Rack & Enclosure Systems

High Density Cooling Solutions

For Business-Critical Continuity™ In Energy Efficient Data Centers

knürr
environments for electronics

EMERSON
Network Power

'Green-IT' – Full-On Trend!

Technology Solutions Of Emerson Network Power Are Already Available

Green IT is more than just a fashionable trend. Just query this hyped-up term in Google and you will have more than 4 million queried results. Of course as we all know, quantity is never the same as quality, and where Green IT appears this does not logically mean that environmentally-friendly IT solutions are actually provided. 'Green IT', however, unmistakably describes an obligatory mission!

Corporate enterprises and market researchers speak with one voice: "Real" Green IT will play an increasingly more important role in the strategic orientation of corporate IT. A study by the Experton Group reveals that the market for environmentally-friendly IT solutions will grow at an average of 66 percent by 2010.
Experts believe that one important reason for this sharp trend is the fact that Green IT is no longer seen as just a moral obligation for the CIO but is also becoming alarmingly crucial in this day and age.

The rapidly rising energy costs – maintenance and operating costs for IT systems – provide the necessary driving force for ecological IT, and are increasingly becoming the motivation to introduce a long lasting Green IT strategy.
Many companies are already heavily investing in their IT technology, for example, in virtualization solutions for servers, storage and networks, or with appropriate hardware and thermal management systems. A survey by NetApp in Germany shows, however, that specific activities such as the consolidation and virtualization of data storage are currently even higher up on the agenda than a long-term, company-wide strategy for Green IT.

Urgent need for action

According to the market research institute, Gartner, as on today the ITC industry is already responsible for approximately two percent of global carbon dioxide emissions. With around 600 million tons, the CO_2 production of the worldwide IT infrastructure is equal to the CO_2 emissions of approximately 320 million small cars. Some 600 billion trees would be required to compensate for this.
CO_2 reductions in IT are especially so important because market researchers forecast that IT infrastructures will also cause increased energy demands.

Taking 2000 as the starting point, CO_2 emissions produced by IT operations would therefore rise by 212 percent by 2020. This is revealed in the "Von Green-IT zu Green Business" (From Green IT to Green Business) study by A. T. Kearney, in which management consultancy refers to the urgent need for Green IT action. Various Green IT solutions that are tailored to the respective company's requirements are required. Their subsequent use can make a significant contribution to environmental protection and considerable cost savings.

Server and storage virtualization

One of the most important topics related to the energy-efficient organization of ITC technologies is the virtualization of servers and storage space.
This primarily provides an option for improved hardware utilization and simplified system management. This then also enables the number of servers to be reduced, and therefore logically reduces power requirements.
Experts estimate that server virtualization can save 50 to 80 percent in power costs. Less server hardware automatically means less administration needs, which results in a further reduction of IT operating costs.
For medium-sized enterprises there is already an extensive offering of virtualization solutions.

Centralized desktops and thin clients

Desktop virtualization enables the centralization of individual workstation computers in the Data Center, and has already developed into an important trend in the IT industry.
According to the Fraunhofer Institute for Environmental, Safety and Energy Technology, desktop PCs pollute the environment twice as much as functionally comparable thin clients, where the configuration is restricted to input and output.

The Sun Ray Thin Client is an important step in the energy-saving direction in companies. A Sun Ray Client, as already integrated into the Knürr ARCOS TFT Drawer, only requires about four watts of energy, compared to as much as 300 watts for a desktop PC.

'Resources As A Service'

Green-IT-Outsourcing provides another possibility for a company to make its IT more environmentally friendly. In this context we're talking about outsourcing in-house IT processes to energy-efficient service providers. Instead of operating their own Data Center, a company can, for example, rent the resources they need from a third party provider – and often at a monthly fixed price. Based on the SaaS model, this is what's now being referred to as "Resources as a Service." If several companies share the capacity of a central, particularly energy-efficient Data Center, substantial energy savings can be made and the ecological footprint of each individual company can be significantly improved.

Data Center Scalability

Important Aspects Of Business-Critical Continuity™

In today's global economy, with customers expecting on-demand availability of information, the Data Center has never been more vital to the ongoing success of an organization. Additionally with the increase in regulatory requirements, and other market drivers, we have seen cost of downtime for some Data Centers exceed millions of dollars per minute.

Perhaps most challenging is the impact high density computing is having on the Data Center. Power and cooling still remain the two biggest concerns relating to Data Centers. According to a recent Gartner prediction, over 50% of all Data Centers will lack sufficient power and cooling by 2008/2009. Complicating matters is the drive towards implementing more efficient "green" technologies.

Scalability

Regardless of how much money you want to spend and how redundant you want your Data Center to be, perhaps one of the most important aspects of any new design is scalability. Perhaps the best definition of scalability is...

"...the potential for a business or an aspect of a business to continue to function effectively as its size increases!"

The operative word is effectively. Scalability directly impacts reliability. As resources get taxed and stretched, the potential for failure increases exponentially.

