VERTIV.

# Liebert®

## EFC
## from 100 to 350 kW

The Highly Efficient Indirect
Evaporative Freecooling Unit

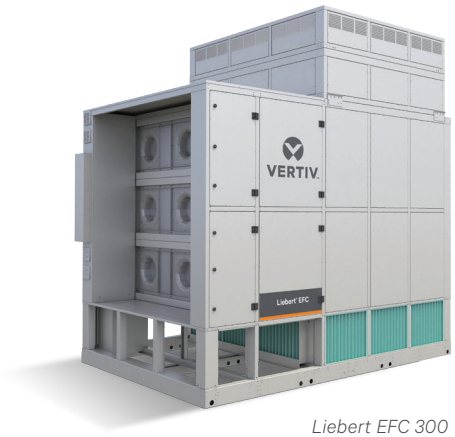
# Vertiv™

Vertiv designs, builds and services mission critical technologies that enable the vital applications for data centers, communication networks, and commercial and industrial environments. We support today's growing mobile and cloud computing markets with our portfolio of power, thermal, infrastructure management products, software and solutions, all complemented by our global service network. Bringing together global reach and local knowledge, and our decades-long heritage including brands like ASCO®, Chloride®, Liebert®, NetSure™ and *Trellis*™, our team of experts is ready to take on your most complex challenges, creating solutions that keep your systems running—and your business moving. Together, we're building the future of a world where critical technologies always work.

*YOUR VISION, OUR PASSION.*
**VertivCo.com**

## Liebert® EFC, the Highly Efficient Indirect Evaporative Freecooling Solution

**The Liebert EFC** is equipped with the most advanced industry technology. The system includes indirect air-to-air heat exchange and evaporative cooling technology all in one footprint. The Liebert EFC is capable of reducing air temperatures by leveraging on the evaporative cooling principle.
The process involves the evaporation of water which, as a consequence, cools the surrounding air. Through this technology, the Liebert EFC can thus achieve pPUE levels of 1.03 ensuring top energy efficiency, as well as minimized operating costs.




*Liebert EFC 300*


*Liebert EFC 220*

Brochure interattiva

### 1 Download
the "**Liebert EFC**" App for your tablet available on the App Store and Google Play or scan the QR Codes below

Scarica su App Store
DISPONIBILE SU Google play

### 2 Launch
the app and scan with your tablet the pages with these simbols

*Vertiv ICOM™ Control* · *Calculation Tool* · *Read Brochure* · *3D Viewer* · *Watch Video*

### 3 Interact
with content


**Supplying indirect freecooling for data center applications via the evaporative technology.**

# Liebert® EFC: Enhancing Data Center Efficiency

### Evaporative Cooling

The highly efficient evaporative system sprays water onto the heat exchanger to enable cooling even at high ambient air temperatures, without the need for mechanical cooling.


### Highly Efficient EC Fans

The new generation of fans installed in the Liebert EFC dramatically reduce the noise level and increase the overall efficiency of the unit.


### Reduced $CO_2$ Emissions

At pPUE levels of 1.03, Liebert EFC requires minimum power input consequently reducing $CO_2$ emissions.


### Data Center Free from Contaminations

The air-to-air heat exchanger separates external and internal air, protecting the data center air from bacterial contamination, as well as other external events such as fire and pollution.

### New Vertiv™ ICOM™ 7” Touch Display

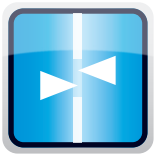
Vertiv ICOM Control ensures high level management of the units to work together as a single system, thus optimizing room temperature and airflow. Furthermore, it features a new 7” touch screen display for quicker and easier data readability.


### Energy Efficiency

The evaporative cooling technology enables Liebert EFC to reach pPUE levels as low as 1.03.

### Eurovent Certified Heat Exchanger

Eurovent certification guarantees that Liebert EFC heat exchangers undergo independent testing, thus delivering rating accuracy and enhancing the unit's reliability.



### Freecooling

Evaporative cooling extends indirect freecooling operation all year round.


### Integrated Chilled Water Coil and Direct Expansion System

These technologies ensure the unit's operation even in climates characterized by extreme humidity levels or severe temperature peaks.

### Partial Load Efficiency

New generation EC fans and integrated digital scroll compressors contribute to achieving the highest efficiency levels at partial load.


