



Guide Specifications

Liebert® CWA

CA Models



SUMMARY

This specification describes the requirements for a chilled water thermal wall installed on the gallery side. The system shall be designed to control air flow and temperature conditions in rooms containing electronic equipment.

Design Requirements

The Thermal Management system shall be a Vertiv™ Liebert® CWA factory assembled unit. The unit shall be designed to meet CE requirements and therefore compliant with the relevant EU Directives:

- Machine Directive 2006/42/EC
- Low Voltage Directive 2014/35/EU
- PED Directive 2014/68/EU
- EMC Directive 2014/30/EU
- Rohs2 directive 2011/65/EU
- Rohs3 directive 2015/863/EU

Quality Assurance

Each unit shall be factory-tested before shipment. The units are dispatched with the following documents: user manual, wiring diagram, CE-declaration of conformity, main replacement components list of the unit, SW configuration parameters and the factory tests report. All the documents are protected by an envelope and stored in a dedicated support. The system shall be designed and manufactured according to world-class quality standards. The manufacturer shall be ISO 9001, ISO45001, ISO14001 certified.

Operating Limits

The unit needs to be designed to operate within these working ranges.

Room air conditions:

- Temperature: from 24°C to 45°C
- Humidity ratio: from 6 g/kg to 11 g/kg
- Relative humidity: from 20% to 35%

Chilled water circuit:

- Inlet water temperature: min. 5°C
- Water pressure: max. 16 bar

Altitude:

- Maximum altitude 2000m

For conditions that fall outside these working envelopes, please contact a sales representative.

Installation/Serviceability

The unit shall be ready to allow the installation through a forklift or using eyebolts for top handling. The cabinet shall be designed so that all components are easily accessible for service and maintenance. Fans, valves and filters can be replaced without removing any other internal component. Electrical panel should have power and signal quick connectors for fans to reduce installation time and unit downtime in case of failure.

Submittals/REVITS

Submittals shall be provided after the agreement of the proposal and shall include: single-line chilled water diagram, unit dimensions and weight, electrical and capacity data (net sensible cooling capacity, unit power consumptions including microprocessor controller and the unit net sensible EER); piping and electrical connection drawing. Unit Revit file comply with EN19650-1:2018 with a level of development at least of LOD400.

Cabinet

DIGIT 1-4

The cabinet is manufactured from hot-dipped galvanized steel sheet, externally painted with black RAL 7021 colour epoxy polyester powder paint and assembled using stainless steel and galvanized screws and high tensile rivets. All the zinc sheet metals parts are hot dip galvanized or powder coated in order to minimize any harmful zinc whiskers.

Airflow Configuration

The warm air enters the unit through the filter section located on the front surface of the cabinet. A blow-through design, allow the fans to force the warm air through the coil and then discharge the cold air inside the room. A safety protection for the coil needs to be installed on the discharge side.

Cooling Circuits

DIGIT 5 = 6/8

The coil is manufactured from copper tubes and mechanically bonded to hydrophilic painted aluminum fins and is pressure tested to 22 bar. The large face area/low velocity coil allows precise control of temperature and humidity during cooling and dehumidification and is designed to optimize fluid velocity and minimize pressure drop, reaching the highest SHR value (Sensible Heat Ratio). The hydrophilic coating shall significantly improve the speed of condensate drainage from the fins and shall provide superior water carryover resistance. A stainless-steel condensate drain pan shall be provided.

Each unit internally is separated by two chilled water circuits, which include a coil section, copper pipes, a motorized modulating valve, an air relief valve and a drain valve.

Fan Section

DIGIT 6 = E/P

The unit is fitted with variable speed, high efficiency, single inlet, backward curved, centrifugal 'plug' type innovative EC fan(s). The fan(s) have an impeller with corrosion resistant curved blades and the wheel is statically and dynamically balanced.

The fan motors are electronically commutated, with internal protections, continuous speed regulation via controller signal. The unit airflow is

guaranteed until at least one fan will still be running, thus granting cooling continuity.

DIGIT 6 = 2

The unit is fitted with variable speed, high efficiency, single inlet, axial type EC fan(s). The fan wheel is statically and dynamically balanced. The fan motors are electronically commutated, with internal protections, continuous speed regulation via controller signal.

