VERTIV.™

Liebert®

DSE™ Thermal Management System

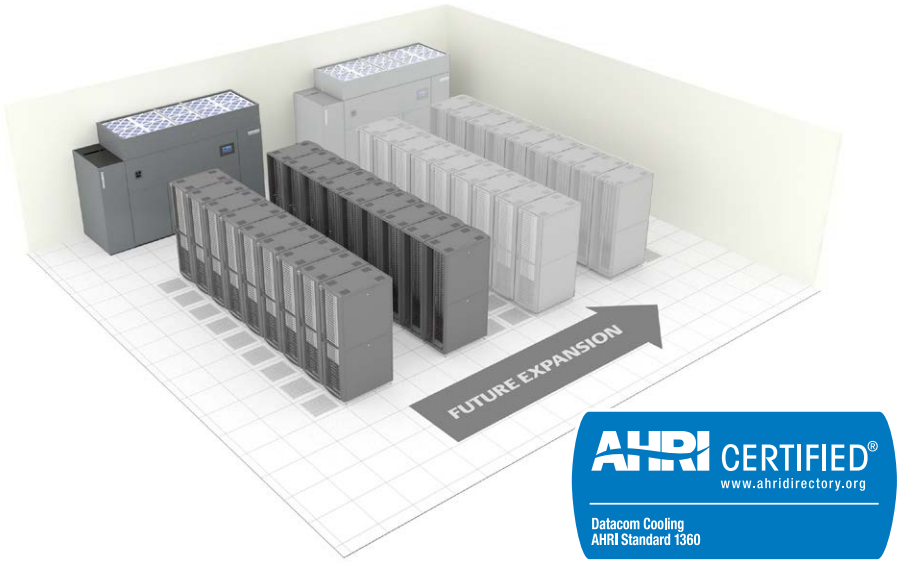
Free Cooling Economization Without Using Water

AHRI CERTIFIED®
www.ahridirectory.org
Datacom Cooling
AHRI Standard 1360

Liebert® DSE™ System Overview

A Highly Efficient, Self-Optimizing Solution for Thermal Management

The Liebert® DSE™ provides industry-leading thermal management efficiency, protection and insight. It uses no water for economization and its innovative design makes it up to 50% more efficient than legacy solutions. Designed with unparalleled expertise, it is part of Vertiv's Thermal Management solutions that make your data center as dynamic as your business.



Reliable, Low-Maintenance Pumped Refrigerant Economization Operation

- No water usage
- No water treatment
- No outside air contamination
- No dampers and louvers to maintain
- Automatic switchover to maximize economizer usage
- Lower refrigerant charge than traditional DX systems

CAN BE USED TO COMPLY WITH TITLE 24, PART 6

The Liebert DSE solution lets you simplify every aspect of thermal management.

1. **Add Capacity Efficiently** with a modular, scalable design and no need for additional chillers, cooling towers, or ductwork
2. **Economize Easily** with automatic switchover
3. **Operate Hassle-Free** with advanced controls and no water usage
4. **Optimize Intelligently** with Liebert iCOM™ advanced thermal management system
5. **Streamline Maintenance** with use of water, outside air, or manual adjustments

QUICK SPECS

Mechanical PUE: 1.3 - 1.05

Capacity: 50kW, 80kW, 85kW, 125kW, 150kW, 165kW

Footprint: 80-85kW: 24 ft2; 125-165kW: 47 ft2

		ANNUAL ENERGY USAGE			
CITY	TYPICAL DX SYSTEM	LIEBERT DSE SYSTEM	LIEBERT DSE SYSTEM SAVINGS	CHILLED WATER SYSTEM	LIEBERT DSE SYSTEM SAVINGS
Columbus	$340,860	$117,606	65%	$294,220	60%
San Francisco	$334,057	$114,293	66%	$189,221	40%
Phoenix	$380,544	$179,544	53%	$213,015	16%

Water Conservation: Compared to a chilled water economization system, the Liebert DSE system can reduce water usage in a typical data center by 4 million gallons annually.

1,000 kW Load, $0.10 per kWhr, 70% load

The World's Most Efficient DX System

The air-cooled Liebert® DSE™ offers water-free economization, a rapidly deployable configuration and advanced Liebert iCOM™ thermal controls that let you optimize each unit and harmonize the operation of multiple units for temperature and airflow.

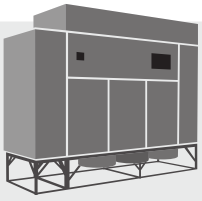
A highly scalable and modular solution, it easily accommodates changing IT loads and is ideal for upgrading outdated or inefficient cooling systems.

