

# Knürr IT Special Catalog

Networks and Data Centers



As at: July 2012

# Emerson Network Power

*Business-Critical Continuity™ - so your success continues*

## Core competencies:

- AC Power
- Connectivity
- DC Power
- Embedded Computing
- Embedded Power
- Infrastructure Management & Monitoring
- Outside Plant
- Power Switching & Controls
- Precision Cooling
- Racks & Integrated Cabinets
- Services
- Surge Protection

No company, no matter how big it is, can afford business-critical system failures.

Over the years we at Emerson Network Power have acquired unique know-how, and with our name we represent reliable rack systems, power supply, precision cooling, connectivity and integrated solutions. We can consequently ensure that you generate optimum benefits from your technology investments.

Thanks to Emerson Network Power's technology range and expansive competencies, the entire bandwidth of company-wide solutions is supported for today's critical business requirements. Customers all over the world build on our support for future-proof investments, because they know that we offer globally specific innovations and optimized solutions from one single source – supported by reliable local service and support.

We can ensure the stable operation of your network infrastructure – regardless of whether voice, data or multimedia content are transmitted.

This is based on a proven, comprehensive portfolio of products, services and systems which supports a multitude of computing, telecommunications, health care and industrial applications. This creates a foundation of trust that is only possible with a partnership with Emerson Network Power.

Our assignment is to prepare you for the unknown and the unexpected. We show you the way against the background of dynamic changes in your business environment. And we help you to master the requirements this entails and avail of the greatest possible benefits from your technology investments. This is what we mean by Business-Critical Continuity™.

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For decades now **Emerson Network Power** has been a recognized global leader in the business-critical systems segment. The most successful companies in the world build on our solutions, technologies and services.



## Market-leading data center technologies for your company.

**Business information is more important today than ever for companies of every size. Data centers form the backbone for business processes to run on. And the same challenges appear in absolutely every data center. Increasing heat densities. Growing requirements for reliable power supply. Faster technological change. Cost pressure and lack of space.**

Knürr provides comprehensive products and services for all requirements – from compact racks and computer rooms, right through to global data centers.

On the basis of the specific requirements of different data centers, Emerson Network Power has developed a specific, ready-made solution – rack systems with integrated thermal management, power supply, cooling and monitoring. We also provide optional services and on-site expertise and support. We consequently ensure that you can easily order, configure, manage and implement your Knürr solution with no problems whatsoever.

## Integrated solutions. Integrated benefits. Integrated energy efficiency.

Together with Knürr and other divisions, only Emerson Network Power can provide the benefits of a fully integrated and prefabricated solution that covers all requirements – from the rack right through to the entire room. With us you get all your products and services from one single source. You can also rest assured that all components interact with one another perfectly.

- **Reliability** – Proven business-critical technologies that minimize failure sources (single points of failure) guarantee the greatest possible reliability for your IT systems. You can rest assured that your infrastructure is in good hands.
- **From one single source** – One central provider for the provision, configuration, installation and support of your products and technologies – a call is all it takes.
- **Integration** – From the rack through to the entire room – our products and services form one entirely integrated holistic system. All ready-to-use products that carry our name are configured for optimum interaction.
- **Technical support** – Where required on-site and factory-side support are provided by application specialists. In terms of numbers alone Emerson Network Power has the world's strongest team of customer service specialists, trained directly in the factory. They have the know-how and product knowledge to guarantee the highest possible availability, and in emergencies they will ensure the fastest possible recovery.
- **Flexible configuration options** – Your IT requirements change continuously. Our products and technologies can be flexibly adjusted and provide you with a cost-effective option to support your growth – so the unexpected won't upset your course.
- **Energy efficiency** – This has always been one of our obligations for our customers, which is why we provide "Green IT" solutions that set standards on the ITC market. The result – a data center infrastructure that stays abreast of current and future requirements.

# Glossary

## Adaptive Architecture Industry terms and phrases

### Liebert Adaptive Architecture™

The Liebert Adaptive Architecture is a product and technology family that really impresses on the basis of its optimum minimum TCO and optimum availability balance.

### Open Architecture/Closed Architecture

With open architecture cooling coils and the room's air volume can be used as thermal storage to guarantee continuity with power failures.