Power

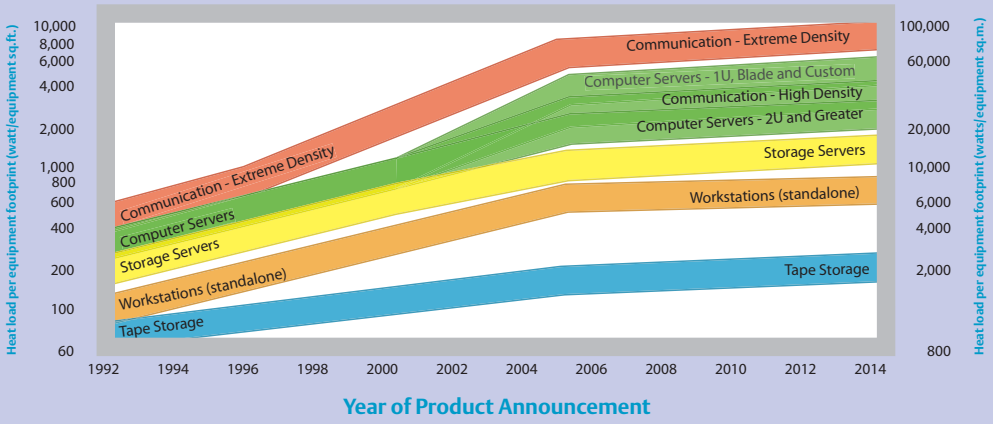
Just a few years ago, a robust Data Center was one that was built to handle 50-75 watts per square foot of power.
Today, we see that number growing in some cases to 200-300 watts per square foot and in some facilities have seen it higher than that.
While you may not need 250 watts per square foot today, you just might in a couple of years.

Scalability: Knürr CoolLoop®
Side-mounted cabinets unit for highly efficient cooling in server cabinets from 10 to 30 kW – with significant reductions in Data Center energy costs.

The Knürr CoolLoop® has a modular setup that can be equipped with one to four fan units. Cooling is therefore adapted to suit the actual requirement within the Data Center.

The cooling range per Knürr CoolLoop® is 10 – 30 kW.
Selection of the required capacity can be determined by the Data Center operator. This ensures investment security and only provides the required cooling power relative to the heat load produced by the Data Center.

No Relief In Sight: Heat Loads Rising



If you do not design your Data Center architecture to be able to expand power requirements, you could find yourselves not having enough power to either properly operate your equipment or cool it sufficiently. Inadequate power is one of the leading causes of outages in a Data Center.

Cooling

As equipment becomes denser adequate cooling becomes more and more imperative.
The HVAC system you are installing today may be more than enough for today's requirements but what about three years from now? Will you be able to add more CRACs? Will you be able to add enough to handle the anticipated load? What about chiller loops? What about cooling tower capacity? Can the architecture handle a 25% or a 50% increase in growth when required? If not, that could present major challenges down the road. Without proper cooling from Emerson Network Power, equipment will fail and outages will cause havoc on your operations.

Maintenance & Operations

One of the most overlooked aspects in Data Center build-outs is the ongoing maintenance and operations of the facility once it is completed. As you increase the amount of infrastructure and equipment in the facility, the need for preventive maintenance escalates.

Procedures

The final areas of concern when it comes to Data Center's scalability are the procedures. There is no such thing as a reliable Data Center without documented and tested standard operating procedures (SOPs) for the day to day operations of equipment and methods of procedures (MOPs) for the maintaining of that equipment.

Scalability = Reliability

In the end, just as there is no such thing as an un-safe reliable Data Center, so too there is no such thing as a non-scalable reliable facility. Scalability is directly related to resiliency.
However, scalability is far more than just architecture or equipment. Be it documentation or ongoing maintenance and operations, the effectiveness of your facility in the long horizon is directly impacted by the growth plan you chalked across the entire spectrum of elements for resiliency.

Data Center Architecture

Ensuring The High Availability Of Mission-Critical Data And Applications

Unique 19“ Rack platform for Data Center

Knürr Miracel® and Knürr Miracel$^{PLUS®}$ are truly multi-talented, strictly tailored to Data Center requirements: The platform technology provides the basis for a versatile range of racks, which has been setting standards in the world of IT-technology as a versatile solution for the most diverse requirements. The main feature of Knürr Miracel® is the unsurpassed aluminium extrusion with T-slot. It is lightweight, easy to assemble, offers numerous equipping possibilities and is incredibly stable. The internal space for built-in components is impressive in relation to the installation area.

The most eye-catching functional and design aspect of this rack system are the doors, which have a perforation level of 83 %. This offers mechanical protection for valuable built-in components against intentional or unintentional access.

All over the world, Knürr Miracel® is one of the best-selling rack systems for servers, storage, cabling, power supply and mobile communications.

The industry recognizes Knürr Miracel® as an innovative rack firmly rooted in 19“ construction. This rack system also makes a significant contribution to energy efficiency.

Thermal management for High Density Cooling Solutions

Servers, storage and other IT components are constantly becoming more efficient and at the same time more compact in their construction, and increasingly require less space.

A Data Center’s infrastructure requirements change considerably, especially in tackling technical and physical heat load issues and in providing the thermal management required to overcome these.

Emerson Network Power with Knürr has been dedicated for decades to developing individual solutions that are necessitated by the complexity of high availability Data Centers and IT rooms – as experts of **Business-Critical Continuity**!

Business-Critical Continuity™ to keep you going strong

Regardless of your size, you cannot risk any downtime of your critical business systems.
At Emerson Network Power, we have built our capabilities and an unquestionable reputation when it comes to delivering reliable power, precision cooling, connectivity and embedded solutions, just so your technology investment performs at its optimum.

Emerson Network Power's broad technology offering and deep expertise support a full spectrum of enterprise-wide solutions for today's vital business needs. Around the world, customers like you count on us to get the most out of their critical investments, confident that we deliver purpose-driven innovation and optimized solutions from a single global source, one that is backed by local service and support.