Optimization Through Intelligent Controls

The Liebert DSE system has four components that work together to optimize the use of ambient temperatures for higher efficiency and to ensure higher protection of the thermal system.

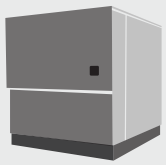
The hardware components are managed by the Liebert iCOM unit control which is integrated into the CRAC unit. It provides fail-safe economization with full DX backup.

An optional capacitive buffer provides continuous control operation during power outages of up to 3 minutes. Continuous operation of controls allows for monitoring systems to remain active, and allows for faster restart times after power is restored.

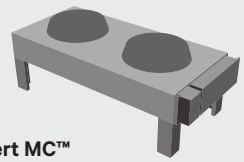


The **Liebert DSE**
indoor computer room air conditioning (CRAC) unit
World's most efficient DX cooling system

Liebert iCOM Thermal System Controls
Intelligence for optimized operation



The **Liebert EconoPhase™**
pumped refrigerant economizer
Economization without hassles



The Liebert MC™
micro-channel condenser
Intelligent, high efficiency condensers

SYSTEM COMPONENTS

Liebert Indoor Unit

- Industry-best efficiency
- Digital scroll compressors match cooling to IT load
- EC plugs fans match airflow to IT server needs
- Electronic expansion valves

Liebert MC Condenser

- Most efficient air-cooled condenser for data centers
- Fan/Coil operating strategy increases part load efficiency
- Each fan is variable speed

Liebert iCOM Controls

- Protection from adverse events and system wear and tear
- Higher efficiency across the thermal system – up to 50% energy savings
- Insight for action into real-time data and trends for performance optimization

Liebert EconoPhase

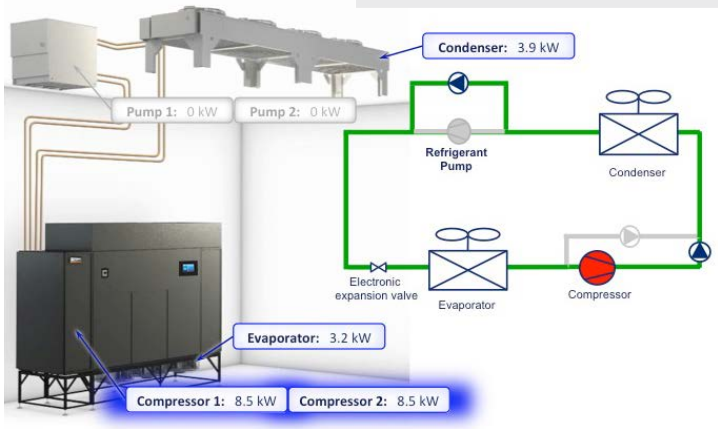
- Integrated economizer control with automatic diagnostics
- Liebert iCOM monitoring of pump operation
- Automatic changeover on loss of free cooling
- Pump serviceable without loss of cooling

Designed for the Highest Efficiency

1. The example to the right shows full compressor operation with the Liebert DSE units operating at 70% capacity. During warm summer months, the Liebert EconoPhase unit is idled, and the system instead uses compressors to drive heat rejection. To maximize efficiency in this scenario, the variable-speed evaporator fans, variables speed condenser fans, and the digital scroll compressors automatically adjust to match IT load and optimize energy usage.

1. DX Operation Mode

COOLING MODE	OUTDOOR TEMP	COOLING PUE
Full Compressor	95	1.28



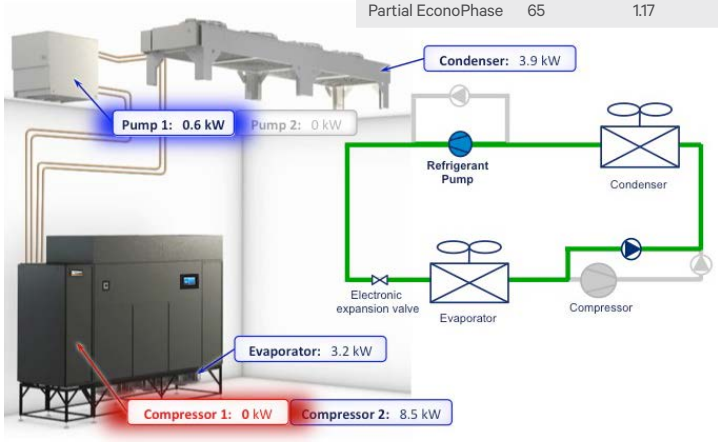
2. During cooler times, such as mild seasons and at night, the refrigerant economizer has the ability to provide partial free cooling, offsetting some of the compressor power usage.