With a closed architecture the rack is completely closed off. The cooling coils are inside the rack. Other provisions must be made for bridging power failures.

### Redundancy

Measure for a system's failure tolerance and for the ability to perform maintenance work on a product in operation and without and function loss.

- Systems without redundancy can fail as soon as one single component fails, or cannot be operated during maintenance work.
- Redundancy is not achieved with the parallel setup of the same components, of which at least one component is not required to reach 100% system functioning. Such a setup means that even the failure of important components or planned maintenance work will not impair the product's continuous operation. Redundancy concepts can therefore help achieve very high system availability levels.
- The highest level of redundancy is attained with the installation of two systems independent of one another, whose incoming and outgoing lines are also optimally separated. Preventive maintenance work or component faults then do not cause any impairment in the system's performance because the second system can take over the entire desired functionality at any time.

### Availability

A proven technology or a system for minimizing fault risks and downtimes on your IT system ensure the required availability.

### Business Critical Continuity

The continuity of business-critical systems – our promise to the customer that their infrastructure will not fail and bring business processes to a standstill.

### Flexibility

"Flexible" products and systems can be reconfigured or extended to meet the requirements of new technologies, provide even more protection, or meet the requirements of corporate growth or business changes.

### Total Cost Of Ownership

All operating costs (TCO) of a solution, including purchase, future changes and maintenance.

## Power supply

### Power supply, three-phase (EMEA)

A three-phase power circuit has three conductors, earth and in most cases a neutral conductor. Typical voltages for such power circuits are 380 V, 400 V and 415 V.

### Power supply, single-phase (EMEA)

Single-phase power circuits have two cables and an earth. Typical voltages are 220 V, 230 V and 240 V.

### Power density

More power. More heat generation. Less space. Power density increases (from less than 50 to more than 300 watt pro m<sup>2</sup>) because processors are higher performance and get less space. This generates far more heat and concentrated hot spots in your data center.

### UPS types: Online and Line Interactive

An online UPS is used to back up critical applications and guarantees continuous power supply, free of all supply faults. Frequency and wave form are also regulated. A line-interactive UPS protects against voltage peaks and inadmissible power supply parameters. This energy-efficient technology regulates the power supply and the battery backup system and is especially ideal for installations that rarely suffer power failures, but frequently suffer supply fluctuations.

### Battery capacity

The percentage power capacity of your batteries, depending on their age, usage period, environment, ambient temperature and maintenance status. A normal VRLA battery can possibly achieve 80% and has to be swapped out after 3-5 years.

### Battery runtime

The time (in minutes) for which your batteries can take over the power supply with power or system failures and protect your information.

### kW

Standard unit for electrical power. 1 kW is 1,000 W or power consumption of 1,000 joules per second. (1 joule is the required energy amount to heat 1 kg of water by 1°C.)

## Cooling

### Back cooling

Containing the rise in heat generation caused by air-cooled condensers and dry coolers for all ambient temperatures or heights. Hot air or hot water is drawn off; water is cooled and returned.

### Precision cooling

The precise controlling and regulation of temperatures, moisture or air filtering.

### Hot Aisle / Cold Aisle

A highly efficient method for power increases with existing raise floor systems with high-density rack-based installations. The racks and frames are set up to produce "hot" and "cold aisles". Perforated bottom covers from which the raised floor's cool air flows are only placed in the cold aisles.

### Sensible heat

"Sensible" or "tangible" heat can be directly sensed or measured. Sensible heat changes a material's temperature. These are practically temperature information similar to weather forecast information. Sensible heat is measured with a thermometer. Severs, for example, only give off sensible heat.

### Latent heat

"Latent heat is the heat energy that goes into a material's state change. With a thermally managed cooling process the latent heat is diverted with the condensation of the vapor in the air when the air is cooled to below the dew point (dehumidification). Latent heat discharge does not have any effect on the temperature you feel.

### Total heat

The total heat is composed of the heat content of the air (sensible heat) and the water-vapor mixture (latent heat). It is crucial for the thermal device's nominal power.