Our ability to keep your network infrastructure up and running, regardless of whether the content is voice, data or multi-media, comes from a time-tested grid-to-chip portfolio of products, services and systems that can maintain a wide range of computing, telecom, healthcare and industrial applications. The result is a level of confidence achieved only by partnering with Emerson Network Power. We are here to prepare you for the unknown, whatever comes your way, navigating with you through changing business environments and uncharted demands they place on your technology investment. That's what we mean by Business-Critical Continuity™.

Professional fire prevention in Data Centers

Data Centers feature fire protection systems, including passive and active design elements, as well as implementation of fire prevention programs in operations.

Smoke detectors are usually installed to provide early warning of a developing fire by detecting particles generated by smoldering components prior to the development of flame. This allows investigation, interruption of power, and manual fire suppression using hand held fire extinguishers before the fire grows to a large size.

A fire sprinkler system is often provided to control a full scale fire if it develops. Clean agent fire suppression gaseous systems are installed to supress a fire earlier than the fire sprinkler system.

Availability

Zero Down-Time, 24/7

IT platform system availability and reliability are critical factors in a company's modern day success. As the basis for communication and business processes, IT is decisive in ensuring efficiency and productivity. Failures increasingly have a significant effect on company-critical business processes. In addition to production downtimes and the financial losses that these entail, they also mar industry-wide reputation and pose legal consequences. With the spread of the Internet and globalization, a 24-hour presence is indispensable – and hence a 24/7 IT availability.

Driven by the continuous further development of hardware components, new challenges for physical infrastructures also arise. Continuously faster processors, miniaturization and higher performances necessitate new concepts – just as they are offered by Emerson Network Power.

Availability refers to the ratio between usable time and the maximum available time. This is typically provided as a percentage. 24/7 availability means 24 hours, 7 days a week without interruption. This is equivalent to 100% infrastructure availability. Therefore a system with annual availability of

99%	**may fail for 3.6 days**
99,99%	**may fail for 52 minutes**
99,999% (five nines)	**may fail for 5 minutes**

■ An **MTBF** (Mean Time Between Failure) time is used to determine the failure probability of devices and systems, and hence achieve a dimension for reliability. This establishes the average time between two faults and is provided in hours. The reliability of a system therefore increases according to how high the MTBF time is.

■ Another key measure is the **MTTR** (Mean Time To Repair) time, which defines the average time until repair, i.e. the time until a device can be put back in to operation after a fault. The MTTR should therefore be a low as possible.

A system's availability is calculated with the MTBF time and the MTTR time:

$$\text{Availability} = \frac{\text{MTBF}}{\text{MTBF+MTTR}}$$

Various redundancy concepts are used to increase availability. This means that critical systems are available more than once. If a device fails, the other system takes over. A single redundancy or multiple redundancies can be provided according to requirements: from N+1 redundancy to 2N+2 redundancy.

On the basis of these principles, Emerson Network Power offers a perfected product portfolio to meet and cover all of these requirements. This begins at the early product development stage where MTBF and MTTR calculations are integrated and significantly influence the selection of the components that are used.

Knürr CoolTherm® has an MTBF time of 78,000 hours and enables the construction of high availability data centers and IT rooms which are highly secure and cost-effective.

IT Security

Responsibility And Liability

Despite the amount of national and international standards, it is still difficult to resolve legal uncertainty with liability risks in the world of IT.
New civil and criminal court decisions keep creating additional requirements and are confusing both IT and management responsible people.

It has become all the more important that a balance be found between the daily handling of IT and security mechanisms and effectively communicating these in a comprehensible way. Of primary importance here is the clarification of key questions concerning IT liability.
Ultimately the legislators and assorted regulatory authorities are constantly increasing their efforts to standardize the requirements for diligence. When it comes to compliance with these regulations, management is generally in the first line of responsibility, and it cannot completely delegate this responsibility. The risk therefore increases of being held personally responsible for the consequences of ignoring the security options and having to pay the corresponding compensation from personal wealth.
Added to this are the increasingly tighter European and international regulations (e.g. the directive on data protection in electronic communication or Basel II). However the law does not change any of the basic principles of IT liability and responsibility for the conduct of third parties (malicious included).
IT security must be understood as a process, which must be constantly redefined and adjusted to changing technical and financial framework conditions.

Implementing and following such processes helps not only to control legal risks – it also creates a safer and hence a better IT environment for all of us.

Many IT responsible people, whether they be members of the board, managing directors, official representatives or IT managers, do not know the content and scope of their responsibility when it comes to IT security, and hence risk their personal liability for possible security deficits within their company.
In this age of increasing threats to information technology systems and applications, IT security takes a paramount position in comprehensive Business-Critical Continuity™ planning.

Every company – and therefore its respective responsible employees – is therefore set to the task of actively countering potential risks in security of its information technology involving data loss, system interruptions, and even disaster situations, by implementing measures in the operation of physical, logical and technical security. But of course data protection – i.e. the protection of personal data against unauthorized access – is also equally important in IT security.

Professor Dr. jur. Joachim Schrey, the renowned legal expert, Partner and Lawyer at CLIFFORD CHANCE, for example, will give a lecture on the complexity of IT security responsibility and liability at the **Data Center Forum**, a gathering of industry experts in various European cities. Just call us and we will tell you about the nearest event location and arrange an invitation.

Total Cost Of Ownership (TCO) Versus Return On Investment?

Total cost of ownership is a financial estimate designed to help consumers and enterprise managers assess direct and indirect costs commonly related to software or hardware. It is a form of full cost accounting.

TCO analysis was popularized for the Gartner Group in 1987 but its roots are considerably older, dating at least to the first quarter of the twentieth century. It has since been developed in a number of different methodologies and software tools. It was developed as a means of clearly and reasonably addressing the real costs attributed to owning and managing an IT infrastructure in a business.