The evaporative system has a dedicated internal pump that provides the exact amount of water needed.
Water is sprayed through special nozzles onto the heat exchanger and evaporates, thus humidifying and cooling the air.

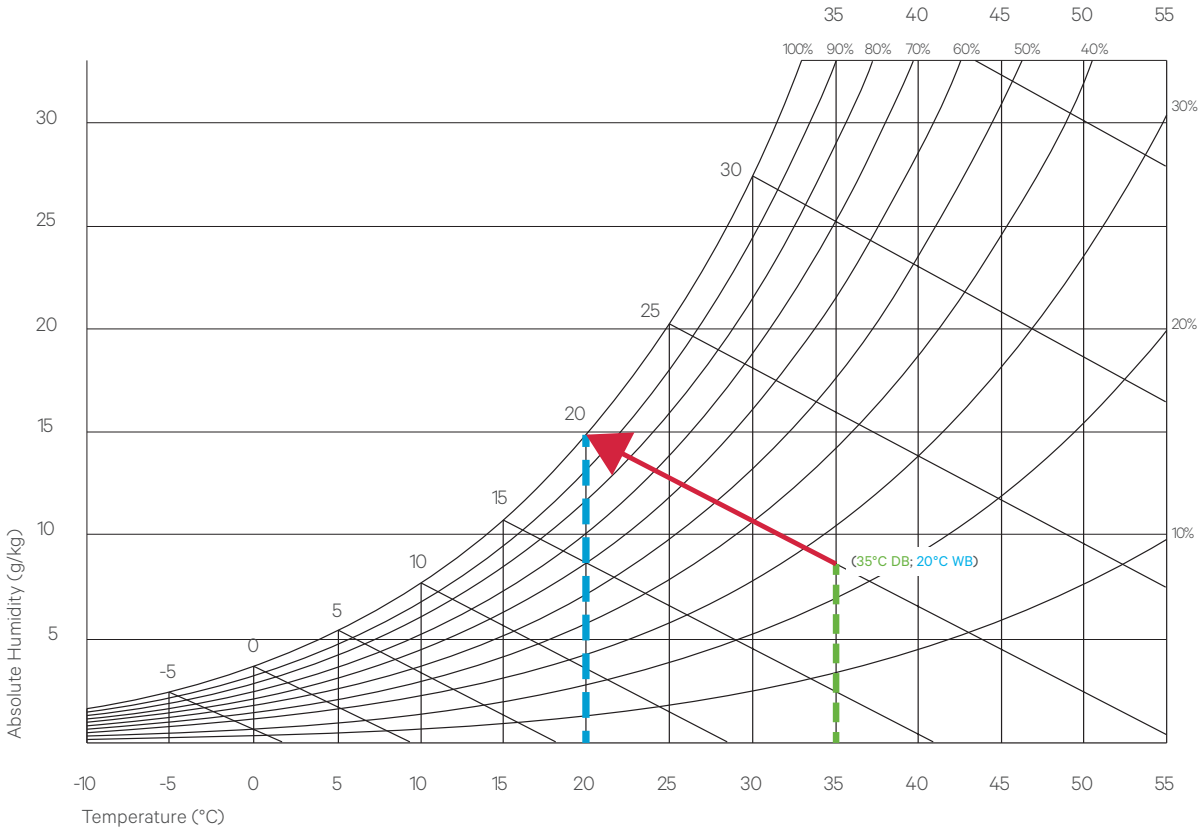
## Ensuring Top Efficiency Levels through the Evaporative Principle

The Liebert® EFC combines the capabilities of freecooling and evaporative cooling principles in one single unit. It has been specifically designed to select the most appropriate operating mode based on the external environment conditions, leveraging both principles in order to deliver significant energy savings.

The use of the evaporative cooling, hence using cold external air as a means of cooling, allows freecooling operation to be maximized and compressor-related cooling to be reduced to a minimum, thus optimizing operating costs.

The evaporative principle uses air to absorb water that is sprayed through special nozzles onto the heat exchanger. Water evaporation, thus removes heat from the air and cools the outside air temperature.

Outside air consequently transitions from Dry Bulb Temperature to Wet Bulb Temperature (the graph below shows the transition from 35°C to 20°C).