The unit airflow is guaranteed until at least one fan for each model will still be running, thus granting cooling continuity.

Active Harmonic Filter – Option

The unit is equipped with an Active Harmonic Filter designed to compensate the unwanted harmonic oscillations and also corrects the power factor, improving the system efficiency while reducing harmonic pollution. The filter device is compliant with standard IEEE 519.

Water piping connections

DIGIT 7 = V

The unit is equipped with grooved connections, two smooth pipe stubs are provided with the units and can be used to create the connection.

DIGIT 7 = F

The unit is equipped with grooved connections, bimetal flanges are supplied separately to for easy installation on site. The flanges are PN16 rated with 8 holes of 18mm.

Chilled Water Modulating Valve

DIGIT 8 = 2

The unit is equipped with a chilled water 2-way modulating valve, complete with motor for the control of water flow to the coil. The actuator is suitable for up to 1400 kPa closing pressure. The valve shall be designed for up to 1600 kPa water pressure.

DIGIT 10 = P

The unit is equipped with a chilled water pressure independent valve, which compensates for pressure variations, performing a continuous balancing function to maintain system performance at varying loads. The actuator is suitable for up to 1400 kPa closing pressure. The valve shall be designed for up to 1600 kPa water pressure.

Pressure independent valves setting - Option

The pressure independent valves for each unit shall be set from the factory close to the design value, reducing in this way the commissioning time. To perfectly adapt to real system working conditions, the maximum waterflow setting can be adjusted through the unit display or BMS system if the monitoring card is present, to avoid stopping the unit or opening its front panel.

Waterflow Reading – Option

Unit fitted with pressure independent control valve can provide water flow value. Combining it with the water temperature sensors allows to calculate and display unit cooling gross capacity. Waterflow and Cooling Gross Capacity value can be available on display and shared with the BMS system if the monitoring card is present.

Electrical Panel

DIGIT 9

The electrical panel, located at the front of the unit in a compartment isolated from the airflow, contains the MCB's, contactors, transformers, controller PCB, overload relays etc. High voltage system component are protected with MCB over-current device. All high voltage components are touch protected. A main switch shall be accessible from the front of the unit with the door closed and prevents access to the high-voltage electrical components unit when switched to the off positioning. The

manual disconnect switch shall be mounted in the high-voltage section of the electrical panel.

DIGIT 9 = 3

Electrical power supply is 400V (±10%) / 3Ph / 50Hz (±2Hz) +N +E.

DIGIT 9 = T

Electrical power supply is 380-400V (±10%) / 3Ph / 60Hz (±2Hz) +N +E.

DIGIT 9 = 6

Electrical power supply is 460V (±10%) / 3Ph / 60Hz (±2Hz) +E.

Extended Operating Range – Option

The unit operating range can be extended up from 45°C to higher return air temperature, keeping the main components monitored and avoiding any damage to the unit equipment.

Module

The unit consists of two modules coupled together. Each module contains its own coil and fan assembly, while the chilled water piping, electrical and control system are interconnected.

DIGIT 10 = B

Bottom module also houses the unit's electrical panel

DIGIT 10 = T

Top module also houses the chilled water valves.

Redundancy Execution

DIGIT 11 = R

The cooling redundancy execution allow to split the unit in two independent modules inside the same frame, allowing an independent control of Top/Bottom module, maximizing the unit's reliability. The two modules are directly connected to the same control system avoiding in this way any interference with cooling requests from the IT equipment.



Microprocessor Controller and Display

DIGIT 12

The Control System is microprocessor based. Terminals are provided for remote start/stop control plus Volt-free 'Common Alarm', 'Common Warning'. Full list of microprocessor features includes:

Single Circuit units

up to 8 configurable digital inputs (for instance condensate pump, fire, water alarms, no power, etc..)

- 1 digital input for remote ON/OFF
- 2 digital outputs to report general warning, general alarm
- 1 humidifier digital outputs
- 1 Ethernet port

The microprocessor can be programmed, in alternative, through:

DIGIT 12 = 7

A 7-inch, high definition, colour display with capacitive touchscreen that shall be mounted in an ergonomic, aesthetically designed housing.