TCO applies a rigorous and holistic methodology to the analysis of IT infrastructure related costs. The methodology is broad enough to include regional and industry variance and still retain the ability to present objective and consistent cost information to the IT department and business alike.

This analysis identifies costs as being made up of two major components - direct and indirect. Direct costs traditionally forms the area that organizations find easiest to measure and as a result direct costs can often receive undue or excessive focus. Typically, direct costs are made up of labor and capital costs.

> "TCO [Total Cost of Ownership] is a holistic assessment of IT costs over time. The term ***holistic assessment*** implies an all-encompassing collection of the costs associated with IT investments, including capital investment, license fees, leasing costs and service fees, as well as direct (budgeted) and indirect (unbudgeted) labour expenses"
>
> **Bill Kirwin**
> VP, Research Director
> Research & Advisory Services
> Gartner

The other component of the TCO are indirect costs which are more elusive and difficult to measure and rationalize. The 'soft' nature of indirect costs means that their impact on owning an IT infrastructure is often underestimated.

Indeed, some organizations dismiss the impact of indirect costs completely. Gartner surveys, however, consistently show that despite the difficulty of measuring them, indirect costs can typically represent a substantial component - as much as 60% - of the total cost of managing and owning an IT infrastructure. Indirect costs typically reflect the factors that drive and are driven by, direct cost decisions; for example downtime or quality of service. Most importantly, indirect costs are often a result of misdirected funding in direct costs like technical support, training and help desk; therefore, making those costs look artificially low, and further, shift these costs to business units reducing available resources to perform business tasks.

For example, it might seem like a sensible 'direct costs' decision to reduce costs by spending less on contract negotiations, or hardware purchases or staff development and retention programs. However, if the result of such action means delivering services with inappropriate service level agreements, or less reliable hardware that fails more often or longer waits for less effective support, the ultimate outcome might be to shift the comparatively meager savings from the direct side to the comparatively significant increased costs on the indirect side.

TCO is sometimes referred to as total cost of operation. When incorporated in any financial benefit analysis (e.g., ROI, IRR, EVA, ROIT, RJE) TCO provides a cost basis for determining the economic value of that investment. TCO also directly relates to a business's total costs across all projects and processes and, thus, its profitability.

Nevertheless, if the objective of appraising an IT investment is to determine its profitability, i.e. its influence on the company's success, mathematical finance procedures, such as the net present value method, are excellent options for determining the potential value of the investment.

The all-important Key Performance Indicators (KPI), Return on Investment (ROI) and amortization period, provide information on which specific monetary benefit can be achieved with a particular investment, and when the investment will amortize to show positive returns. In the IT area the challenge is to identify benefit factors to provide data models and perform analyses and calculations.

Both models, TCO and ROI, support each other in this evaluation. TCO is suitable for determining and comparing costs of different technologies. A cost-benefit analysis must be performed to examine the profitability of IT projects. The optimization of the profitability quotients, cost-benefits, is therefore the focus of a ROI examination and not the costs optimization.

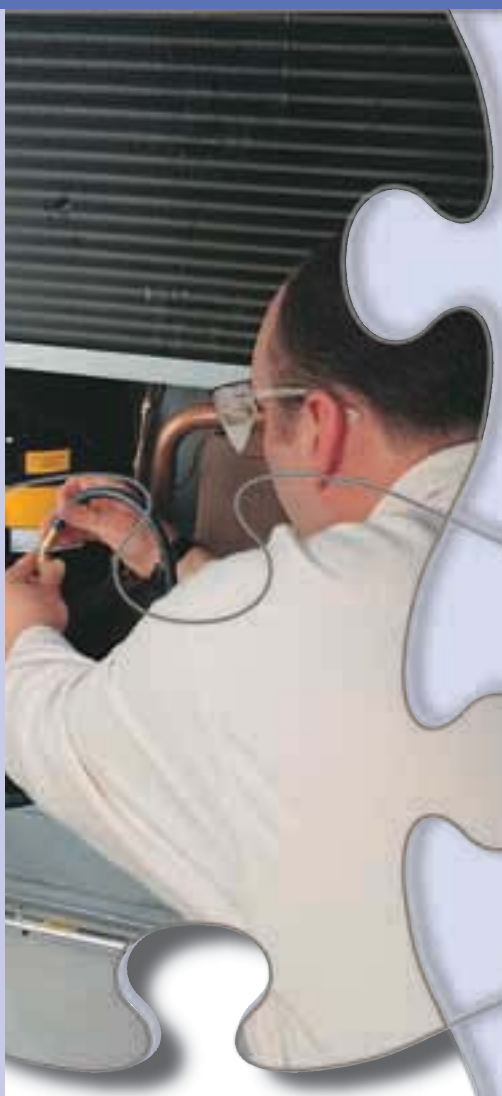
With the evaluation of Emerson Network Power's technological solutions in the IT world, both models underscore the exceptional advantages and ultimately the attractiveness of the solutions – enhanced by further analytical sub-considerations.