Psychrometric Chart for Sea-Level Elevation

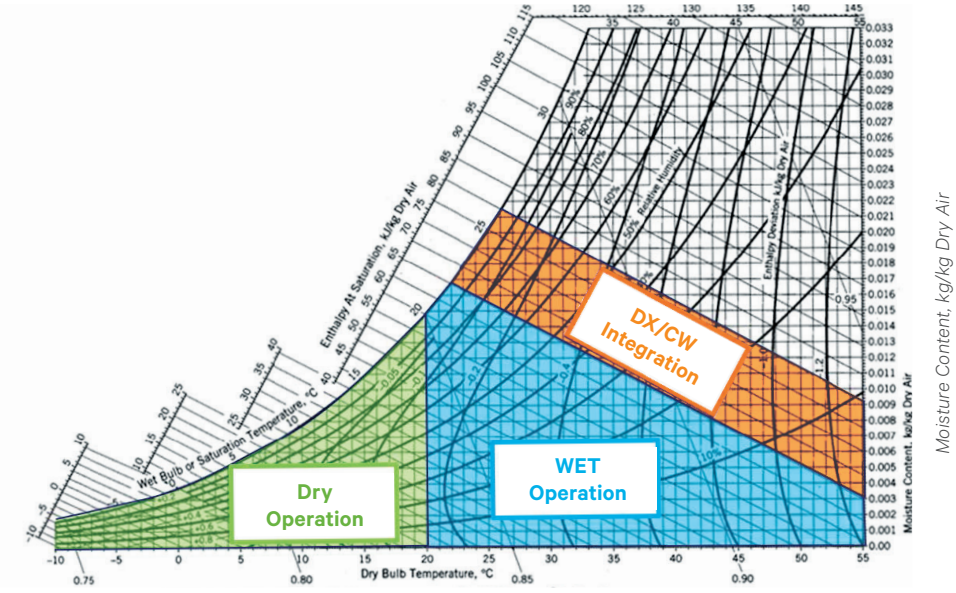
## Where Indirect Evaporative Cooling Works

In order to optimize the overall system efficiency, the Liebert® EFC has been designed to change its operation mode according to the external environment. When the external air is cold enough to allow freecooling, the unit works in dry operation mode (winter operation mode).

When ambient temperatures are higher, also external humidity determines unit capacity and performances as the evaporative effect is directly associated to the external air capacity to absorb water.

When the unit operates in environments with higher temperature and lower relative humidity (summer operation mode), Liebert EFC works in evaporative (wet) mode.

In climates featuring high levels of humidity the unit may thus require the integration of a Direct Expansion (DX) system or the installation of a Chilled Water (CW) coil (extreme operation mode).




*Dry Bulb Temperature, °C*

*Moisture Content, kg/kg Dry Air*

**DRY OPERATION (Dry Bulb Temperature <17°C -20°C)***

The unit can cool the data center solely via the air-to-air heat exchanger, thus using only cold external air.

**WET OPERATION (Wet Bulb Temperature <20°C - 22°C)***

The unit can leverage the evaporative effect via humidification.

**DX/CW INTEGRATION**

External humidity assumes a key role in determining unit performances:

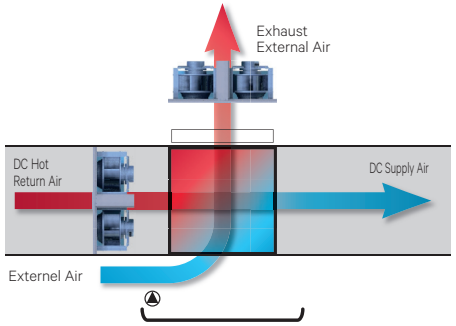
- At 24°C and 90% relative humidity, the unit may require DX/CW integration.
- At 35°C (higher temperature) and 25% (lower relative humidity), the unit can solely operate with evaporative cooling.

**Assumptions: data center 36°C ⟶ 24° C - 100% of full load per unit (redundancy operation)*

## Liebert® EFC Operation Modes In Detail

During the cold season (winter operation mode) return air from the data center is cooled down, leveraging the heat exchange process with external cold air. There is no need to run the evaporative system and the fan speed is controlled by the external air temperature.

