Diagrams; Dimensional, Electrical, and Capacity Data; Piping and Electrical Connection Drawings.

1.5 Acceptable Alternatives

Acceptable alternatives shall be 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.

1.6 Quality Assurance

The specified system shall be factory-tested before shipment. Testing shall include but shall not be limited to: Quality Control Checks, "Hi-Pot." The system shall be designed and manufactured according to world class quality standards. The manufacturer shall be ISO 9001 certified.

2.0 PRODUCT

2.1 Cooling System

2.1.1 Fluid System

The fluid circuit shall be designed to distribute fluid into the entire coil face area.

2.1.1.1 Cooling Coil

The fluid cooling coil shall be 7.25 ft² (0.674m²) face area, six rows deep. It shall be constructed of copper tubes and aluminum fins.

2.1.2 Pumps

2.1.2.1 Dual Pump

The unit shall be equipped with two pumps for redundancy. The pump speed shall be variable and automatically regulated to setpoint by the Vertiv™ Liebert® iCOM™ including lead/lag control to even run time and improve pump life. Each pump shall have a dedicated motor, and speed controller with fault monitoring circuitry which provides a level of redundancy. Flow is monitored by flow meter and pressure sensors.

Each pump shall be rated for _____ GPM (___ l/min.) at ___ ft. (___ kPa) of head.

2.2 Fan Section

2.2.1 Models Vertiv™ Liebert® XDU060

The unit shall be equipped with two plug fans: direct driven centrifugal fans with backward curved blades and electronically commutated DC motors; commonly referred to as EC plug fans. The fan speed shall be variable and automatically regulated to the discharge fluid temperature by the Liebert® iCOM™. Each fan shall have a dedicated motor, fault monitoring circuitry and speed controller which provides a level of redundancy. The impellers shall be made of aluminum and balanced. The EC plug fans shall be mounted on the front door. The entire fan assembly shall be capable of swinging out of the unit for accessibility. The fans shall be located to blow air through the cooling coil to ensure even air distribution and maximum coil performance.

2.3 Cabinet Construction and Accessibility

2.3.1 Cabinet Construction

2.3.1.1 Models Vertiv™ Liebert® XDU060

The exterior panels shall be 20-gauge steel and powder coated with charcoal color paint to protect against corrosion. The double wall side panels separate the half-inch, 2.0 lb./ft³ insulation from the air stream and increase unit rigidity. The unit shall be mounted on casters for quick installation and provided with leveling feet. The perforated inlet and outlet panels shall have 81% open area. The rear door shall utilize a Knurr™ rack style handle and hinges to mirror the appearance of neighboring server racks.

2.3.2 Serviceability

The cabinet shall be designed so all components are easily accessible for service and maintenance through either the front or rear of the unit. Units that are not fully accessible from front and rear or not serviceable in place shall be unacceptable.

2.3.2.1 Models Vertiv™ Liebert® XDU060

The variable speed EC plug fans shall be mounted on the front door to provide access to all sides when swung out of the unit.

2.4 Locking Disconnect Switch

2.4.1 Models Vertiv™ Liebert® XDU060

A manual disconnect switch shall be mounted in the electrical panel and be capable of disrupting the flow of power to the unit. The electric panel compartment shall be accessible only with the switch in the Off position. It shall be located behind the Vertiv™ Liebert® iCOM™ display door for quick access.

2.5 Short Circuit Current Rating (SCCR)

2.5.1 Models XDU

The electrical panel shall provide at least 65,000A SCCR.

3.0 CONTROL

3.1 Vertiv™ Liebert® iCOM™ Microprocessor Control with 7-Inch Color Touch Screen

The Liebert® iCOM™ shall be microprocessor based with a 7-inch, high definition, capacitive, color touch screen display and shall be mounted in an ergonomic, aesthetically pleasing housing. The display and housing shall be viewable while the front panel is open or closed. The controls shall be menu driven. The system shall display user menus for active alarms, event log, graphic data, unit view/status overview (including the monitoring of room conditions, operational status in percentage of each function, date, and time), total run hours, various sensors, display setup and service contacts. A password shall be required to make system changes. Service menus shall include setpoints, standby settings (lead/lag), timers/sleep mode, alarm setup, sensor calibration, maintenance/wellness settings, options setup, system/network setup, auxiliary boards, and diagnostics/service mode. The Liebert® iCOM™ control shall provide Ethernet/RS-485 ports dedicated for BMS connectivity (i.e., Base Comms).