### BTU

BTU is a heat energy unit. It is equal to the required energy amount for changing the temperature of a British pound of water by 1 degree Fahrenheit (at sea level). One ton of cooling power is equal to 12,000 BUT/hour.

### Ton

A ton in relation to cooling systems is the heat amount required to melt 1 ton of ice in 24 hours. A ton is equal to 12,000 BTU/hour or 3,025,900 calories/hour.

# Emerson Network Power Core Competencies

When you work together with **Emerson Network Power** to meet your company-wide requirements in the **Business-Critical Continuity™** area, you not only benefit from our products for **supporting and protecting your technology infrastructure**. By developing a wide range of technologies, we have detailed industry knowledge and can estimate the requirements for the interaction of systems in critical environments in the overall context. We provide this know-how with the aid of Emerson Network Power's core competencies. These are various areas of **first-class products and services**, which will help you to select the right solution for your requirements, location and area of application, so you can offer your customers the best possible services at all times.

## ■ AC Power

Business-critical processes – available at all times. With an expansive range of UPS systems from Liebert® and Chloride and the respective power distribution components and racks – from individual products through to integrated systems – we ensure an uninterrupted operation of network racks, computer rooms and data centers.

## ■ Infrastructure management and monitoring

Management and monitoring of critical environments around the clock at several locations. We have the right solutions for ROI-oriented business environments: professional infrastructure management and 24/7 monitoring systems, services for constant controlling in data centers, computer rooms and network racks, as well as wireless, wireline and enterprise communication applications.

## ■ Power switching and regulation

Protection in systems against operational failure caused by power supply interruptions. We provide ASCO® Power Transfer Switches, network-parallel control cabinets for equipment/power regulation systems, touchscreen-SCADA for monitoring and controlling power supply and on-site power equipment as a backup to guarantee an uninterruptible power supply for important and business-critical communication and data processing systems, vital security systems and other critical loads. We commission industry leaders here, work with directly location-related project management and deploy the best service technicians in the industry.



#### ■ Precision cooling

Guaranteed precise temperatures for reliable equipment performance. We provide "Chip-to-Room Cooling" – the most extensive range of precision cooling systems from Liebert, which allows even the smallest temperature changes to be ruled out so that your business-critical applications can be reliably protected.

#### ■ Racks and integrated racks

Optimization of the technology and performance requirements for indoor IT applications. We provide standardized and customized integrated rack solutions that meet all individual requirements. Our product spectrum ranges from rack solutions from Knürr and Liebert for computer rooms of every size through to integrated enclosures with their own thermal management, UPS and cable management in a robust, lockable rack.

#### ■ Overvoltage protection

Protection for power supply, voice content and data in the network against network fluctuations and dangerous electrical faults. Depending on the application we provide Liebert and PowerSure™ AC Power Protection, Islatrol™ Active Tracking Filters or Edco™ data/signal overvoltage (surge) protection equipment for securing the power supply, minimizing downtimes, saving valuable work time and extending equipment and device service life.

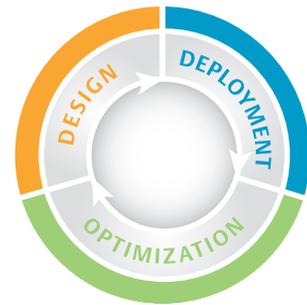
#### ■ Services

Provision of reliable analysis and test programs – supported by the biggest global service organization in the industry. Our offering includes engineering, installation, start-up services, project management, training and extensive on-site operational management, preventative and prognostic maintenance and energy consumption monitoring.

## Infrastructure services and support

Emerson Network Power's core competencies are supported by the biggest global service organization in the industry. The services:

- Design, installation and start-up
- Warranty service
- Preventive maintenance
- Remote around the clock monitoring
- Emergency service
- Site audits



### Design

Advance planning is critical for a successful operation. We therefore offer flexible services in development and installation for a smooth startup and lifelong efficient and effective operation.

### Installation

Right now today, we already integrate the flexibility and scalability for your growth tomorrow.

### Efficiency

Optimization means using your infrastructure efficiently. Emerson Network Power offers you optimized support for your daily requirements and long-term plans – for energy savings in particular.