Winter

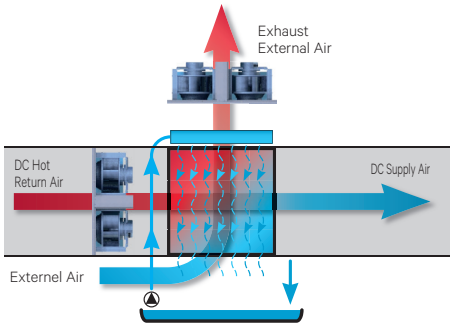



### Dry Operation

Air-to-Air Heat Exchange Without Spraying Water

During the warm season (summer operation mode) the evaporative system must run in order to saturate the air. This enables the unit to cool the data center air even with high external air temperatures. By saturating the air, the dry bulb temperature can be reduced.

Summer

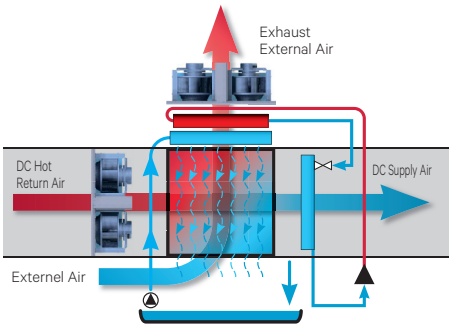



### Wet Operation

Air-to-Air Heat Exchange Via the Spraying of Water to the External Air Side

In the case of extreme external conditions, a Direct Expansion (DX) system is available to provide additional cooling. As an alternative, the Chilled Water (CW) coil can be installed. DX and CW systems are sized to provide partial back up for the overall cooling load and are designed to provide maximum efficiency with minimum energy consumption.

Optional




### DX/CW Integration

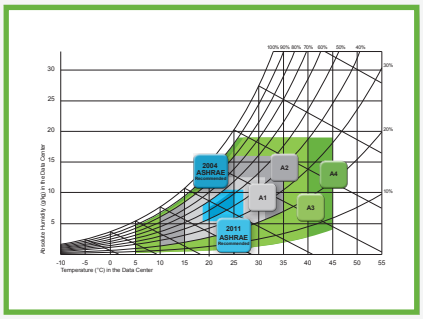
External Air Is too Hot to Achieve 100% Cooling with Adiabatic, the DX Module Is thus Integrated to Cover the Missing Capacity

# The State-of-the-Art Vertiv™ ICOM™ Control

## Precise, User-friendly Information at Unit Level

### To guarantee ASHRAE recommended guidelines even at extreme conditions

- Extreme Winter Operation (i.e. below-20°C) can cause the unit's unrequired internal dehumidification causing it to exceed ASHRAE recommended minimum humidity. Liebert® EFC offers a constant control of data center air via its integrated Vertiv™ ICOM™ control logic, ensuring dew point temperature is lower than heat exchanger surface temperature, thus avoiding unrequired dehumidification.




### To provide precise temperature and airflow control in front of servers

- The Vertiv SmartAisle™ control logic embedded in the Vertiv ICOM optimizes internal air volumes and temperatures according to specific server needs. Vertiv SmartAisle logic allows Liebert EFC to exactly match the servers' airflow needs, ensuring that not even a single Watt is wasted in moving or cooling unrequired air.

### To optimize water and electricity costs with the Cost Function software feature

- The user friendly Vertiv ICOM Control exploits the management of energy and water also at teamwork level. The system collects information from the different units' key parameters and operating modes (dry, wet and DX/CW) while taking into account water and electricity costs. The control predictively calculates and then implements the combination which optimizes operating costs.

## Utmost Efficiency Even at the Data Center System Level

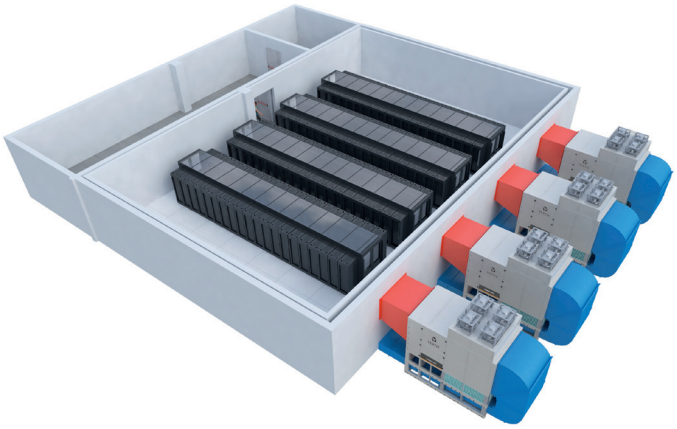
The Vertiv ICOM Control manages the operation of the Liebert EFC units, in order to ensure top reliability in all conditions. Access to the units installed in the data center, is granted through the Ethernet connection, that is capable of coordinating the multiple on-site installations. The high-level supervision of multiple units allows these to work together as a single system, thus optimizing overall system performance.