- **Password Protection:** The Liebert® iCOM™ shall contain two unique passwords to protect against unauthorized changes. An auto hide/show feature shall allow the user to see applicable information based on the login used.
- **Unit Backup and Restore:** The user shall be able to create safe copies of important control parameters. The Liebert® iCOM™ shall have the capacity for the user to automatically backup unit configuration settings to internal memory or USB storage drive. Configuration settings may be transferred to another unit for a more streamlined unit startup. An analysis.csv file shall be provided via the backup which allows the end user to download and view unit level settings, parameter names, default values, and newly adjusted values.
- **Parameter Search:** The Liebert® iCOM™ shall have search fields for efficient navigation and parameter lookup.
- **Context Sensitive Help:** The Liebert® iCOM™ shall have an on-board help database. The database shall provide context sensitive help to assist with setup and navigation of the menus.
- **Display Setup:** The user shall be able to configure the display information based on the specific user's preference. Language, units of measure, screen contrast, home screen layout, backlight timer, and the hide/show of certain readouts shall be configurable through the display.
- **Additional Readouts:** The display shall enable the user to configure custom widgets on the main screen. Widget options will include items such as fan speed, call for cooling, call for free cooling, maintenance status, call for hot water reheat, call for electric reheat, call for dehumidification, call for humidification, airflow, static pressure, fluid flow rate and cooling capacity.
- **Status LEDs:** The Liebert® iCOM™ shall show the unit's operating status using an integral LED. The LED shall indicate if the unit has an active alarm; if the unit has an active alarm that has been acknowledged; or if the unit is On, Off or in standby status.
- **Event Log:** The Liebert® iCOM™ shall automatically store the last 400 unit only **events** (messages, warnings, and alarms).
- **Service Contact Information:** The Liebert® iCOM™ shall be able to store the local service or sales contact information.
- **Upgradeable:** Liebert® iCOM™ upgrades shall be performed through a USB connection.

- **Timers/Sleep Mode:** The menus shall allow various customer settings for turning the unit On or Off.
- **Menu Layout:** The menus shall be divided into two main menus: User and Service. The User screen shall contain the menus to access parameters required for basic unit control and setup. The Service screen shall be designed for service personnel and shall provide access to advanced control setup features and diagnostic information.
- **Sensor Calibration:** The menus shall allow unit sensors to be calibrated with external sensors.
- **Maintenance/Wellness Settings:** The menus shall allow reporting of potential component problems before they occur.
- **Options Setup:** The menus shall provide operation settings for the installed components.
- **Auxiliary Boards:** The menus shall allow setup of optional expansion boards.
- **Various Sensors:** The menus shall allow setup and display of optional custom sensors. The control shall include four customer accessible analog inputs for field supplied sensors. The analog inputs shall accept a 4 to 20mA signal. The user shall be able to change the input to 0 to 5VDC or 0 to 10VDC. The gains for each analog input shall be programmable from the front display. The analog inputs shall be able to be monitored from the front display.
- **Diagnostics/Service Mode:** The Vertiv™ Liebert® iCOM™ control shall be provided with self-diagnostics to aid in troubleshooting. The microcontroller board shall be diagnosed and reported as pass/not pass. Control inputs shall be indicated as On or Off at the front display. Control outputs shall be able to be turned On or Off from the front display without using jumpers or a service terminal. Each control output shall be indicated by an LED on a circuit board.
- **Base-Comms for BMS Connectivity:** The Liebert® iCOM™ controller shall provide one Ethernet Port and RS-485 Port dedicated for BMS Connectivity. Provides ground fault isolated RS-485 Modbus, BACnet IP & Modbus IP network connectivity to Building Management Systems for unit monitoring and management. Also, provides ground fault isolated 10/100 baseT Ethernet connectivity for unit monitoring and management. The supported management interfaces include SNMP for Network Management Systems, HTTP for web page viewing, SMTP for email, and SMS for mobile messaging. The iCOM™ controller shall support dual IP on a single network and one 485 protocol simultaneously.

