

Liebert® EFC from 100 to 350 kW

The Highly Efficient Indirect Evaporative Freecooling Unit





Liebert® EFC, the Highly Efficient Indirect Evaporative Freecooling Solution

■ **Emerson Network Power** provides a unique combination of industry expertise, technology, and resources to make the future of your business possible.

As a trusted industry leader in smart infrastructure technologies, the company provides innovative data center infrastructure management solutions that bridge the gap between IT and facility management, delivering efficiency and uncompromised availability regardless of capacity demands.

The wide product portfolio and integration capabilities enhanced by complete life cycle services support data centers, communication networks, healthcare and industrial facilities from project launch to performance optimization.



Liebert EFC 300



Liebert EFC 200

■ **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 pressurized 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.

Contaminations
Free

**Data Center
Free from
Contaminations**



**Optimized Water
Consumption**

1.03

**Top Energy
Efficiency Levels**
pPUE down to 1.03



**Reduced
Capital Cost**



**Reduced Electrical
Infrastructure**



**Technical
Expertise**

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 inside the unit, as well as on the heat exchanger to enable cooling even at high ambient air temperatures, without the need of 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 CO₂ Emissions

At pPUE levels of 1.03, Liebert EFC requires minimum power input consequently reducing CO₂ 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 iCOM™ 7" Touch Display

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.



The evaporative system has a dedicated internal pump station that provides the exact amount of water needed. The pump pressurizes the water which is then atomized through special nozzles in billions of micro drops, which in turn evaporate, humidifying and cooling the air.



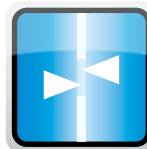
Energy Efficiency

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.



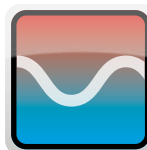
Freecooling

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.

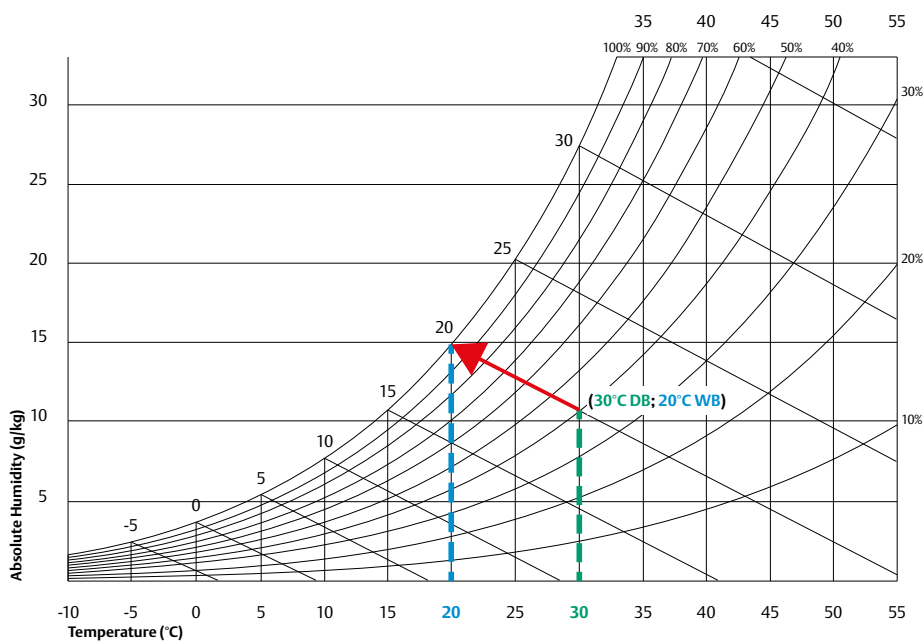


Ensuring Top Efficiency Levels through the Evaporative Principle

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.