DIGIT 12 = F

A 10-inch, high definition, colour display with capacitive touchscreen that shall be mounted in an ergonomic, aesthetically designed housing.

DIGIT 12 = 0

For units without display, a Virtual Display can be replicated through a web browser, providing all the functionalities of the standard display, either remotely or connecting a laptop on the Ethernet port directly to the front door.

Small display Option: Small display is a semi-graphic LCD monochromatic terminal with 132x64 pixel resolution, LED backlighted. It provides buttons to navigate through the screen. The application shall be menu-driven.

User Profile: The application shall display menus for basic setpoints, temperature and humidity alarms (limits), run hours for each device, timer bands, event log, unit overview and system overview.

Service Profile: The application shall display menus and a password shall be required to make system changes.

More than 240 types of warnings / alarms / messages can be displayed including:

- High temperature (return/remote/ supply)
- Low temperature (return/remote/ supply)
- High relative humidity (return/remote)
- Low relative humidity (return/remote)
- Fan failure
- Electrical heater high temperature
- Sensor failure

The Liebert iCOM control shall activate both an audible and visual alarm.

The unit can store up to 100 events in a memory. Each unit shall have one factory mounted return temperature and humidity sensor.

The control as standard allows to manage:

- A return temperature and humidity sensor.
- A supply temperature sensor.
- Up to 10 active remote temperature and humidity sensors.
- Up to 3 read-only temperature and humidity reference sensors.

Supply temperature sensor

NTC sensor is provided for acting supply control logics. Each coil section is equipped with a sensor to allow a uniform air delivery temperature.

Remote Humidifier Contact

A pair of normally open contacts shall be provided for connection to a remote humidifier that allow the unit's humidity controller to control a humidifier outside the unit. Power to operate the remote humidifier doesn't come from the unit.

Read-only room temperature and humidity reference sensors

The remote sensors are used for reading temperature and humidity in specific areas of the room without any impact on the unit's control logic. Unit shall allow controlling of the cooling capacity and



fan speed from multiple different sensor selections. The control shall have auto adaptive algorithms known as PIDs. The user shall finally act on the Set Points of the main PIDs (like Air Temperature and Humidity Control). Specific PIDs settings shall be changeable by the Service Personnel during commissioning if this is necessary; cooling capacity and fan speed PIDs can be decoupled if needed. Temperature control mode defines from which sensor cooling capacity will be driven. Three options are available:

- Return
- Supply
- Remote

Fan speed control mode defines how airflow will be controlled.

Several options are available:

- Return Sensor
- Remote Sensor
- Delta T between Return or Remote temperature and supply temperature
- Static Pressure
- Return CW priority
- Fixed Speed
- Through BMS System

Further fan control functionalities for improving the temperature control:

Fan Speed Offset

The Fan Speed Offset between the Top/Bottom Module allow to define a percentage offset to be applied to the top fans to increase the airflow of the top module.

Remote Compensation

When remote temperature is higher than a specific threshold the unit supply air setpoint will be decreased proportionally to a specific limit.

Remote Override

This function allows to modify (increase)

the fan speed when the remote temperature reach a specific threshold, the fan modulation is controlled anyway from the control sensor.

Static Pressure Override

This function takes care about not letting the static pressure fall below a limit setting, although the fan speed is controlled from a temperature sensor.

Humidity control mode defines from which sensor humidification and dehumidification will be driven.

Two options are available (for external humidifier only):

- Return Sensor
- Remote Sensor

Humidity Control types available (for external humidifier only):

- Relative
- Relative Compensated
- Absolute
- Dew Point

In case of control sensor failure, the unit automatically adapts to grant cooling/airflow continuity. An U2U (unit to unit) communication between multiple units via Ethernet network (up to 32 units) allows for advanced control functionality: teamwork modes, sharing sensor data, standby rotation, lead-lag, cascade operation, auto restart delay and rotating master function; without the need of a dedicated sequencing panel.

Remote Pressure Control - Accessory

The Pressure control transducer monitors the fan speed to keep constant the static pressure. In case multiple units are connected in teamwork, they share pressure sensor data to provide greater flexibility, visibility and control. Users can decide to control the fans on the average reading collected in the U2U network. In

case of failure, the system can work as long as at least one sensor is available.

