



# **Solution Reference: 4XL400**

AI Starter Kit 4: Liquid to Liquid Direct to Chip with Heat Reuse

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## **1 Executive Summary**

Vertiv<sup>™</sup> 360Al Solutions uniquely combine deep domain expertise in power architectures, thermal management, remote management, and seamless service delivery to enable rapid deployment of infrastructure for Al applications and high-performance computing.

Your goals for high-density, floorspace optimization, sustainability and efficiency became our teams' key design criteria, focusing their efforts on designing the solution that exceeds your goals and expectations with seamlessly integration into your environment. Our world class solutions and engineering team delivered on this promise, and our services team fully supports it with their unmatched expertise and global footprint.

## 2 General Technical Description

This high-density solution is sized for IT load of 400 KW across 4 racks, assuming 320 kW of direct to chip liquid cooling capacity and 80 kW traditional air-cooling via rear door heat exchangers with two separate fluid networks (i.e., 80:20 liquid and air split).

For the direct to chip circuit, the cooling solution is a liquid-to-liquid standalone cooling unit, assuming the facility chilled water supply is  $55^{\circ}F$  (12.8°C) with a specified 14°F (7.8°C) delta T with 100% water. The technical water side is specified at 86°F (29.5°C) supply at 1.5 lpm/kW or 0.3962 GPM/kW with 25% propylene glycol, equating to a technical side return water temperature of 103.9°F (40°C) or 17.9°F (10.5°C) delta T. For the rear door heat exchanger circuit, the cooling solution is a second standalone cooling unit, assuming 65°F (18.4°C) water at 18 GPM to meet 80 kW capacity in a 75°F (23.9°C) environment at 45% relative humidity. This equates to a water delta T of 7.6°F (4.2°C) or 72.6°F (22.6°C) return.

Included products are heavy-duty racks that house rack PDUs, manifolds, rear door heat exchangers, and top-of-rack management appliance, as well as other accessories necessary for integration and normal data center operation. Above the racks are busway power distribution and piping.

Also included are comprehensive deployment services for installation, fluid-fill, recurring a warranty service such as warranty inspection, start-up, and acceptance testing. Optional services include workforce training on thermal management operation and servicing.



## 2.1 System Capacity

Rack (s)	Total Solution Capacity	Load Per Rack
4	400 kW	100 kW

## 2.2 Technologies Used

Cooling Method	Heat Rejection type
Direct-to-chip (liquid)	Water/Glycol



## 3 Material list

Qty.	SKU	Description
2	XDU450	Liquid-to-Liquid CDU: Liebert XDU450 Coolant Distribution Unit
4	DCD35	Rear Door Heat Exchanger: Liebert DCD Water- Cooled Active Rack Door, 35 kW
4	RM124	Rack Manifold: Manifold assembly in-rack 36U medium flow
4	LT460-Z20	Zone Leak Detection Sensors: Leak Detection Kit, 20' cable
1	Powerbar iMPB	Busbar system: 600 A iMPB Busway, tap-off units, and endcap
8	VP7UA002	Rack PDU: Switched Outlet Level Monitoring, 80 A, 240/415 V WYE, 57.6 kW, Vertical, (36) Combi C13/C19, Hardwired
4	VR9357	Heavy Duty Rack: VR-HD 48U 800 mm x 1200 mm
1	RDU501	1U Liebert RDU501 Intelligent Infrastructure Management Appliance
1	POESwitch24Port	1U POE Switch for Solutions

Material list only includes major components, other supporting peripheral components such as the hoses, valves, cable, adapter kits, etc. would be part of final quote document.



## **4** Solution Pictures

### 4.1 Front Quarter View



The images shown are for illustration purposes only and may not be an exact representation of the product.



### 4.2 Back Quarter View



The images shown are for illustration purposes only and may not be an exact representation of the product.