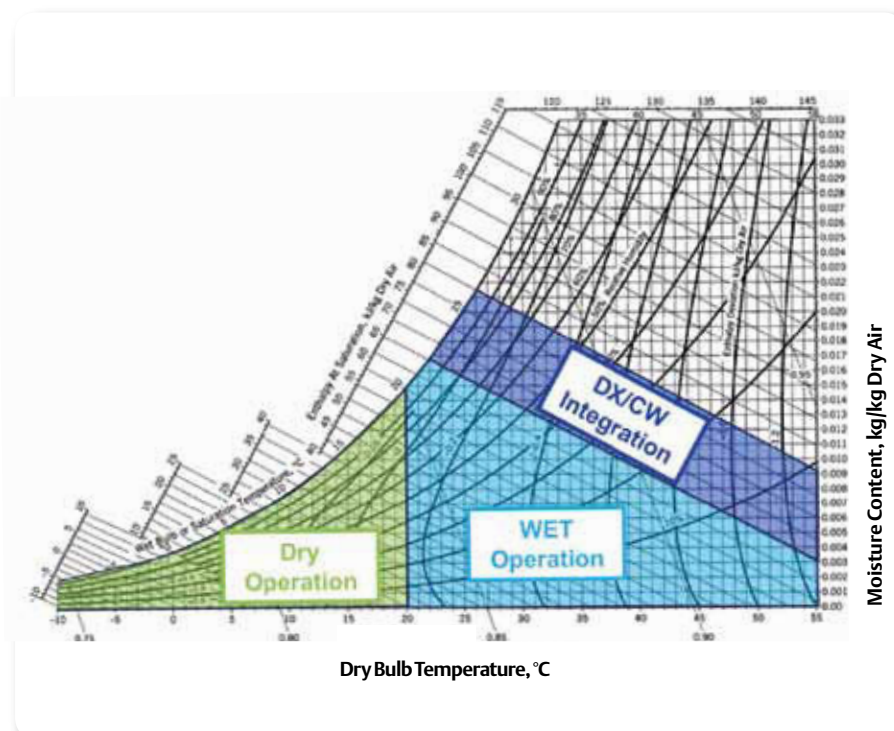
The evaporative principle uses air to absorb water that is sprayed at high pressure. Water evaporation, thus removes heat from the air and cools the outside air temperature. Outside air consequently transitions from Dry Bulb Temperature to Wet Bulb Temperature (*the graph below shows the transition from 30°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 Operation
(Dry Bulb Temperature <math><17^{\circ}\text{C} - 20^{\circ}\text{C}</math>)*

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 <math><20^{\circ}\text{C} - 22^{\circ}\text{C}</math>)*

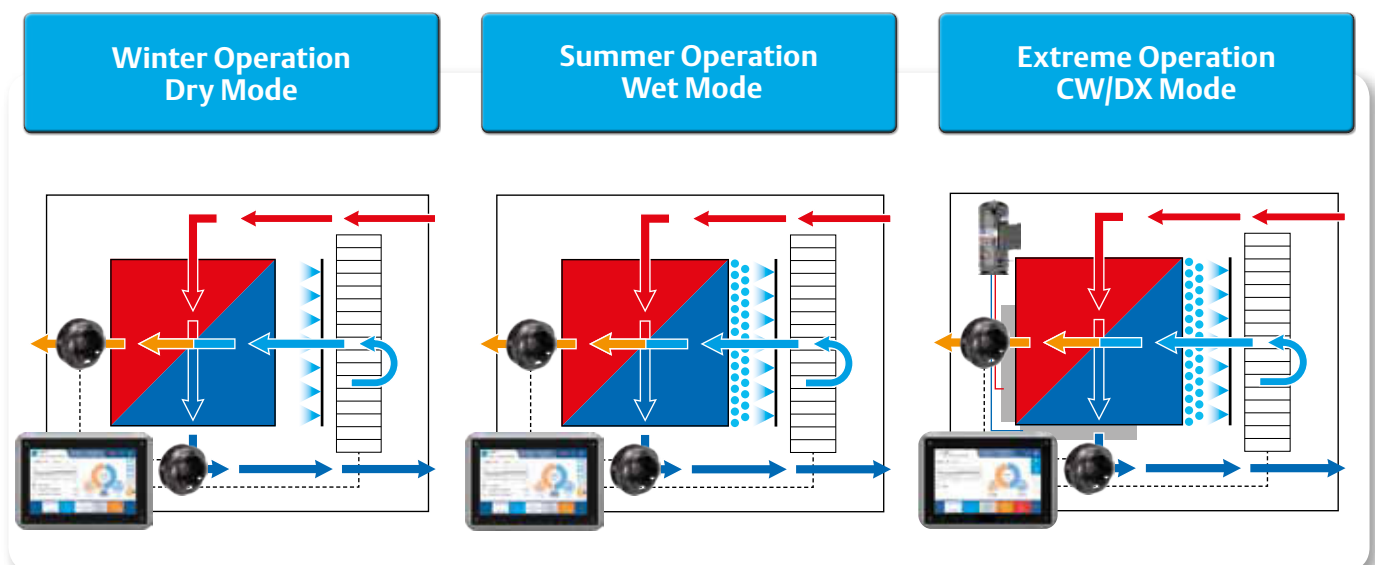
The unit can leverage the evaporative effect via humidification. External humidity assumes a key role in determining unit performances:

- 24°C - 80% relative humidity, the unit may require DX/CW integration.
- 30°C (higher temperature) and 35% (lower relative humidity) the unit can operate solely with evaporative cooling.