Remote Temperature and Humidity sensor - Accessory

The remote temperature and humidity sensors can be Active or Read-only.

Active remote temperature and humidity sensors shall permit to select the minimum, maximum or average values read by the multiple remote sensors, in order to achieve the best control strategy. A remote sensor can be even selected as redundant sensor, in this case the control will consider the value of the first sensor only; the second sensor will be used only if the first one is broken or missing. The same rule will be applied for succeeding redundant sensors.

Teamwork

Four 'teamwork' modes can be adopted.

- No Teamwork. The units work independently on the cooling control. Sensor values and setpoints are not shared. The control drives cooling, heating, ventilation, humidification and dehumidification based on the local requests. Standby function and unit rotation are possible.
- Teamwork Mode 1 (Parallel). The control uses the system PI's for driving cooling, heating, ventilation, humidification and dehumidification. In this Teamwork mode, all relevant control parameters are shared; if a value is changed in any of the units, all other units will follow with the same changed setting.
- Teamwork Mode 2 (Independent). The control drives cooling, heating, ventilation, humidification and dehumidification based on local requests, while avoiding operational conflict with the other units in the network. For example: If one unit is on cooling, no other unit may start heating. If one unit is on dehumidification, no other unit may start humidification. In this Teamwork

mode, all relevant control parameters are shared; if a value is changed in any of the units, all other units will follow with the same changed setting.

- **Teamwork Mode 3 (Optimized Aisle).** The control uses the system PI's for driving ventilation, humidification and dehumidification. Local request is used for driving cooling and heating. Note: this teamwork mode can be set only if the SmartAisle option has been enabled and remote sensors are purchased together with the unit. The unit should have the capability to modulate airflow according to the airflow taken by the servers, using remote temperature sensor as controlling sensor. The Master controls duty, standby and rotation, calculates system values and sends it to the other units in the system. The Master controls the selected number of units and starts/stops the units in order to have the requested number of units working.

Stand by Rotation

Each unit in the group needs to get a unique communication number. The rotation index number defines the order of which unit will be the next one to be activated.

Lead-lag

Units, before going in standby mode, shall continue operation for the time set in "Overlap Timer".

Auto Restart Delay

Avoid a simultaneously re-start of multiple units (no matter if teamwork is selected or not). Each unit has a delay time between Power On and starting of the fans after a power cycle in order to minimize total inrush current.

Cascade

Usually Standby Units will start in case of an alarm of one of the Duty Units. Cascaded units will also start in order to help the Duty Unit base on the cooling request (Teamwork 1) or for Airflow request (Teamwork 3). In this way the

system optimizes the Standby Units not only in case of an alarm/failure.

Rotating Master

As part of the robust architecture of the control, when the Master gets disconnected from the network, another unit will automatically change to be the Master. All system values are available for all connected units. When the Master gets disconnected from the network, another unit (the unit with the lowest U2U_ID in the remaining network) will automatically change to be the Master.

This feature avoids system reset when the Master disappears or when it comes back available in the system.

Supersaver – Option

The Supersaver function enables communication between indoor and outdoor units in order to maximize chiller freecooling operation. Whenever possible the system will automatically raise water temperatures as thermal loads fall, aligning cooling capacity with demand, thus increasing system efficiency and freecooling operation of the chillers. The increase of the water temperature will never impact the unit supply air temperature threshold, in order to guarantee the right temperature in front of the technical equipment. This feature is available with all the chillers which implement this feature and can communicate with the indoor units.

Virtual Backdraft Damper

Unit placed into standby mode allows to operate the fans at the pre-set speed to maintain positive air pressure at the discharge of the unit to prevent back-flow through the unit. During the Virtual Backdraft Damper mode, the chilled water valve can be opened at a specific value in order to let cold air inside the IT equipment room.

Air Filtration

The standard filtration grade is ePM10 50% according to ISO/EN16890. The ePM10 50% standard filters are made by

paper material and are completely recyclable. The filter pleated structure gives high filtration efficiency, low pressure drops and allows the use of the filter without metallic or cardboard frame. The filter media is composed by fiber and latex. They are easily accessed/replaced on the gallery side.