One Face To The Customer

Best-In-Class Technologies From A Single Source

Center of Expertise:

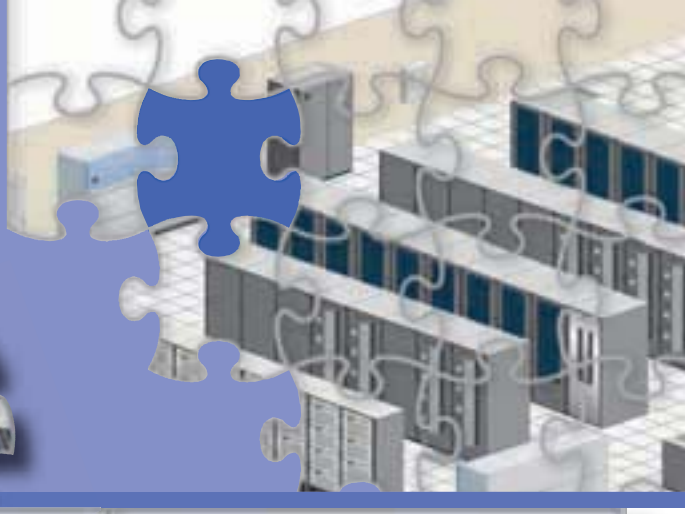
When you partner with Emerson Network Power for your *Business-Critical Continuity™* needs across your enterprise, you benefit from not only our products and support, but also from the protection your technology infrastructure receives.



AC Power
Mission critical operations can't go down. With a full range of uninterruptible AC power systems and associated power distribution and enclosures, from individual products to integrated systems we keep Data Centers up and running.

Connectivity
Keeping your voice, video and data flowing smoothly and quickly. We deliver connectivity solutions, through a full line of products that safeguard network reliability.

DC Power
Supporting voice and communication networks with dependable DC power. We've built a DC Power technology platform, the next-generation global technology platform that delivers the most rigorous network-power applications, with DC power, distribution, control and monitoring systems.



Embedded Computing

Reducing time to market and software-development costs for the telecom industry. We deliver comprehensive, highly integrated platform solutions that draw on our deep expertise, plus a full line of products that bring real competitive advantage.

Outside Plant

Protecting and moving voice, video and data electronics from the central office closer to the subscriber or optimizing cellsite infrastructure. We deliver a full line of enclosures, cabinets and shelters that meet the networked world's demands for high speed without interruption.

Racks & Integrated Cabinets

Optimizing technology and performance needs for indoor IT applications. We deliver standard and customized integrated cabinet solutions that meet unique and specific needs for computer rooms of all sizes to integrated enclosures that include selfcontained air conditioning, UPS and wiring management in a sturdy, lockable cabinet.

Embedded Power

Making power conversion easyfor IT and communications equipment. We deliver a broad offering of solutions, including AC/DC and DC/DC power supplies, adapters, chargers and power accessories.

Power Switching & Controls

Safeguarding facilities from operational disruption in case of electrical abnormality. We deliver power-transfer switches for an on-site power source that ensures power continuity for sensitive communications and data-processing electronics, while providing increased power control.

Services

Delivering network reliable programs backed by the largest global services organization in the industry. We encompass engineering, installation, project management and total on-site operations management, preventive maintenance and energy-consumption-monitoring.

Monitoring

Managing critical equipment activity at multiple sites and site monitoring around the clock – with 24x7 remote and self-monitoring systems and services that provide continuous oversight of Data Centers as well as wireless, wireline and enterprise telecom applications.

High Density Cooling

Maintaining precise temperature for reliable equipment performance. We deliver "chip-to-room cooling"– the most comprehensive range of precision- and high density cooling solutions, which protect mission-critical applications from even a slightest increase in temperature.

Surge Protection

Defending power, voice and data in a network against grid irregularities and dangerous electrical disturbances. We offer product solutions which provide power protection to reduce downtime, save crucial man-hours and extend equipment life.

A Perfect Solution – A Single Source

Emerson Network Power Give Your Mission-Critical Network The Flexibility To Deal With Uncertainty

Our pre-engineered solutions promise flexibility and availability, providing you the lowest cost of ownership.

How is this possible?

With the widest range of products in the marketplace, we can provide maximum flexibility to meet the most stringent demands.
We are a single, global source with a long and successful legacy of protecting the operation of mission-critical systems.
Only Emerson Network Power can provide you with Knürr and Liebert products as well as the services you need - before, during, and after the installation, and the peace of mind you deserve.

POWER

Surge Protection

Surge suppression protects your IT equipment against damaging power spikes—and from catastrophic failure.

Uninterruptible Power

Availability depends on the continuity of power and the ability of an uninterruptible power supply to ride through outages and provide clean power to sensitive IT loads.

Power Distribution

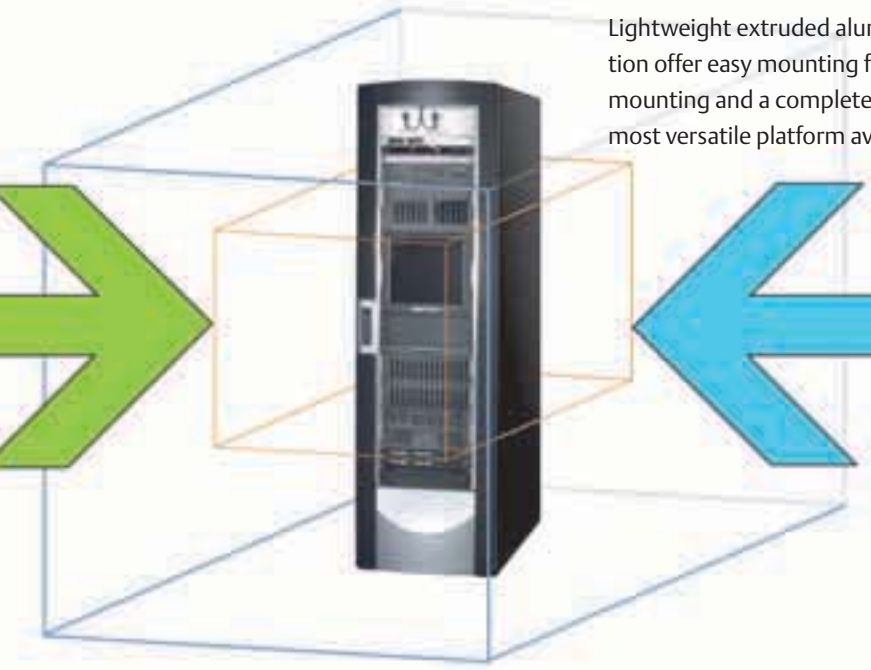
From the room level to the rack level, delivering and managing power to each individual piece of IT hardware is critical in ensuring availibility.