### Chloride LIFE.net

- Maximized system availability – real-time diagnostics and removal of every kind of.
- Minimized downtime – qualified service technicians available around the clock.
- Reduced operational costs – thanks to preventive maintenance.

# Emerson Network Power

## Data center infrastructure

### Precision cooling



- **SmartAisle™**
  - Aisle containment.
  - Highest energy efficiency.
  - Compatible with all Liebert cooling units.



- **Liebert PCW / Liebert HPM**  
From 4 kW to 230 kW, DX-Digital Scroll-CW.
  - First class energy efficiency.
  - Certified performance (Eurovent).
  - User-friendly iCOM controls.



- **Liebert HPC**  
Extensive range of highly efficient chillers with free cooling of 40 kW to 1600 kW.
  - Specially designed for data center applications in combination with SmartAisle™.
  - First class energy efficiency.
  - iCOM control.



- **Liebert CRV**
  - Highly-efficient linked precision cooling units, available in the DX or CW version.
  - Decoupled control for airflow and cooling capacity.
  - Cooling capacity modulation with Digital Scroll.
  - iCOM control with remote rack sensors.



- **Liebert XD**
  - Cooling agent-based high-density cooling applications close to servers.
  - "Hot spot" management for up to 30 kW per rack.
  - On-demand upgrade as with "Plug&Play"
  - High efficiency and 100% sensitive cooling.

### AC Power



- **Chloride Trinergy**
  - Dynamic function modes (VFI, VI, VFD) with an average efficiency level of 97.9%.
  - Three-level module design for optimum scalability (up to 9.6 MW).
  - Maximum availability thanks to internal redundancy and simultaneous maintenance.



- **Liebert NXL**
  - UPS for critical high power applications.
  - Higher capacity and reliability
  - Meets the power and energy efficiency requirements of high availability data centers.



- **Liebert STS**
  - Solid state digital bus transfer switch for uninterruptible power supply.
  - Dual bus power supply systems for connecting critical loads with two independent UPS systems.
  - High reliability with Triple-logic redundancy with power control.



- **Power Distribution Rack**  
Central connection unit to power supplies for individual server racks.
  - Interface between the low voltage feed and the PDU (Power Distribution Unit).
  - Individually pluggable slot-in units.
  - Up to 346 kVA/rack.

### Rack PDU

- Rack-based power distribution units.
- Supports measurement at socket strip level, switching at socket level and measurement and switching at socket level for remote power management/power control.
  - Horizontal and vertical models for different rack configurations in branch and external offices.

### Racks and integrated racks



- **Knürr CoolTherm® 4-35 kW**  
Energy-efficient server rack technology.
  - Significant reduction in TCO (Total Cost of Ownership).
  - Autonomous server rack; independent of environmental conditions.
  - Up to 30% improved cooling system energy efficiency.



- **Knürr DCD®**  
Passive cooling water heat exchanger.
  - Cools up to 30 kW.
  - Neutralizes room heat.
  - Combinable with Knürr and other manufacturer products.



- **Knürr DCM®**  
19" rack platform for server, telecommunications and network technology.
  - Aluminum construction
  - Threaded connection system
  - T-slot system

### Surge protection

#### Liebert TVSS

- Easy to connect to the UPS, the distributor or the service entrance of the systems.
- Surge protective devices (SPD) for protecting sensitive equipment against damage caused by short voltage rises.

### Infrastructure management and monitoring



- **Avocent MergePoint® Unity Appliance**  
Secure remote access to servers (KVM over IP).
  - Secure remote access to servers in data centers and branch offices.
  - More error-tolerant and comprehensive remote management solution with simultaneous use of in-band and out-of-band tools.



- **Avocent MergePoint® Service Processor Manager**  
Secure ESP remote management (Embedded Service Processor).
  - One console for different service processor types and IPMI.
  - SoL, power control and hardware monitoring support.



- **Avocent ACS Console Server**  
Secure remote access (Serial over IP) to console equipment.
  - Remote access to servers, routers and other console-based equipment.
  - Physical use or encapsulation in one virtual machine.