*Assumptions: data center 36°C → 24°C - 75% 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.
- 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.
- In the case of extreme external conditions, a Direct Expansion (DX) system is available to provide additional (Top-Up) 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.



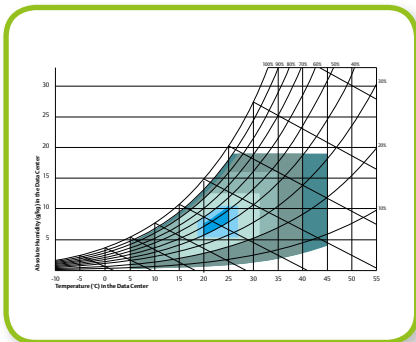


The State-of-the-Art iCOM™ Control

Precise, User-friendly Information at Unit Level

To guarantee ASHRAE RECOMMENDED guidelines

■ Extreme Winter Operation (i.e. temperatures $< -20^{\circ}\text{C}$) 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 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

■ The SmartAisle™ control logic embedded in the iCOM optimizes internal air volumes and temperatures according to specific server needs. 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

■ The user friendly 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 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.



LIFE™ Remote Diagnostic and Preventive Monitoring Service

Emerson Network Power’s service program is designed to ensure that your critical Thermal Management system is maintained in an optimum state of readiness at all times.

The LIFE remote diagnostic and preventive monitoring service provides early warning of Thermal Management conditions and out of tolerances. This allows effective proactive maintenance, fast incident response and remote troubleshooting, giving customers complete security and peace of mind.



With LIFE services you will benefit from:

Uptime Assurance

Constant monitoring of the units’ 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 LIFE service centers, our experts proactively analyze the data and trends of your equipment, to recommend actions to ensure their best performance.

Minimized Total Cost of Ownership of Your Equipment

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

Fast Incident Response

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

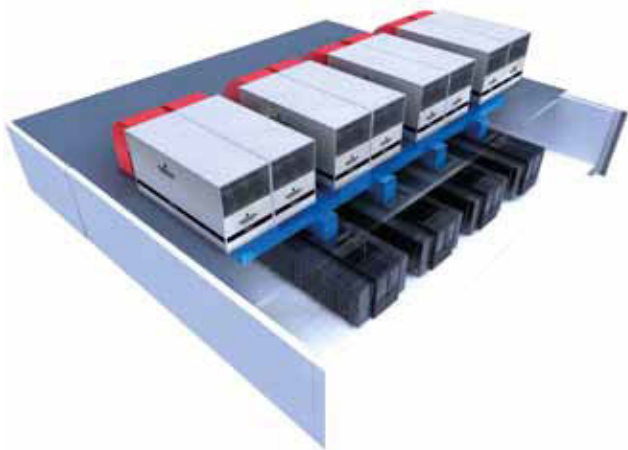
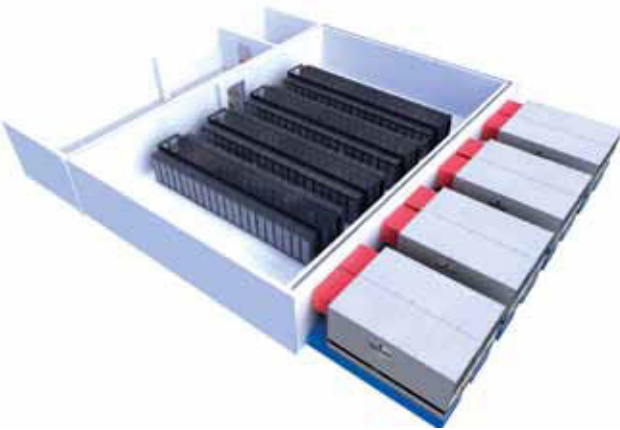
Reporting