## High Flexibility Matching Customer Needs

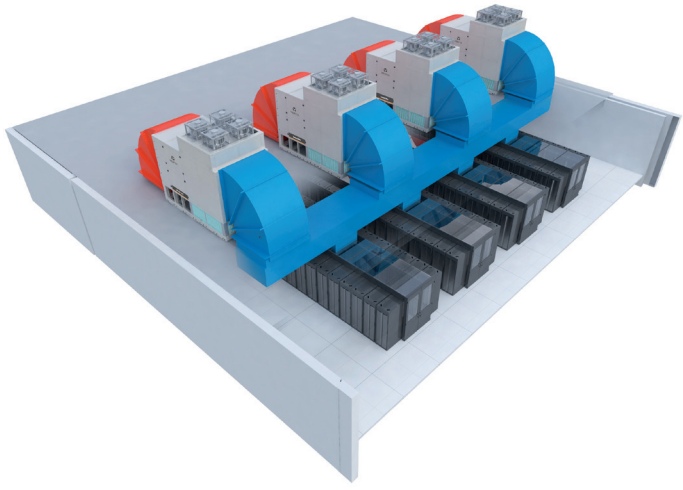
The Liebert® EFC delivers substantial reductions and savings in terms of electrical infrastructure and equipment. With the unit being installed externally, the available internal white space is maximized ensuring ease of system installation. All of these features significantly reduce data center TCO.

| MAIN OPTIONS AVAILABLE | BENEFITS |
|---|---|
| DX or CW coil for mechanical cooling integration | Water storage reduction<br>Dehumidification availability<br>Premium efficiency<br>Delivery temperature guaranteed also under the worst ambient conditions |
| G4 or M5 data center air filter | State-of-the-art filtration class |
| Low ambient kit | To avoid unrequired dehumidification at very low ambient temperatures |
| Automatic transfer switch with intelligent controller | Due to the communication with the unit control, all the electrical power data is monitored through the BMS |
| UltraCapacitor | Control always active even during a power failure |
| Monitoring | Integrated BMS interface (i.e. ModBus, Bacnet and SNMP) |
| Energy meter/water meter | To manage energy and water consumption, thus optimizing operating costs |
| Right and left versions available in both perimeter and roof configurations | To adapt to any data center layout |

**Perimeter Configuration**



**Roof Configuration**

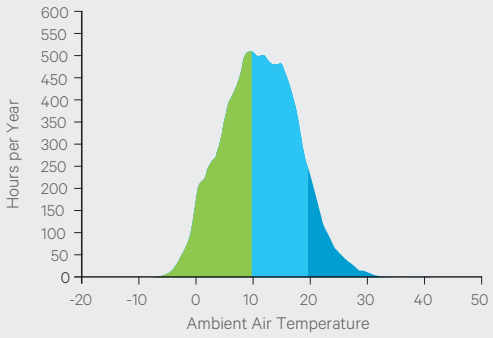


# Annual Distribution of Operating Modes with Indirect Evaporative Freecooling

While respecting ASHRAE guidelines, the Liebert® EFC unit can be installed not only in cold climates, where the unit can leverage on the dry operating mode, but also in hotter ones (as shown in the example below for Istanbul) where DX operation is reduced to a minimum and used only during extreme temperature peaks that may be experienced throughout the year. This results in a significant reduction in electrical consumption possible even at full load (reaching the highest possible savings at partial loads).

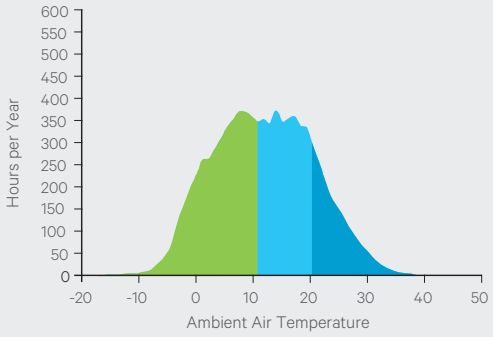
The Liebert EFC Cost Function optimizes running costs (water and electricity), and according to the external dry bulb and heat load, selects the most convenient working mode (i.e. dry vs. wet). With the same logic, the Cost Function will also optimize the use of the optional Direct Expansion (DX) mode.