DIGIT 14= 2

The unit can be fitted with a filter differential pressure transducer, connected to the microprocessor controller to provide a dynamic 'Filter Status'.

DIGIT 14= 3

The unit can be fitted with a filter differential static pressure switch, connected to the microprocessor controller to provide 'Filter Clogged' warning indication. Gauge after and before the filter are installed for measuring the Dp.

Pipes

DIGIT 15

The hydraulic connections are drawn in order to avoid any interference with fans replacement.

DIGIT 15 = T

The unit is provided with top left hydraulic connections.

Frame

DIGIT 16 = S

Cabinet is factory reinforced with additional stiffeners to be in compliance with IBC2018, CBC 2019, Ip=1.0 and Sds = 0.75 requirements, based on third-party analytic certification. A certificate of compliance is available upon request.

High Voltage Options

DIGIT 17

The unit offers possibility to have dual power supplies, in order to guarantee cooling continuity once the main power supply fails.

DIGIT 17 = P

Dual power supply parallel

The unit is fitted with Dual Power Supply Parallel version.

The unit is fed by two separate power supplies for the two fan sections modules top and bottom.

The bottom section additionally supplies the unit CPU, the BMS and all the auxiliary's components. Integrating the bottom supply line with an external UPS allows to grant the cooling for all the conditions.

This feature is available only in case unit redundancy execution is embedded.

DIGIT 17 = A

Dual power supply alternate

The unit is fitted with Dual Power Supply Alternate version. The unit is fed by two separate power supplies: each power supply can completely feed the unit. In case of main line failure ATS switches to the second power supply. This allows to have a complete power supply redundancy and therefore to have full cooling redundancy during emergency mode.

The unit integrates an ATS (Automatic Transfer Switch): in case of line I failure, it can be used for operating the motorized change-over switch to the line II, if line II is operational. Switching time at nominal current excluding loss of supply sensing time and excluding any delay timers applicable is at least 1.2 s-1.5 s.

DIGIT 17 = G

Dual power supply alternate with ultracap for control

The unit is fitted with Dual Power Supply Alternate Version. The unit is fed by two separate power supplies: each power supply can completely feed the unit. In case of main line failure ATS switches to the second power supply. This allows to have a complete power supply redundancy and therefore to have full cooling redundancy during emergency mode. The module integrates a simplified ATS (Automatic Transfer Switch)

functionality: in case of line I failure, it can be used for operating the motorized change-over switch to the line II, if line II is operational. Switching time at nominal current excluding loss of supply sensing time and excluding any delay timers applicable is at least 1,2-1,5 s.

When completely charged, the ultracapacitor, is capable of maintaining alive the CPU, the BMS card and the passive sensors for at least 1 minute (only the optional small semi-graphic display can be kept active by the ultracapacitor); the full charging time for the ultracapacitor is 5 minutes. The remote sensors are frozen when the power is off.

ATS Positioning Monitoring-Option

The unit can display and share with the BMS system (if monitoring card is present) which line is powering the unit, and thus also the position of the ATS.

Cooling Override-Option

During control reboot due to a power outage or in case of control failure, the cooling override function increases unit reliability, limiting cooling interruptions to the IT equipment, without the need of any capacitors or battery backup. A specific algorithm permits to operate at programmable fan speeds, while the chilled water valve drives to pre-set point. Once the communication has been re-established, the valve and fans control are released to normal operation.

In case of dampers, this feature disables fan actions.

Predispositions

DIGIT 18 = D

The unit shall be ready for controlling an external damper.

Monitoring

DIGIT 19 = 0

The unit features a website link that can be accessed via HTTP using a common browser. The unit shall also include input for remote on-off and volt-free contacts for simple remote monitoring of alarms.

DIGIT 19 = 1

The unit can communicate with Building Management Systems and Network Management Systems supporting third party protocols: Modbus TCP/IP RTU, BACnet IP v1.14, SNMP v2c, v3 and HTTP. More than 600 different parameters/events are available to BMS.

Devices

DIGIT 20 = C/R

Condensate Pump

Unit is fitted with condensate pump to allow condensate removal. The pump shall have a capacity of 50 l/h at 5 m head. Pump is completed with integral float switch. In case of alarm the unit can react stopping the unit or raising the alarm signal.