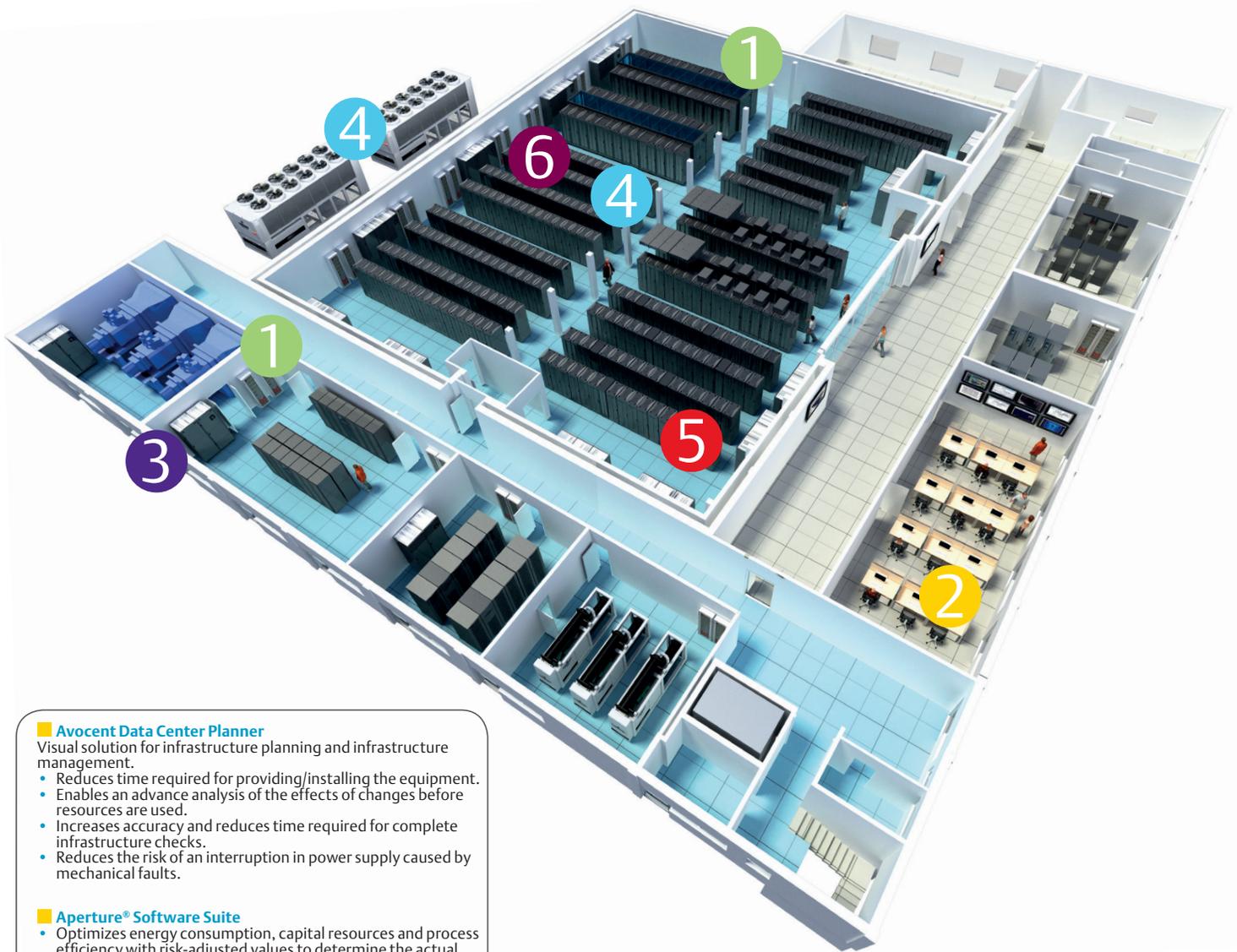
- **Alber Battery Monitoring**
  - Monitors batteries and prevents premature battery failures.
  - Internal direct current resistance test method to rule out doubts.
  - Specification of the actual battery status by the user – comparable with ultrasound.



- **Knürr Synergy®**  
Consoles, monitor walls and mobile equipment trolleys for control rooms.
  - Standards compliance and ergonomics.
  - Manually height-adjustable, even in basic version.
  - Modular construction.