   Assuming an 85°F return air temperature to the CRAC unit, when the outdoor temperature drops low enough (65°F for the example shown, but at even higher temperatures for lower load applications), the Liebert EconoPhase can begin to offer partial economization.

   In this mode, refrigerant bypasses the CRAC's first compressor, allowing it to idle. Pump One of the EconoPhase system is then activated, consuming only 0.6 kW - a net savings of over 90% compared to compressor operation. The result is a lower cooling PUE of 1.17 or a system SCOP of 5.8.

2. Partial Economization

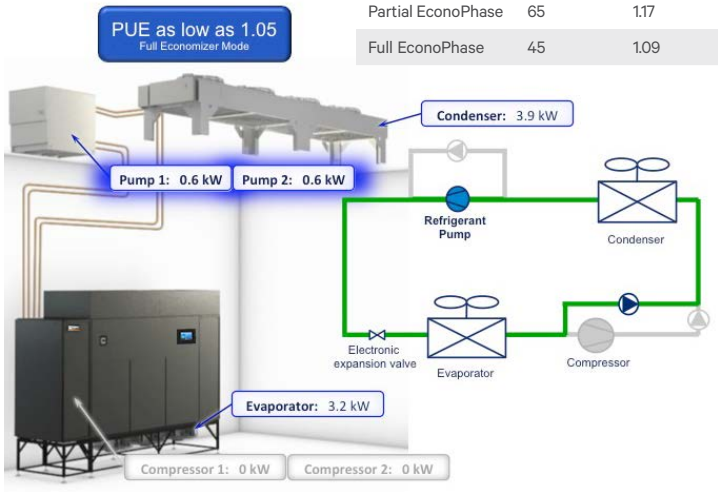
COOLING MODE	OUTDOOR TEMP	COOLING PUE
Full Compressor	95	1.28
Partial EconoPhase	65	1.17



3. When outdoor temperatures are at their lowest (particularly in winter months), the Liebert DSE™ can leverage the Liebert EconoPhase system to operate at full economization.In this scenario (45°F ambient shown, but potentially higher for lighter loads), all of the Liebert DSE system's compressors are idled and bypassed, replaced entirely b/.or 9 kW of power for the cooling system for every 100 kW of IT load.

3. Full Economization

COOLING MODE	OUTDOOR TEMP	COOLING PUE
Full Compressor	95	1.28
Partial EconoPhase	65	1.17
Full EconoPhase	45	1.09



Designed for High Performance

Liebert® DSE™ Cooling Unit

The Liebert DSE high-efficiency cooling system provides greater protection and far exceeds ASHRAE 90.1 – the industry standard for energy efficiency in thermal management solutions.

Protection

- Higher unit reliability:
  - Direct-drive EC fans with no belts or pulleys to maintain
  - Automatic economizer transition maximizes economizer run time and minimizes wear and tear on compressors
- Variable capacity digital scroll compressors match heat rejection capacity to IT equipment, ensuring proper cooling of critical components

Efficiency

- Digital scroll compressors minimize energy consumption by matching heat rejection capacity to IT load
- Electronic expansion valve allows reduced head pressure operating to minimize system power consumption
- Staged evaporator coil allows for increased part-load efficiency
- Integrated Liebert iCOM unit control coordinates compressor utilization with economizer transition points to minimize system power consumption

Liebert EconoPhase Economizer

The Liebert DSE air cooled model can utilize the Liebert EconoPhase pumped refrigerant economizer, to ensure efficiency and cost-savings while maintaining simplicity of installation without the use of water.

Protection

- No water inside the data center
- No outside air contamination
- No dampers and louvers to maintain

Efficiency

- No additional coils or heat exchangers
- Liebert iCOM automated economizer switchover routines maximize hours of economizer operation

Liebert MC Microchannel Condenser

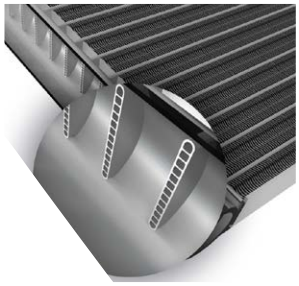
The air-cooled Liebert MC Condenser has an exclusive microchannel coil design that reduces energy costs and operational expenses.