Knowing what is happening with your critical power and cooling equipment — and having automated processes to shut down servers in an orderly way if required — is vital to system reliability and uptime.

MONITORING

Rack Platform

Lightweight extruded aluminum frames with modular construction offer easy mounting for all IT equipment. Tool-less accessory mounting and a complete cable management system provide the most versatile platform available.



COOLING

Precision Cooling

Active precision cooling provides precise temperature and humidity control as well as air filtration, protecting your critical equipment from heat and air impurities.

SUPPORT SERVICES

Offering the full spectrum of on-site support services including preventive maintenance.

Flexible Solutions For High Density Cooling

A Cooling Solution For Every High Density Solution Application

No one offers you more ways to meet the challenges of cooling high density installations than Emerson Network Power. We offer open and closed architectures, a choice of pumped refrigerant and water-based cooling, and the widest range of equipment configurations to meet every need—from small communications equipment closets to the largest data centers. That makes us unique and sets us apart from the rest!

A Choice Of Cooling Architecture

Open and Closed Architecture Systems as defined by ASHRAE

- The **open architecture** systems utilize cooling coils near the heat load either inside or outside the open server rack and utilize the room air volume as a thermal storage to ride through short power outages.
- The **closed architecture** fully encloses the rack with the cooling coils inside. Other provisions are required for power loss ride through.

There are two possible methods for heat dissipation.

- **A cooling agent (pumped)** is used when:
  - Cooling units or heat exchangers are used inside or outside electronic components.
  - The infrastructure is already in place for this.
  - Water may not be used in the IT room.
- **Cooling water** is used in all other instances because of its easy handling and low system costs.

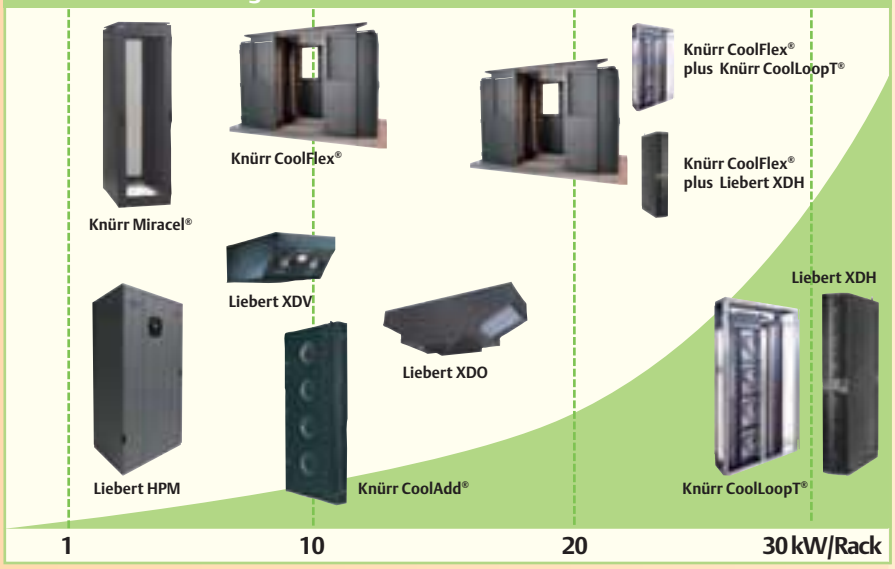
Advantages of Data Centers with OPEN architecture on rack cooling:

1. All common server racks with perforated doors can be used.
2. All cooling units in the room can work in parallel and create a high level of redundancy.
3. The room level fire detection and extinguishing system can be used.
4. Supplemental cooling units can be installed.

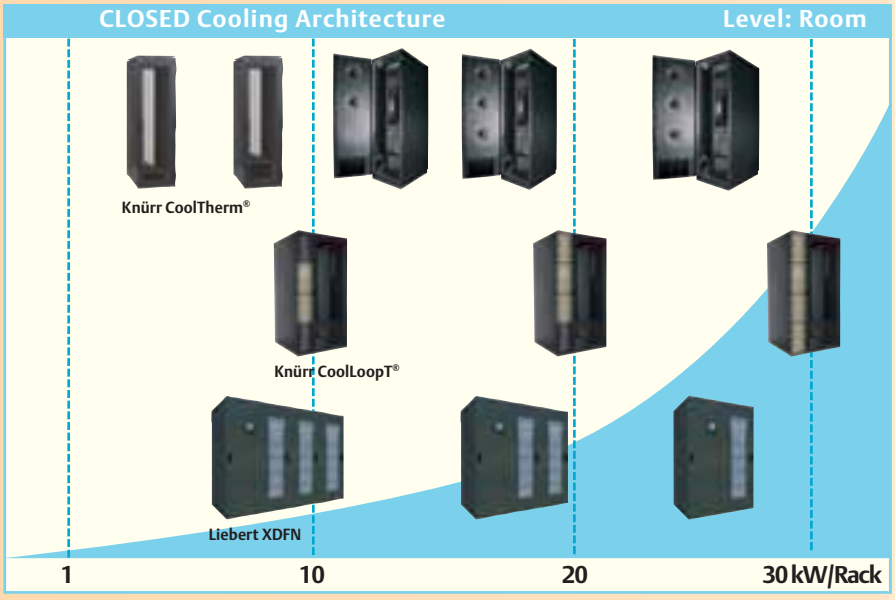
Advanatages of Data Centers with CLOSED architecture on rack cooling:

1. Supply temperature of cooling media can be maximized.
2. Cooling air flow rate can be minimized. All cooling air is guided through the server and is used for server cooling without bypass.
3. Short air path caused low fan power consumption.
4. Very low acoustic noise emission.
5. Cooling capacity can be controlled and planed on rack level individual.

OPEN Cooling Architecture — Level: Room



CLOSED Cooling Architecture — Level: Room



Cooling Plant — Level: Facility

Liebert HPC

Liebert XDP

Liebert XDC

Knürr CoolTrans®

Demands On IT And Its Infrastructure Dictate The Architecture In Data Centers

Demands on IT systems and IT infrastructure

The ceaseless changing of global markets means that companies must have business processes that can be quickly and safely adapted to changing requirements at all times. Insensitivity to disturbances and a high level of cost-effectiveness are basic needs for lasting financial success.

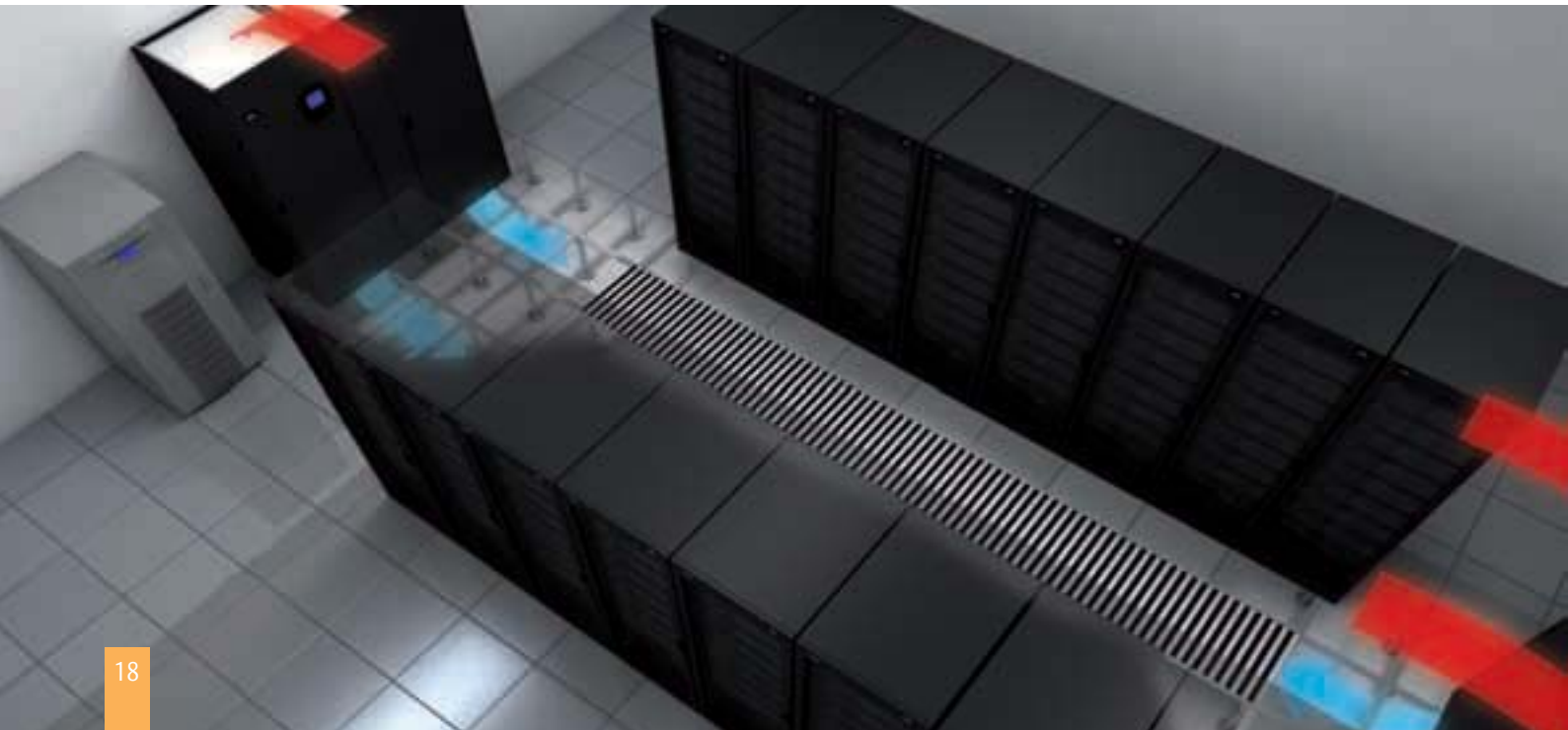
Constant availability and reliable functioning under all conditions are demanded of both IT systems (software, applications) and the IT infrastructure (server, storage, network). A fast and flexible adjustment to modified or new business processes is a key capacity in keeping investment and operating costs down.