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

Liebert® EFC Configurations

Perimeter Configuration

Roof Configuration




ASHRAE Recommended, ASHRAE Allowable (A1-A4)	Suggested Working Area	ASHRAE Recommended, ASHRAE Allowable (A1-A4)
<ul style="list-style-type: none"> - Air-to-air heat exchange and evaporative cooling in one footprint - EC Fans - With DX or CW coil for mechanical back-up - SmartAisle™ 	Liebert EFC: The future of data center solutions	<ul style="list-style-type: none"> - Air-to-air heat exchange and evaporative cooling in one footprint - EC Fans - With DX or CW coil for mechanical back-up - SmartAisle™
<ul style="list-style-type: none"> a) Green field sites b) Warehouse data centers 	Where it is most commonly applied	<ul style="list-style-type: none"> a) Data centers located on the top of the building b) City center applications
This configuration requires space for installation and maintenance, especially in city centers.	Application Constraints	This configuration requires to be on top of the building floor and to have enough space on the roof for the units' installation.
Liebert EFC with a downflow configuration provides advantages in terms of simplified installations for the customer.	Benefits of Emerson Network Power Solutions	Liebert EFC with roof configuration provides indirect evaporative freecooling for roof applications.



Liebert® EFC Energy Savings

The Liebert EFC indirect evaporative freecooling unit takes advantage of the external air temperature to achieve ultimate energy savings for data centers. The main source of cooling derives from the outside air and the evaporative system, which is then transferred to the data center via the highly efficient fans and air-to-air heat exchanger. The Liebert EFC has thus been designed to achieve a pPUE level between 1.03 and 1.06 (depending on the environmental conditions).

Comparison between Annual Energy Consumption and Annual Energy Cost at Varying pPUE

pPUE	Annual Energy Consumption (kWh)	Annual Energy Cost (€)
1.6	5,256,000	630,720
1.2	1,752,000	210,240
1.1	876,000	105,120
1.06	525,600	63,072
1.03	262,800	31,536 

A 1 MW data center has been considered for calculation purposes

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.



Customer Experience Center Thermal Management

Emerson Network Power's newest 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 Emerson Network Power's 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 - Emerson Network Power's highly efficient indirect evaporative freecooling 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 m³ per hour at any external ambient temperature required to simulate typical peak conditions across EMEA region.

All our measuring tools are 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 as well as the relevant outputs for the specific Thermal Management unit validated. With our constant focus on our customers' needs, we guide them through a first-hand experience with full transparency and flexibility enabling them to achieve the highest standards of technical excellence.

Emerson Network Power

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 SmartAisle™
- Premium energy efficiency version
- iCOM™ Control featured