## 4.3 Top View







The images shown are for illustration purposes only and may not be an exact representation of the product. Nominal dimensions, reference submittal drawings for exact dimensions



### 4.5 Rear View



4.6 Side View



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### 4.7 VR Rack ISO View



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## **5** Technical Description

### 5.1 Single Line Diagram





### 5.2 Monitoring Diagram





### 5.3 Piping Diagram





# **6** Technical Specifications

## 6.1 Product weight

SKU	Quantity	Weight (per SKU)	Total weight
XDU450 (CDU)	2	923 lbs (419 kg)	1846 lbs (838 kg)
DCD35 (Rear Door Heat-Exchanger)	4	238 lbs (108 kg)	952 lbs (432 kg)
RM124 (Rack manifold)	4	83 lbs (38 kg)	332 lbs (152 kg)
VP7UA002 (Rack PDU)	8	22 lbs (10 kg)	176 lbs (80 kg)
VR9357 (Heavy Duty Rack)	4	560 lbs (254 kg)	2240 lbs (1016 kg)

### 6.2 Maximum Static load capacity of rack

SKU	Maximum Static load capacity
VR9357	1218 lbs (1927 kg)
(Heavy Duty Rack)	+2+0 103 (1927 Kg)

## 6.3 Operation & Storage conditions

	Operation temperature range: 50°F to 104°F (10°C to 40°C)
Operation conditions	Operation relative humidity range: 10% to 90% RH (non-condensing)
	Storage temperature range: -4°F to 122°F (-20°C to 50°C)
Storage conditions	Storage relative humidity range: 5% to 93% RH (non- condensing)



## 7 **Product Specification**

### 7.1 Liebert® XDU450 Coolant Distribution Unit

Designed to support liquid cooling within high density environments, the Liebert® XDU450 Coolant Distribution Unit is suitable for chip & rear door cooling applications to offer easy, cost-effective deployment in any data center.



### Key Benefits:

- Achieve incredible efficiency in high-density environments.
- Protects secondary liquid network with strict conformance to wetted material compatibility.
- Intuitively designed for ease of deployment.
- Accommodates any facility design and with multiple cooling configurations.
- Robust design with confidence inspiring redundancy options including teaming for the most demanding applications.
- Integrated controller designed from the ground up to be easy to deploy and supports leak detection.
- Flexible support services available for installation and maintenance with same day options.



#### **Product Summary:**

Main Unit Quantity	1	
Model Number	XDU0450AAA110TMS000008S0	
Nominal Capacity	XDU0450: XDU 450 kW Chilled water	
Unit Voltage	A: 460 V – 3 ph – 60 Hz	
Automatic Transfer switch (ATS)	A: Automatic Transfer switch 440/480V	
Communication	1: Standard w/ BACnet gateway	
Primary Filtration	1: Factory Fitted (500 μ)	
Secondary Filtration	0: None	
Primary Connections from Facility	T: Top Connection	
Secondary Connections to Equipment	M: Cabinet Extension & Manifold Ready	
Manifold Connection Type	S: 6Way Header w/1 British Standard Pipe BV/DRV Valve	
Water Detection Rope	Water Detection Rope 3.3 ft (10 m)	





### 7.2 Liebert® DCD Water-Cooled Active Rack Door, 35 kW

The Liebert<sup>®</sup> DCD active chilled-water cooling unit is a highly efficient heat exchanger module that mounts on the rear of an IT rack and provides up to 35 kW of room-neutral cooling. The active fan module mounts on the DCD passive door and aids the server fans in properly removing the heat load from the high-density application. The DCD can be supplied by either the existing chilled water system or by a coolant distribution unit, such as the Liebert<sup>®</sup> DCP, providing flexibility during installation.



#### **Key Benefits:**

• Low energy consumption using variable speed fans to match airflow with demand provides low operational costs and high energy efficiency.

• Mounts on the rear side of the IT rack, saving valuable floorspace for additional critical IT equipment.

• Few moving parts enable a much longer product lifespan, ensuring high cooling availability for years.