3.2 User Main Menu

All unit main menu clearly displays on the screen the current operating conditions and communicates to the customers. Building Management System/Building Automation System. Information displayed on the main menu may be changed by the user to suit site requirements. The Vertiv™ Liebert® iCOM™ main menu factory configuration displays the following conditions:

- **Status Dial:** Display of unit supply/return fluid temperature and flow rate
- **Event Log:** Display of unit status, alarms, and warnings
- **Unit Function:** Entering and leaving air temperatures, connected load, percent fan and pump speed, percent capacity, flow rate, and load (kW).

3.3 Alarms

All unit alarms shall be annunciated through both audio and visual cues, clearly displayed on the screen, automatically recorded in the event log, and communicated to the customer's Building Management System/Building Automation System. The Vertiv™ Liebert® iCOM™ shall activate an audible and visual alarm in event of any of the following conditions:

- High Supply Fluid Temperature
- High Return Fluid Temperature
- Fluid System Fault
- Pump Fault
- Pump Inverter Fault
- EC Fan Fault
- Loss of Air Flow
- Loss of Power
- Pump Operation with No Flow
- Pump Inverter Fail 1
- Pump Inverter Fail 2
- Pump Flow Fail 1
- Pump Flow Fail 2
- Custom Alarms

Custom alarm inputs shall be provided to indicate facility specific events. Custom alarms can be identified with programmable labels. Frequently used alarm inputs include:

- Leak Under Floor
- Smoke Detected
- Standby Unit On

Each alarm (unit and custom) shall be separately enabled or disabled, selected to activate the common alarm, and programmed for a time delay of 10 to 9999 seconds.

3.4 Vertiv™ Liebert® iCOM™ Control Method

The Liebert® iCOM™ shall be factory-set to allow precise monitoring and control of the fluid temperature leaving the unit.

Fluid flow rate is manually set from the Liebert® iCOM™ control based on the server equipment manufacturer's configuration specifications. Once set, the Liebert® iCOM™ control precisely monitors and controls the pump speed to maintain the flow rate at all times.

3.5 Quick Start Operation

When enabled, Quick Start shall allow the unit to start the unit fans and pump within 10 seconds after a system boot. The system fans/pump shall run at a fixed speed until the Vertiv™ Liebert® iCOM™ controller has had time to measure the inputs to determine the proper fan/pump speed required to maintain desired user defined setpoints.

3.6 Fan Control

Two fan control shall be utilized to provide the maximum rated airflow at 100% fan speed. Both fans will run at the same speed to provide the airflow required to maintain control setpoint for leaving water temperature. Loss of airflow shall be detected by a differential pressure switch. In the event of a single fan failure, the remaining active fan will continue to operate and will increase speed (%) to compensate for the loss of a fan.

3.7 Pump Control

The system shall contain two pumps. Pumps are 100% redundant (i.e., single pump operation at any given time). Each variable speed pump includes a VFD and shall provide the required maximum flow rate. A flow meter shall monitor actual system flow rate on the discharge of the system and determine the speed of the pump. Pump speed and differential pressure is monitored to determine the health of the fluid system. Pumps are configured in lead/lag control to maintain equal runtime, reduce corrosion, and maintain wetted seal surfaces of the lag pump. Pump rotation shall be performed in the event of a loss of flow. Switching of the pumps from lead to lag is performed without interruption of flow.

3.8 Standby Lead Lag

The Vertiv™ Liebert® iCOM™ shall allow scheduled rotation based off a user defined daily, weekly, or monthly schedule to keep equal run time on units. iCOM™ shall provide automated emergency rotation of operating units to standby units in the event of an active alarm.

3.9 Ambient Return air Sensor

Each Vertiv™ Liebert® iCOM™ shall have one factory supplied and connected return temperature/humidity sensor that is provided for reference.

3.10 Entering/Leaving Fluid Temperature Sensor

Each Vertiv™ Liebert® iCOM™ shall have one factory supplied and connected thermistor monitoring the water temperature entering the unit and one thermistor monitoring the water temperature leaving the unit. Liebert® iCOM™ shall control fan speed to control the fluid temperature leaving the unit.

3.11 Water Flow Meter

Each Vertiv™ Liebert® iCOM™ shall have one water flow meter monitoring the gallons per minute (GPM) or liters per minute provided at the discharge of the system. Flow meter shall determine the speed of the operating pump.