■ Liebert® PDX - Liebert® PCW

Liebert PDX available from 15-120 kW
Liebert PCW available from 30-220 kW

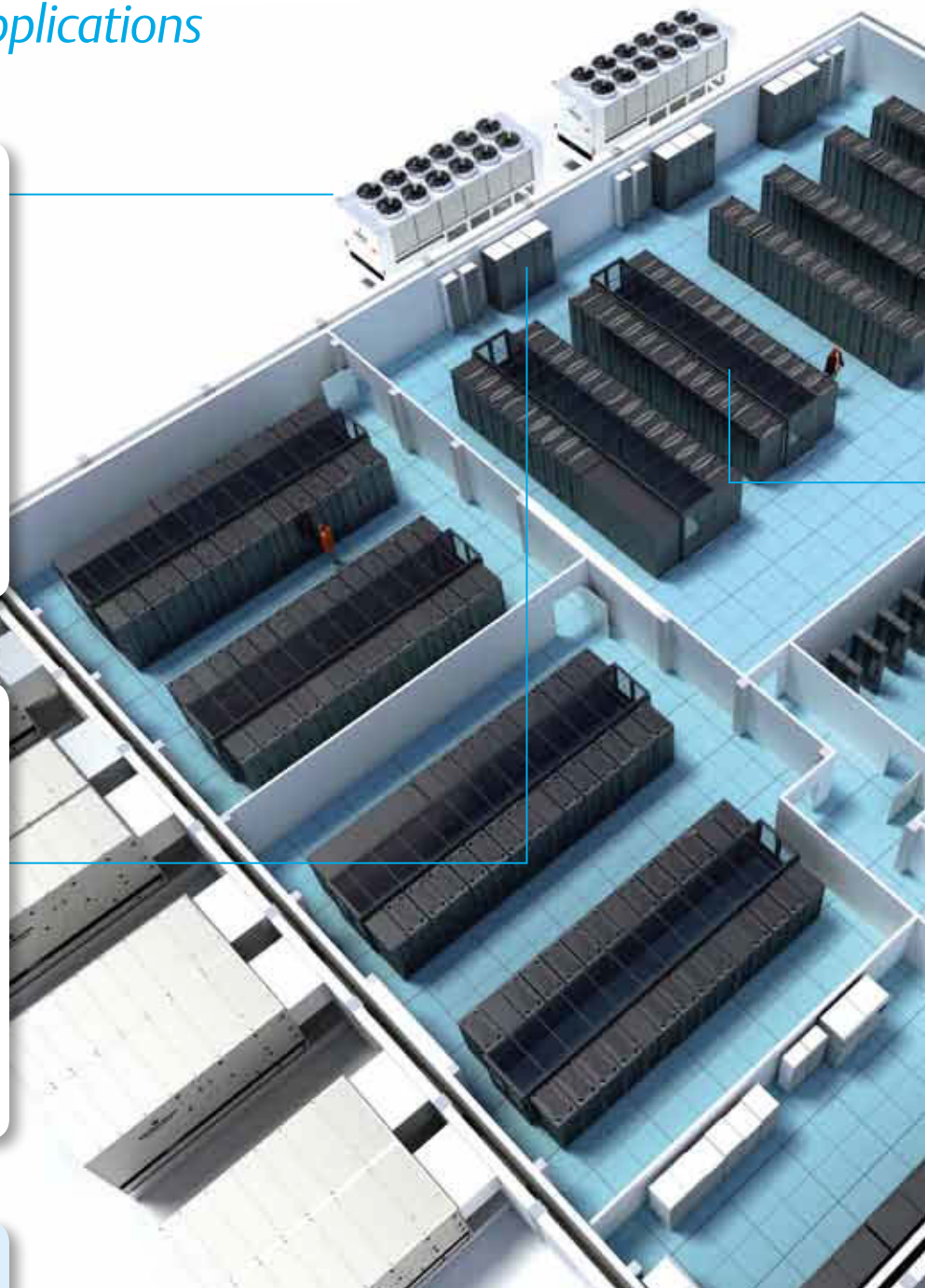
- Premium energy efficiency
- Eurovent certified performance
- Unique control capabilities with the iCOM Control