- **Avocent DSView® 3 Management Software**  
Centralized data center management.
  - Remote access, remote monitoring and remote controlling on various platforms and at different locations (time and location-independent).
  - Secure, centralized out-of-band management of all connected IT and network devices in distributed data centers.



**Avocent Data Center Planner**

Visual solution for infrastructure planning and infrastructure management.

- Reduces time required for providing/installing the equipment.
- Enables an advance analysis of the effects of changes before resources are used.
- Increases accuracy and reduces time required for complete infrastructure checks.
- Reduces the risk of an interruption in power supply caused by mechanical faults.

**Aperture® Software Suite**

- Optimizes energy consumption, capital resources and process efficiency with risk-adjusted values to determine the actual resource load.
- Correct measurement of the physical infrastructure and extended service life of the data center with holistic view of the infrastructure.
- Provides a central, secure information source for the entire data center in a business service view.



**Avocent DSView® 3 Power Manager**

Detailed performance and environmental data and effortless control.

- Provides a power monitoring function in addition to DSView 3 software access and control functions.
- Monitors and measures IT energy consumption and defines the cost/development trends of internal and remote data centers.

1 AC Power

4 Precision Cooling

2 Infrastructure Management & Monitoring

5 Racks & Integrated Cabinets

3 Power Switching & Controls

6 Surge Protection

# System dimensioning

The right dimensioning of a critical power supply system for current and future requirements is of essential importance.

## Current requirements

The estimates of the currently required system dimension in kilovolt-ampere (kVA) can be made in various ways. Site plans of the IT installation, type labels on devices and system and maintenance data are frequently consulted. The kVA and kW requirements can be determined using the following formulas:

V = Volt	pf = Power factor
A = Ampere	
kVA = Kilovolt-ampere	BTU/h = British Heat Units per hour (heat output)
kW = Kilowatt	Kcal/h = kilo-calories per hour (heat output)

1. System's power profile (This formula provides the reliable basis for estimating the current kVA load.)

With three-phase systems whereby V is the phase voltage	With single-phase systems
$kVA = \frac{V \cdot A \cdot 1.73}{1000}$	$kVA = \frac{V \cdot A}{1000}$

2. Kilowatt (kW) and power factor (pf).  
(If pf is not given, use 0.8 for pf.)

$$kVA = \frac{kW}{pf}$$

3. Ampere details for site power supply  
(with three-phase systems).

$$A = \frac{kVA \cdot 1000}{V \cdot 1.73}$$

4. BTU/h or Kcal/h:  
(If pf is not given, use 0.8 for pf.)

$$kVA = \frac{BTU/(h)}{3413} = \frac{kcal/(h)}{860}$$

$$kVA = \frac{kW}{pf}$$

If the currently required kVA capacity has been determined, the future growth potential and the consumers' special properties must also be considered.

## Capacities for growth

A critical power supply must also be configured for future growth. The capacities required in data centers for data processing double rapidly. It is therefore appropriate that the system should be configured for double the current kVA load. Even with low growth rates the power supply system should be estimated at 125% of the current kVA load.

## Special consumer characteristics

Plant specialists should be deployed to determine special consumer characteristics and the corresponding system dimensioning.

## Earth connections

The earth connection of a regulated power supply system has a big influence on its capacity.

# Maintenance for all your power supply and additional devices.

*Without proper maintenance your investment in power supply and cooling solutions loses its value. Even the best systems won't work properly if they are not maintained regularly.*



Emerson Network Power can perform the maintenance of the most diverse UPS and precision cooling systems, batteries and distribution solutions in your data centers or in other business-critical systems whose availability is indispensable.