3.12 System Auto Reset

The auto restart feature shall automatically restart the system after a power failure.

3.13 Sequential Load Activation

On initial startup or restart after power failure, each operational load shall be sequenced with a minimum delay of one second to minimize total in rush current.

4.0 COMMUNICATION INTERFACES

4.1 Remote Shutdown Terminal

The remote shutdown terminal shall provide a location to remotely shut down the unit, complying with the National Fire Code.

4.2 Common Alarm Contact

The common alarm contact shall provide a set of normally open contacts for remote indication of unit alarms.

4.3 Vertiv™ Liebert® Liqui-tect 410 Point Leak Detection Sensor for Remote Mounting

A total of _____ (quantity) solid state water sensor(s) with no moving parts and hermetically sealed to keep out dust and dirt shall be provided. The Liebert® Liqui-Tect 410 (LT410) shall provide a single point detection of leaks. The point detection sensor shall have two gold plated sensing probes to prevent corrosion resistance and to provide accurate readings. The LT410 shall constantly monitor points for leaks, internal faults and power failures and warn of any abnormal conditions. Mounting brackets shall allow for sensor height adjustment and leveling. The LT410 shall provide two independent outputs to signal both a local alarm panel and a remote building management system or external equipment. The LT410 shall be rated for 24VAC, 50/60Hz and 0.10 amp.

4.4 Vertiv™ Liebert® Liqui-tect 460 Zone Leak Detection Module with Cable Kit for Remote Mounting

A total of _____ (quantity) zone water sensor cables with no moving parts and hermetically sealed to keep out dust and dirt shall be provided. The Liebert® Liqui-tect 460 (LT460) shall provide a zone detection of leaks. The LT460 shall constantly monitor points for leaks, internal faults and power failures and warn of any abnormal conditions. LEDs shall provide status indication and ensure the cable is properly installed and operational under raised floors. The LT460 shall provide two independent outputs provide a signal to a local alarm panel, Liebert environmental unit, remote building management system or external equipment.

4.4.1 Vertiv™ Liebert® Liqui-tect 460 Module

The LT460 shall consist of a metal enclosure with a hinged top door providing access to the internal circuit board for wiring termination and configuration of DIP switches. The LT460 shall monitor up to 100 feet (30m) of connected LT500Y leak detection cable. The LT460 shall be rated for 24VAC, 50/60Hz and 0.12A.

4.4.2 Vertiv™ Liebert® LT500Y Leak Detection Cable

The cable material and construction shall allow the cable to lie flat when used with hold down clips. The LT500Y shall be plenum-rated and UL-listed for safe operation. Cables shall be available in lengths of 20, 25, 30, 35 and 45 feet (6, 7.6, 9, 10.6 and 13.7m).

4.5 Vertiv™ Liebert® vNSA Network Switch—Optional

The Liebert® vNSA network switch is designed for networking multiple Vertiv™ Liebert® iCOM™ unit level controllers together. There shall be two different styles of the vNSA14 panel available:

- **vNSA14:** Enclosure with network switches only.
- **vNSA14-iCOM-H:** Enclosure with network switches and 9 inch iCOM color touchscreen display.

Each offering shall be housed inside a steel enclosure secured with a key lock and contain two network switches, providing a total of 14 Ethernet ports available for Vertiv™ Liebert® iCOM™ controller unit to unit networking. The Vertiv™ Liebert® vNSA requires field supplied, hard wiring, 16AWG, 100-240VAC universal (12V, 1.5A) single phase input power supply for 120V or 230V operation with factory supplied power connector.

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 copy of manufacturer's electrical connection diagram submittal to electrical contractor.

5.1.3 Piping Connections

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

5.1.4 Field Quality Control

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

The manufacturer shall design and furnish all equipment to be fully compatible with heat dissipation requirements.

5.1.5 Supply and Return Fluid Piping

Connect fluid supply and return to the Thermal Management system.

5.2 Warranty Start Up and Control Programming

Install the indoor unit in accordance with manufacturer's installation instructions provided with seismic option. Firmly anchor maintaining 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 manufacturer's field service technician to provide warranty start up supervision and assist in programming of unit(s) controls and ancillary panels supplied by them.