## ASSUMPTIONS: DATA CENTER 36°C ⟶ 24° C 100% IT LOAD (REDUNDANCY)



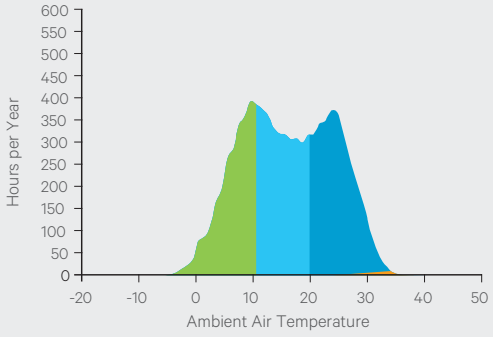

### London

- 45% dry mode
- 45% dry or wet mode (cost function)
- 10% wet mode




### Frankfurt

- 48% dry mode
- 36% dry or wet mode (cost function)
- 16% wet mode




### Istanbul

- 31% dry mode
- 33% dry or wet mode (cost function)
- 34% wet mode
- 2% wet + DX mode

## Vertiv™ LIFE™ Services Remote Diagnostic and Preventive Monitoring

Vertiv's service program is designed to ensure that your critical power protection system is maintained in an optimum state of readiness at all times.


The **Vertiv™ LIFE™ Services** Remote Diagnostic and Preventive Monitoring provides early warning of UPS conditions and out of tolerances. This allows effective proactive maintenance, fast incident response and remote trouble shooting, giving customers complete security and peace of mind.

With **Vertiv LIFE Services** you will benefit from:

### Uptime Assurance

Constant monitoring of UPS parameters, thus maximizing the system's availability.

### First Time Fix Rate

Pro-active monitoring and data measuring ensure that when our customer engineers are dispatched on-site, they arrive prepared for first time resolution.

### Proactive Analysis

From Vertiv LIFE Services centers, our experts proactively analyze the data and trends of your equipment, to recommend a ctions to ensure their best performance.

### Minimized Total Cost of Ownership of Your Equipment

The continuous monitoring of all relevant parameters in turn maximizes unit performance, reduces on-site maintenance and extends the life of your equipment.

### Fast Incident Response

**Vertiv LIFE Services** allows for immediate definition of the best course of action, as a result of the regular communication between your **Liebert® EFC** unit and our **Vertiv LIFE Services** centers.

### Reporting

You will receive a comprehensive report detailing the working order of your equipment and its operational performance.

# Customer Experience Center

## Thermal Management

Vertiv's Customer Experience Center located in Tognana (Padova - Italy), is specifically designed for customers to interact with Thermal Management data center technologies.

The center gives our customers the unique opportunity to witness pre-installation demonstrations, covering technical performance, interoperability and efficiency of Thermal Management solutions under a broad range of real field conditions.

Customers visiting the center may also benefit from a comprehensive consultation from our R&D, engineering and application specialists.


## Evaporative Cooling Validation Area

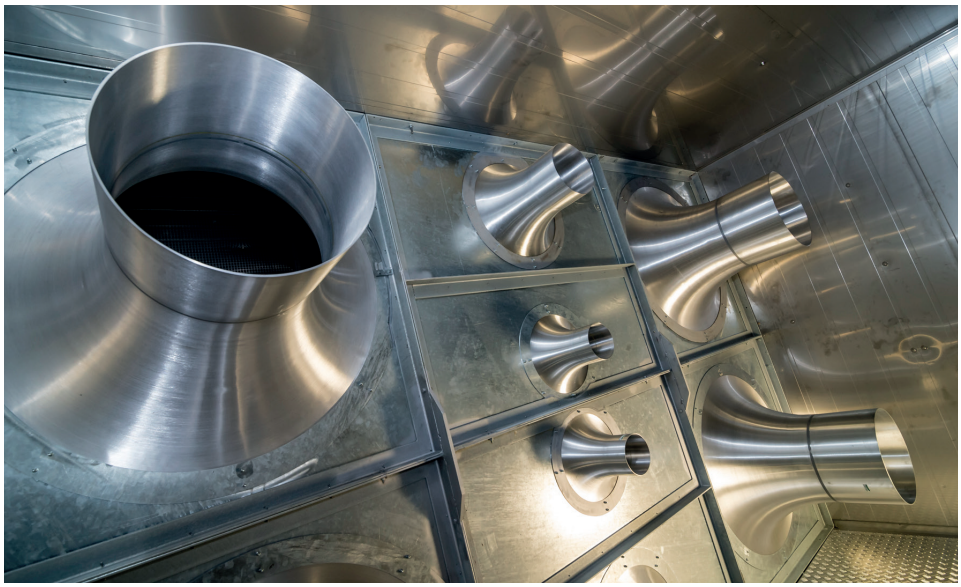
Our Thermal Management Customer Experience Center features a dedicated area to test the state-of-the-art Liebert® EFC unit.