We maintain the following components:

- All UPSs and batteries
- Automatic transfer switches
- Static transfer switches
- System control cabinets
- PDUs
- Bypass racks
- Power regulation
- Precision air-cooling systems
- Generators
- DC supply devices



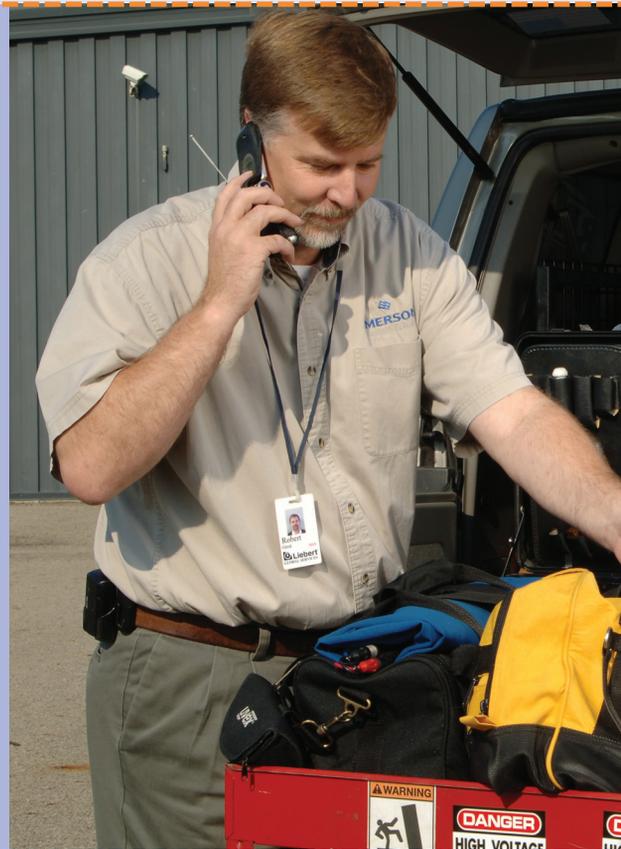
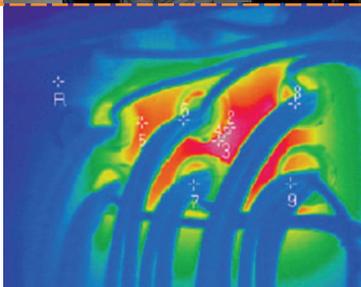
## Secure availability.

With its special tools, industry know-how and efficient service infrastructure Emerson Network Power ensures that your system is available at all times. Our "Grid to Chip" maintenance strategy is based on a systematic service concept for your critical systems, which goes beyond the scope of standardized services. We provide you with a comprehensive service solution, which incorporates the power supply and cooling requirements of your entire company. We have good reasons for such a promise; some are listed here below.

### Our support services for business-critical systems include:

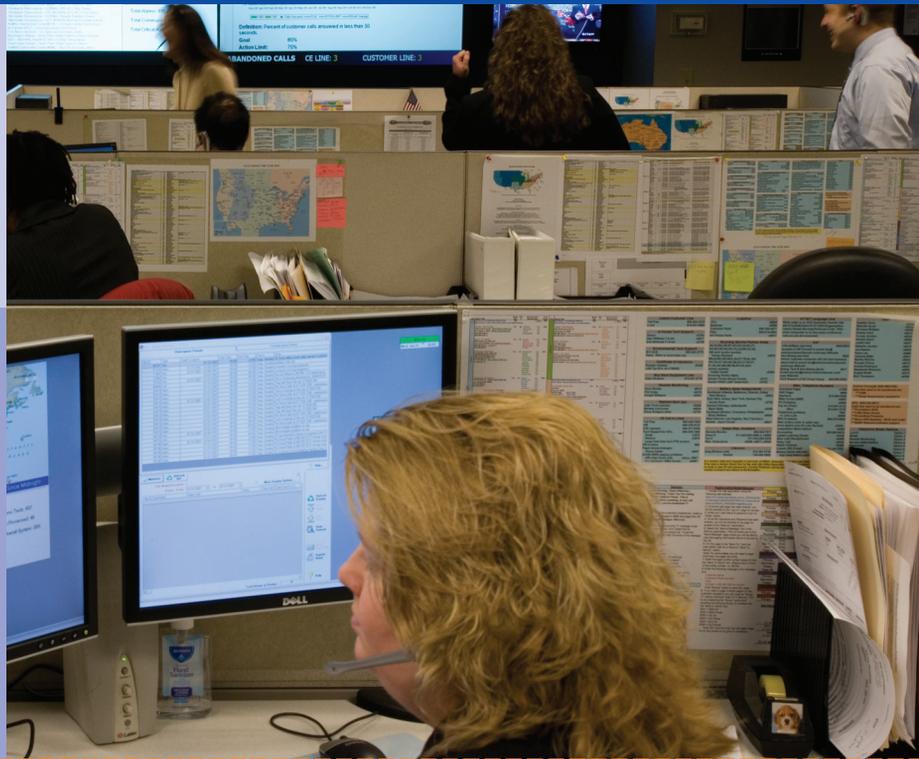
- Design — Availability analyses, infrared tests, electrical test, determination of the cooling requirements and the necessary supply services.
- Preventive maintenance — Regular maintenance ensures the continued operability and high load rating of your systems. Maintenance makes an important contribution to availability and reduces the systems' overall operating costs.
- Prognoses — We point out problems and faults before they occur. You consequently get a more sustainable and more reliable network.
- Remote monitoring — We can monitor the functioning of all your business-critical systems, including the products of other manufacturers. Use this