Benefits versus fin and tube design

- Lower refrigerant charge
- Quieter operation
- Smaller footprint
- Lighter weight

Protection

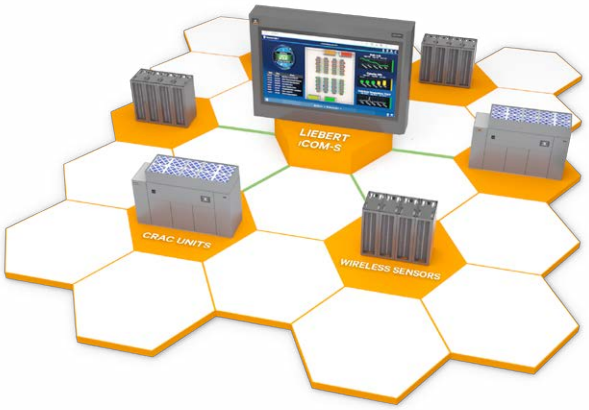
- Communications with indoor CRAC unit for greater visibility into system operation and component status
- Efficiency
- Annual fan power savings of up to 85% compared to traditional fin and tube models



Liebert® iCOM™ Thermal Controls

Introducing the New Era of Environmental Control

The Liebert® DSE cooling system utilizes Liebert iCOM thermal controls, which offer thermal management optimization at both the unit and system levels, with an easy-to-use, touch screen interface that gives data center managers the insight needed to maximize performance. An optional capacitive buffer provides continuous control operation during power outages of up to three minutes. Continuous operation of controls allows for monitoring systems to remain active, and allows for faster restart times after power is restored.



At the cooling unit level, the Liebert iCOM unit control provides the highest protection available and optimal performance.

- Monitors 380 unit and component points to eliminate single points of failure
- Self-healing features avoid passing unsafe operating thresholds
- Highly intuitive, full-color, touch screen simplifies operations to save time and reduce human error
- Multiple, automated unit protection routines, including lead/lag, cascade, rapid restart, refrigerant protection and valve calibration

At the supervisory level, the Liebert iCOM™-S system control offers a revolutionary way to harmonize and optimize thermal system performance to optimize capacity across the data center, gain quick access to actionable data, and automate system diagnostics and trending.

- Advanced monitoring and at-a-glance reporting on performance metrics and trends for efficiency, capacity and adverse events
- Up to 50% system efficiency gains
- 30% lower deployment costs
- Teamwork modes that prevent conflict between units and allow them to adapt to changes in facility and IT demand to improve efficiency and availability and reduce system wear and tear – saving more than $10,000 per unit per year in energy costs
- Simple and easy to deploy — auto-configuration to detect and configure up to 4,800 sensors, eliminating the need for custom integration to building management systems and cutting sensor deployment times in half

Liebert iCOM unit control and Liebert iCOM-S system control are available for new Vertiv data center cooling units or as retrofits.

Simplify Thermal System Management for Protection, Efficiency and Insight

	LIEBERT ICOM™ UNIT CONTROL	LIEBERT ICOM™-S SYSTEM CONTROL
Description	Mission critical unit control for greater protection	Supervisory, multi-unit mission critical control for higher efficiency and insight
	Available on new Vertiv cooling units and backward compatible for retrofits	Direct integration with Liebert iCOM unit controls, with U2U connection
	9" color, resistive touch screen	22" color, high-definition, capacitive touch screen display
	2USB, 2 RS-485 and 2 Ethernet ports	48-port network switch - no monitoring cards required Integrated firewall/router
	LED and audible alarms	Integrated Wi-Fi/Ethernet
Protection and Insight	Highest unit protection available	Advanced monitoring and collaborative protection
	380 unit and component monitoring points	Efficiency, capacity and system performance monitoring, trending and planning
	Over 200 unit and component alarms	Visual floor plan thermal sensor map
	Redundant unit failsafe modes	High security mesh wireless sensor network
	Unit protection routines – lead/lag, cascade	Adaptive control for hot spot reduction and self-healing
	Fast restart	
	Refrigerant protection	
	Automatic valve calibration	
Efficiency	10-20% unit efficiency gains	Up to 50% system efficiency gains
	Shared workload teamwork	Advanced machine-to-machine (M2M) teamwork with wireless sensor integration
	Collaborative, non-fighting teamwork	Independent airflow and temperature control with fan speed coordination
	Predictive auto-economization	Group/Zone control to reduce temperature variations
	Dew point, rack sensor, supply air, return air or differential pressure control	Set point change coordination
Deployment	20% reduction in deployment time/costs compared to integrating and mapping each cooling unit to a building management system	30% lower wireless sensor deployment costs through automatic sensor configuration
	Quick start wizard set up	Automatic sensor detect and configuration for up to 4800 sensors
	BMS points generator tool	Single connection point for all thermal equipment
	Single wire unit-to-unit connection	Integrated cable management and wall mounting bracket
	1-hour retrofit installation	Single person installation
	Exportable configuration parameters and event history	Desk or wall-mount applications

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