• Multiple inlet/outlet water connection options provide flexibility during selection and installation.

• Non-condensing heat exchanger reduces the risk of damage to critical IT equipment, providing peace of mind to IT managers.

• Available with advanced monitoring controls to provide easy remote access through Modbus communication.

• Doors swing open 180°, allowing for easy access to equipment inside the rack.





### 7.3 Vertiv<sup>™</sup> CoolChip Fluid Network

The Vertiv<sup>™</sup> CoolChip Fluid Network is an in-rack manifold that provides a reliable, clean, and effective route between server and coolant distribution unit. Mounting in the zero-U space of any industry-standard rack, the stainless-steel rack manifolds were designed with dripless quick disconnects and multiple coupling sizes for easy install and highly tailored to any deployment size.

#### **Key Benefits:**

• Meet various deployment needs with multiple configurations.



- Ensure high cooling availability and efficiency with several coupling options for proper sizing.
- Universal mounting bracket speeds installation
- Assured cleanliness with vacuum brazed stainless-steel construction and factory validated precleaning process.

#### Main Features:

- Stainless Steel Construction provides a durable and robust product.
- Multiple Sizes and Flow Rates allow for customization of your liquid cooling deployment.
- Universal Mounting Bracket enable mounting on any industrystandard rack.
- Dripless Quick Disconnects ensure quick and safe installation and service operation.
- Air Bleeder Valve eases installation complexity and increases system efficiency, maximizing the amount of cooling fluid in the circuit.
- Integrated Drain Valve allows for easy installation and maintenance.
- Top or Bottom Connections enable configuration in the field, adding flexibility to the install and application.



### 7.4 Liebert® LT460 Zone Leak Detection Sensors

The zone leak detection sensor modules install quickly and work simply for reliable warning of potentially hazardous moisture conditions. The supervised zone leak detector uses up to 100 feet of flexible Liebert® moisture sensing cable, offering protection from unwanted leaks. Designed for use with Liebert LT500Y leak detection cable, the Liquitect 460 is the ideal solution for perimeter sensing or serpentine coverage of small areas. Selectable modes of operation provide flexible alarming options and protection for the cable. Selectable alarm delays minimize false-positive conditions.

#### **Key Benefits:**

• Dual output relays can signal to a local alarm panel, a remote building management system, or to Liebert® SiteScan<sup>™</sup> Web.



- Selectable alarm delays allow reporting customization.
- Perimeter sensing or serpentine coverage of small area.

#### Main Features:

- Zone leak detection sensor.
- Monitors up to 100 feet of leak detection cable.
- Reports to local or centralized monitor panels.
- Installs easily.





### 7.5 Vertiv<sup>™</sup> Powerbar iMPB

Our data center customers benefit from unparalleled flexibility to adapt as their needs evolve, thanks to the innovative overhead power distribution system of the Vertiv<sup>™</sup> PowerBar iMPB, offering seamless integration and scalable design. Supported by our robust global manufacturing network and efficient inter-regional product transfers, we effectively mitigate supply chain disruptions. This streamlined approach accelerates deployment, minimizing delays and ensuring smooth operations. With Vertiv's expertise, we simplify the design and integration of your entire power chain, delivering a tailored solution that sets us apart in offering unmatched, customized power solutions in the market.

#### **Key Benefits:**

• Solution is ideal for data centers of any size, having slab or raised floors, that have



frequent or planned power configuration changes.
Variety of capacity and connection configurations support optimization and adaptation over time with minimal outside support needed.

• Continuous power delivery is enabled with hotswappable tap-off boxes having breaker protection that isolates active IT loads as well as close proximity branch breakers that support proper administration.

#### **Ideally Suited For:**

- Data centers of any size.
- Data centers with frequent or planned configuration changes.
- Single or dual-bus configurations.
- Raised and non-raised floors.