DIGIT 20 = E/R Energy Meter

Unit is fitted with Energy Meter class 1 for active energy.

Unit Power Consumptions Calculator – Option

Unit power consumptions can be calculated thanks to the direct communication between the control and the EC fans motor. This specific algorithm calculates the entire unit power consumption with an accuracy of $\pm 5\%$ at the nominal conditions. This feature is available only for cooling units.

Packaging

DIGIT 21 = P

Unit is packed before shipping (two separate packages for top and bottom module). They stand on an ISPM15 fumigated wooden pallet. Standard packaging consists of honeycomb cardboard corners protecting the corners of the units, lateral walls protected by honeycomb sheets and top part of the unit covered by corrugated cardboard lid. Around the entire unit, including the cardboards, a polyethylene stretch film is applied.

DIGIT 21 = C

The standard cardboard packing is enclosed by additional wooden planks.

DIGIT 21 = S

In addition to the standard cardboard packing, containing desiccant bags, the whole unit is wrapped in VCI foil and enclosed within a seaworthy wooden box.

Water Sensors

DIGIT 22= W

Unit is fitted with water inlet and water outlet NTC temperature sensors. Water temperature values can be available on display and shared with BMS system if monitoring card is present.

Special Feature Authorizations

DIGIT 25 = X

All units can be customized as per customer specification. Any deviation from the standard design is tracked by the serial number of the unit and established in the following design documents:

- Bill of Material
- Price List
- Manufacturing process
- Spare parts list
- Test Reports
- Electrical schematics
- Drawings
- Performance data (in case the customization impacts the unit performance)
- Product manuals, Service Manual and marketing documents are not subject to amendments due to the customizations.

Additional Optional Features (Supplied within the unit)

Alarm Card

The unit shall be fitted with an alarm

card to allow remote monitoring through electrical signals of most important alarms (up to 6), for monitoring working conditions or events (failure).

The outputs (all together) can be set to N.O. (normally open) or N.C. (normally closed).

Ethernet Switch

Ethernet Switch with 5 RJ45 ports shall be installed in the electrical panel. The device needs to include LED indicators for an easier use.

Gravity Condensate Connection Conversion Left/Right

Gravity Condensate Connection Conversion Left/Right shall include all the parts necessary to alter the standard gravity drain to allow either right hand or left-hand gravity condensate drain connection from the unit when viewed from the gallery side.

Additional Accessories Features (supplied loose)

Wall-mounted System Display

A 7" or 10" capacity touch-screen display, designed to control multiple units connected in the same Ethernet network, is supplied in a wall-mount ready box. Power supply for all models is 230 VAC, through schuko socket.

Smoke/Fire Detector

The smoke and fire detector senses the room air: in case of smoke, the unit activates the smoke/fire detector even without any actions; instead in case of fire, the unit activates the fire alarm event and shuts the unit down. Dry contacts are available for a remote customer alarm. This smoke detector is not intended to function as or replace any room smoke detection system that may be required by local or national codes.

Leak Detector - Liquistat

The flooding alarm detects the presence of water or of any other conductive liquid and activates an alarm. It is made up of a corrosion-proof metal covering, with access to the two terminals for

connecting the line. Up to 5 sensors can be connected to the same flooding alarm device to control many points in the room.

Leak Detector – LT410

The flooding alarm detects the presence of water or of any other conductive liquid and activates an alarm. The point-detection sensor has two gold-plated sensing probes to prevent corrosion and to provide accurate readings. Mounting brackets allow for sensor height adjustment and levelling.

Leak Detector – LT460

The flooding alarm detects the presence of water or of any other conductive liquid and activates an alarm. It provides zone detection of leaks, the perimeter sensing or serpentine coverage of areas requiring up to 30 meters of cable.

Spring Return Dampers

Motorized dampers with spring return servomotors are controlled directly by the unit. The unit controls the damper in the safest way managing fans depending on damper position. In case of power failure, the spring return allows the damper to close, therefore avoiding air passing through a unit which is not working.

Fan Covering Plates

Fan backdraft barrier plate shall be used to block airflow recirculation in case of fan failure.

Coil Covering Plates

Coil Backdraft Barrier Plate shall be used to block airflow for unit not in operation when a physical damper is not available.