solution if you want to know your systems' statuses, but you don't have the time or staff to take care of it yourself.



*You get an answer.  
And a solution.*

Unforeseen failures can happen any time. Our customers know that they have a partner that will get their business-critical systems up and running in next to no time. When the unexpected happens you need a partner that has the right answers, quick service and the right parts at the ready so that your systems go back on line as quickly as possible.



**We have the resources**

Our customer center supports you 24 hours a day – every day. Competent contact people that know your technology and your equipment are constantly at your disposal here. No automatic messages. No callbacks. We process 100,000 calls a year, and resolve the situation in an average of two and a half minutes.

**We have the people**

Emerson Network Power's service unit has the necessary skills and expertise to help you out of every situation. We have the most specialists in the industry: 375 of these experts trained in the plant are distributed across the entire country. What does this mean for you? In 2006 we needed an average of only 1.6 hours to be on-site to resolve problems.

**We have the parts**

To ensure activities can be performed when they are required, we provide certified parts in an unrivaled scope, which our perfected logistics deliver to every required site. You therefore never have to wait long for parts with system failures – almost 100% of emergency orders are delivered in less than 24 hours.





# Emerson Network Power



For more energy efficiency in your IT environment

Really reliable availability of business-critical networks are a requirement for reliable network infrastructure installation, administration and continuous support.

This in turn depends on the power supply and cooling infrastructure, which supports these systems and is based on the following key components:

- **Business-critical power supply**
- **Business-critical cooling**
- **Rack and enclosure systems**
- **Monitoring and management**
- **Proactive maintenance**

Emerson Network Power has developed new power supply, cooling, rack and enclosure systems, and monitoring solutions which also support uninterruptible availability – and offer real added value that goes well beyond the sum of the individual solutions.

With our solutions we provide unsurpassed adaptability, individualization and the ability to integrate into the most diverse products and services.

We put together comprehensive knowledge of our challenges and are in a position to meet their requirements.

Our solutions are more reliable, more comprehensive and tailored to your requirements – and therefore provide the benefit of an optimized strategic and operational effect, higher reliability, higher flexibility and lower overall operating costs.

We focus on the combined use of our knowledge, our experience and our resources – for a solution from one single source that meets all requirements.

The result – an infrastructure that stays abreast of current and future requirements.



Emerson Network Power, a business of Emerson (NYSE:EMR), protects and optimizes critical infrastructure for data centers, communications networks, healthcare and industrial facilities.

The company provides new-to-the-world solutions, as well as established expertise and smart innovation in areas including AC and DC power and renewable energy, precision cooling systems, infrastructure management, embedded computing and power, integrated racks and enclosures, power switching and controls, and connectivity. Our solutions are supported globally by local Emerson Network Power service technicians. Learn more about Emerson Network Power products and services at

[www.EmersonNetworkPower.com](http://www.EmersonNetworkPower.com)

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## Emerson Network Power™

Leading global provider of Business-Critical Continuity™ solutions.

- AC Power
- Connectivity
- DC Power
- Embedded Computing
- Embedded Power
- Infrastructure Management & Monitoring
- Outside Plant
- Power Switching & Controls
- Precision Cooling
- Racks & Integrated Cabinets
- Services
- Surge Protection

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