### 7.6 Vertiv<sup>™</sup> Geist<sup>™</sup> VP7UA002 rPDU

Upgradeable Switched Outlet Level Monitored rPDUs provide reliable power distribution to critical IT equipment while delivering individual outlet level control and a comprehensive view of outlet level power usage via remote network access. Includes environmental monitoring capabilities to obtain real-time environmental metrics.

#### **Product Summary:**

 rPDU, Switched Outlet Level Monitoring, 80 A, 240/415 V WYE, 57.6 kW, Vertical, (36) Combination C13/C19, Hardwired, Black Powder Coat.

#### **Key Benefits:**

- Remotely reboot outlets to power cycle unresponsive IT equipment or increase runtime of critical equipment upon power failure with outlet-level control.
  - Reliable power distribution with local and remote outlet-level power monitoring options offers quick access to critical power usage information down to the device level to evaluate energy usage trends and maximize uptime.

• Environmental monitoring capabilities with the addition of optional environmental sensors ensure users have critical infrastructure data at their fingertips to prevent climate-related equipment failure and system downtime.

• Fault-Tolerant Daisy Chaining with RSTP simplifies intelligent rPDU connectivity and ensures data is reported even when a break in the network chain occurs. Supports up to 40 rPDUs.

• Daisy-chain up to 50 devices on a single IP address and reduce deployment time with self-configuration of downstream devices.





### 7.7 Liebert RDU501

The Liebert® RDU501 is an intelligent infrastructure management solution from Vertiv that allows data center administrators to monitor environmental conditions and infrastructure appliances such as UPS, precision cooling units, generator sets, etc.

The RDU501 is a premium infrastructure gateway appliance equipped with out-of-band access to service processors as well as serial console management capabilities.

#### **Fast Deployment:**

• R 2.5D SmartSolutions Modelling with drag-and-drop interface.

#### **Environmental Monitoring:**

- Heat, Power and Assets Monitoring Dashboard.
- Thermal Management (including CRAC teamwork).
- Power Management.
- Security Management.
- Alarm and Data Reports.

#### **IT Management Monitoring**

- Remote and local server management via IPMI 2.0 protocol
- Serial Console Management (Out-of-band access)
- Automated Startup and Shutdown of IT servers.





# 8 Service Summary

SKU name	Description
VRTLC-4XL400-SITE- ASSESS	SITE ASSESSMENT FOR 4XL400 INSTALLATION
VRTLC-ENG-4XL400	LIQUID COOLING ENGINEERING SERVICES 4XL400
VRTLC-INSTMATL- 4XL400	LIQUID COOLING INSTALLATION MATERIAL 4XL400
VRTLC-INSTLAB-4XL400	LIQUID COOLING INSTALLATION LABOR 4XL400
VRTLC-MVS-4XL400	LIQUID COOLING MOVING AND STORAGE 4XL400
VRTLC-PROJMGT- 4XL400	LIQUID COOLING PROJECT MANAGEMENT 4XL400
VRTLC-CUSTDEM- 4XL400	4XL400 OPERATIONAL DEMONSTATION/CUSTOMER ORIENTATION
WI-10HR4	Warranty Inspection
WI-1HR4	Warranty Inspection
DAPRPDU-GE1	Dist Assur Pkg Geist R-PDU or RTS Single
1WLTHERMLAB-K-EBS	WarrantyLaborLWCoverageK
1WLTHERMLAB-D-EBS	WarrantyLaborLWCoverageD
XDU450YC	2PM ONLY 8X5 XDU450
DCD35YC	2PM ONLY 8X5 DCD35
VRTLC-L2	L2 - Delivery, QA/QC, Installation Assembly
VRTLC-L3	L3 - Start-up and Site Acceptance Testing
VRTLC-4XL400-FILL- DOW	Labor to Fill 4XL400 with DOWFrost 25% Propylene Glycol
VRTLC-4XL400-FLUID- DOW	Fluid to Fill 4XL400 with DOWFrost 25% Propylene Glycol