The scope of the Evaporative Cooling Validation Area is to provide customers, consultants and data center specialists with the most complete testing area to experience the capabilities of our evaporative technology at peak conditions.

Testing parameters include IT loads up to 400 kW and an airflow of up to 100,000 $m^3$ per hour, replicating typical peak conditions across the EMEA region, and an exceptional performance measurement accuracy within a +/- 5% maximum tolerance and a +/- 2% airflow tolerance. Airflow rate is also measured at the outlet side using calibrated intake nozzles in compliance with ANSI-AMCA 210/07 and ISO5801.

All our measuring tools are also periodically tested to adhere to the current international quality procedure ISO9001. This guarantees that all our measurements are in line with the metrological laboratories' standards (Accredia/EA/ILAC) and that our equipment precision level is also compliant with the European EN14511 standard.

Every customer visit is accompanied by a complete final report which includes each and every tested parameter. Customers are guided through a first-hand experience with full transparency and flexibility enabling them to achieve the highest standards of technical excellence.



# Thermal Management Data Center Infrastructure for Small and Large Applications

## Liebert® HPC

Wide range of high efficiency Freecooling Chillers from 40 kW to 1600 kW

- Designed specifically for data center applications and to work with Vertiv™ SmartAisle™
- Premium energy efficiency version
- Unique control capabilities with the Vertiv ICOM™ Control.

## Liebert PDX
## Liebert PCW

Available from 5-220 kW

- Premium energy efficiency
- Eurovent certified performance
- Unique control capabilities with the Vertiv ICOM Control
- Liebert® EconoPhase™ available for the direct expansion system.