■ Liebert® EFC

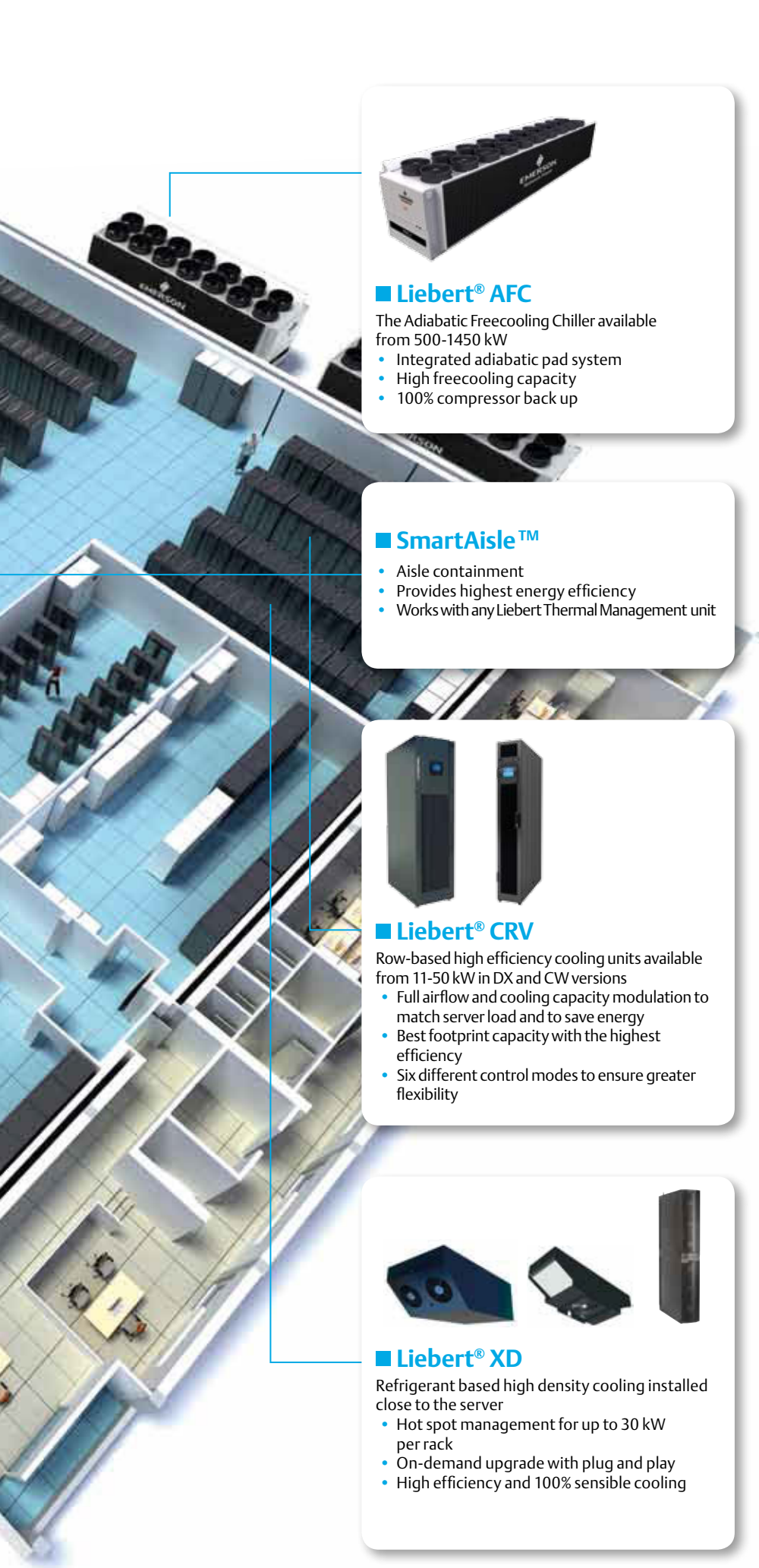
Indirect evaporative freecooling unit

- iCOM Control featured
- New generation EC Fans
- Eurovent certified heat exchanger



Trellis™ Platform trellis

Emerson Network Power's Trellis platform is a real-time infrastructure optimization platform that enables the unified management of data centre IT and facilities infrastructure. The Trellis platform software can manage capacity, track inventory, plan changes, visualize configurations, analyze and calculate energy usage, and optimize cooling and power equipment. The 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

■ SmartAisle™

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



■ Liebert® CRV

Row-based high efficiency cooling units available from 11-50 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® XD

Refrigerant based high density cooling installed close to the server

- Hot spot management for up to 30 kW per rack
- On-demand upgrade with plug and play
- High efficiency and 100% sensible cooling

Service

Emerson Network Power 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 Emerson Network Power which includes access to LIFE™.



LIFE™

LIFE provides remote diagnostics and preventive monitoring service for UPS and thermal management equipment.

LIFE 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 LIFE, our remote service 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.

Ensuring The High Availability Of Mission-Critical Data And Applications.

About Emerson Network Power

Emerson Network Power, a business of Emerson (NYSE:EMR), delivers software, hardware and services that maximize availability, capacity and efficiency for data centers, healthcare and industrial facilities. A trusted industry leader in smart infrastructure technologies, Emerson Network Power provides innovative data center infrastructure management solutions that bridge the gap between IT and facility management and deliver efficiency and uncompromised availability regardless of capacity demands. Our solutions are supported globally by local Emerson Network Power service technicians.

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EmersonNetworkPower.eu

Locations

Emerson Network Power Global Headquarters

1050 Dearborn Drive
P.O. Box 29186
Columbus, OH 43229, USA
Tel: +1 614 8880246

Emerson Network Power Thermal Management EMEA

Via Leonardo Da Vinci, 16/18
Zona Industriale Tognana
35028 Piove di Sacco (PD) Italy
Tel: +39 049 9719 111
Fax: +39 049 5841 257

Emerson Network Power United Kingdom

George CurlWay
Southampton
SO18 2 RY, UK
Tel: +44 (0)23 8061 0311
Fax: +44 (0)23 8061 0852

Globe Park
Fourth Avenue
Marlow Bucks
SL7 1YG
Tel: +44 1628403200
Fax: +44 1628403203

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