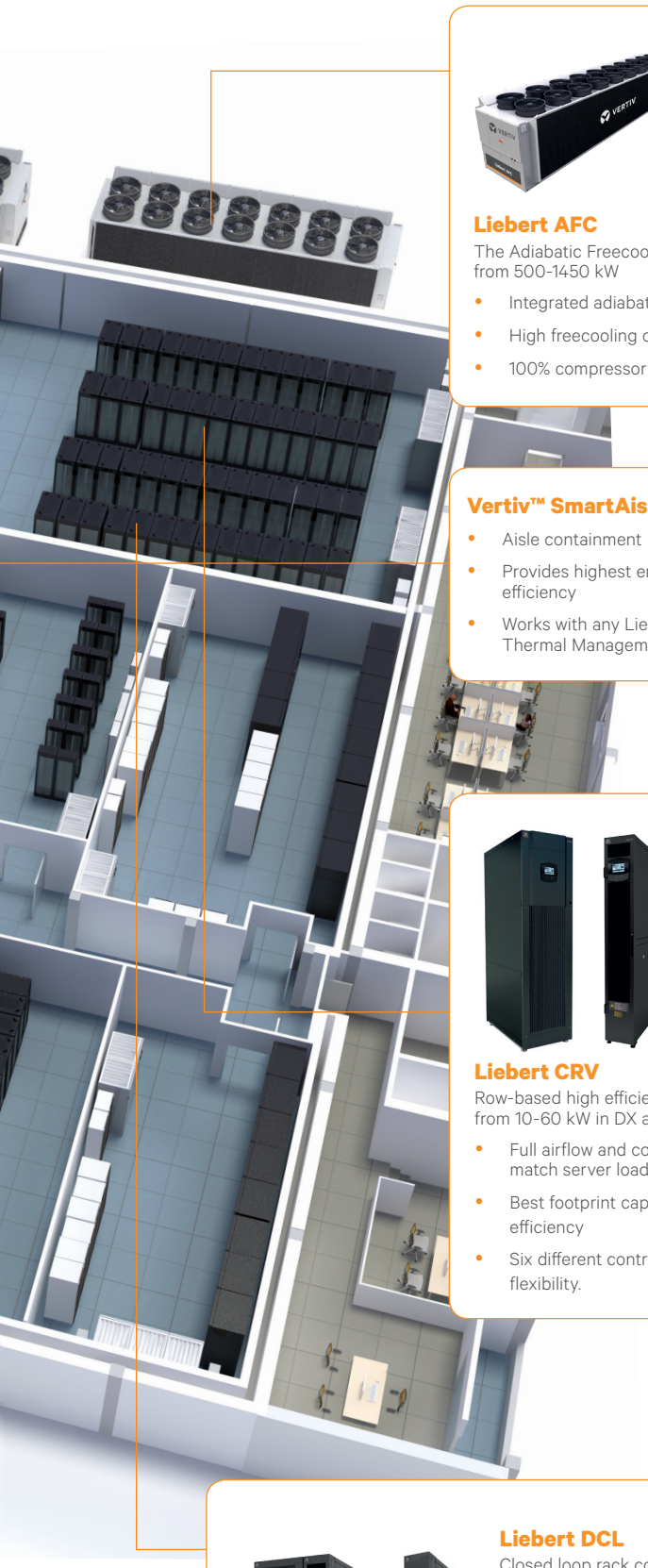
## Liebert EFC

Indirect evaporative freecooling unit leveraging on data center know-how. Available from 100 to 350 kW

- Unique control capabilities optimizing water and energy costs
- Substantial reductions and savings in terms of electrical infrastructure.

## Vertiv™ *Trellis*™ Platform

Vertiv's *Trellis*™ platform is a real-time infrastructure optimization platform that enables the unified management of data centre IT and facilities infrastructure. The Vertiv *Trellis* platform software can manage capacity, track inventory, plan changes, visualize configurations, analyze and calculate energy usage, and optimize cooling and power equipment. The Vertiv *Trellis* platform monitors the data center, providing a thorough understanding of system dependencies to help IT and facilities organizations keep the data center running at peak performance. This unified and complete solution, delivers the power to see the real situation in your data center, make the right decision and take action with confidence.



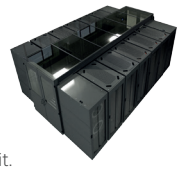
## Liebert AFC

The Adiabatic Freecooling Chiller available from 500-1450 kW

- Integrated adiabatic pad system
- High freecooling capacity
- 100% compressor back up.

## Vertiv™ SmartAisle™

- Aisle containment
- Provides highest energy efficiency
- Works with any Liebert Thermal Management unit.



## Liebert CRV

Row-based high efficiency cooling units available from 10-60 kW in DX and CW versions

- Full airflow and cooling capacity modulation to match server load and to save energy
- Best footprint capacity with the highest efficiency
- Six different control modes to ensure greater flexibility.

## Liebert DCL

Closed loop rack cooling

- Two different architectures:
  Closed Loop
  Hybrid Loop
- Multiple combinations for up to 4 server racks
- Dual CW coil version for redundancy.

# SERVICES

Vertiv supports entire critical infrastructures with the largest global service organization and an extensive service offering, enhancing network availability and ensuring total peace of mind 24/7.

Our approach to servicing critical infrastructure covers all aspects of availability and performance: from single power and thermal management equipment to entire mission-critical systems.

The most comprehensive insurance for business protection can be obtained with a service program from Vertiv which includes access to Vertiv LIFE™ Services.

# VERTIV™ LIFE™ SERVICES

Vertiv LIFE Services provides Remote Diagnostics and Preventive Monitoring for UPS and thermal management equipment.

Vertiv LIFE Services delivers increased uptime and operational efficiency by enabling continuous monitoring of your equipment, expert data analysis and field engineering expertise.

Through the data transferred from your equipment via Vertiv LIFE Services, our Remote experts gain the real-time insight and information needed to quickly identify, diagnose, and resolve any irregularities that may arise in operation, ultimately taking responsibility for your critical assets 24/7.


**VertivCo.com** | **Emerson Network Power Limited,** George Curl Way, Southampton, SO18 2RY, VAT Number: GB188146827



MKA4L0UKEFCAR Rev. 2-04/2016