Demands on energy infrastructures

The constantly increasing energy requirements of IT components have turned energy infrastructures (power supply and cooling) into the most important components of the entire physical infrastructure of server rooms and Data Centers. Their proper functioning is essential for a company's critical business processes.

On the basis of Knürr and Liebert products, Emerson Network Power provides numerous cooling solutions that meet all requirements – from network rooms through to large-scale Data Centers:

- High or highest possible availability and reliability
- Safe and secure covering of power requirements (kilowatts per room/kilowatts per rack)
- Flexible adjustment to current power requirements
- Flexible positioning of new IT components in the room
- Cost-effectiveness (TCO)
- High energy efficiency, low operating costs
- Low installation costs, step-by-step expansion with rising energy requirements
- Low building system costs, optimum space use with high energy densities



Conventional cooling system limits

Data Centers are usually thermally managed via room cooling. Cooling units set up on the room's periphery push cooled air under a raised floor, which then reaches the IT racks in the room through perforated bottom covers. The heated air in servers, storage units and network components rises to the ceiling, from where it flows back to the cooling units. Even when all possible optimization measures are applied, such as setting up hot/cold aisles in the rack, sealing cable ports and closing off unused height units with blanking panels, cooling capacities of more than 5 KW per rack cannot be realized.

This capacity range can only be achieved with a high level of excess air and very low cooling air temperatures. Both of these factors increase energy consumption, and systems are then very difficult to harmonize – hot spots are practically unavoidable.

The biggest problem for practical operation is the fact that there is hardly any flexibility for positioning new IT components.

Selecting cooling systems for higher power densities

Even if the size of the room is a significant factor, the required cooling capacity in kilowatts per server rack (KW per rack) is the critical value. Above 5 KW per rack there are two different solution methods:

Open cooling architecture
The room is part of the cooling system; the cooling air streams through the IT racks.

Benefits:
- Server racks with perforated doors can be used
- Conventional systems can be further developed
- High availability provided by cross redundancies between the cooling units
- Hot/cold separation for high powerdensities and energy efficiency, as well as flexibility for positioning further IT components
- Step-by-step scalability of low and high power densities up to 20 KW per rack:
  - Up to 5 KW per rack: Conventional room cooling with hot aisle/cold aisle principle.
  - 5 to 10 KW/rack: Cold aisle containment with regulated air volume and cooling air temperature.
  - 10 to 20 KW per rack: Usually the cooling air supply from the room's periphery is no longer sufficient for this performance range. Additional cooling units in the room are operated on or above the racks. (Supplemental Cooling)

Closed cooling architecture
The cooling is completely within the rack via built-in heat exchangers or cooling units; the room air is not incorporated.

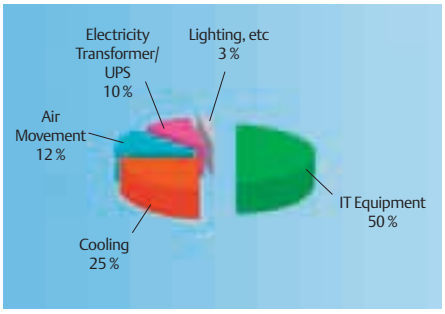
Benefits:
- Cooling unaffected by room influences
- Use of otherwise "impossible" rooms for IT purposes
- Low airflow speeds/noise; high temperatures in the room
- Very high cooling capacity of up to 35 KW per rack, independent of the room layout, etc.
- Excellent energy efficiency with high prerun temperatures, short air paths and minimized recirculation air volume
- Individual regulation of the individual server racks
- Smoke detection and fire suppression at rack level

Consistent Energy Efficiency In Data Centers Produces Massive Cost Savings

Energy consumption in conventional systems

On average, conventionally cooled data centers consume as much energy for power supply and IT cooling as for the operation of the IT itself.

The back cooling system accounts for the largest part of the cooling energy consumption (25%). With bigger setups this system provides cooling water for operating cooling units and heat exchangers.
It essentially consists of water chillers and a pipe system for distributing the cold water.



The air circulation is the second biggest consumer of energy (12%), i.e. for running the fans in the cooling units.

Energy efficient cooling systems

Components

Regardless of the system setup, the use of energy-optimized components that are frequently found in various sub-systems produces valuable benefits:

- Electronically commutated speed-controlled fans (EC fans)
- "Digital Scroll" refrigerant compressors
- Pressure/performance-controlled circulation pumps
- Spaciously dimensioned heat exchanger registers in chillers, cooling units and closed racks

Chillers

The energy consumption of the back cooling system essentially depends on the construction and operation of the chiller.
With free cooling and "Supersaver" operation, up to 50% of the operating energy can be saved when compared with a conventional system.
Further savings potential can also be realized by increasing the cooling water temperature, e.g. as possible in progressive open or closed cooling architectures. Up to 70% of the operating energy can be saved on the whole.

Room cooling

For energy-efficient air cooling it is crucial that only exactly the air volume that is required for cooling the IT components be circulated, and that the air not be cooled any more than is absolutely necessary. This can be achieved by consistently separating cold air and warm air with cold aisle containment and the independent regulation of air volumes and cooling air temperatures.

Even a small speed reduction in the respective fans has a big effect on energy efficiency. A speed reduction of just 20 percent reduces energy absorption by almost 50 percent! A continuous, requirements-related regulation of the fan speed therefore has a decisive effect on energy efficiency. Electronically commutated fans (EC fans) that have a considerably better level of efficiency than AC fans are particularly well suited for this purpose.
Liebert HPM cooling units are designed to fully exploit this effect, so that the fan speed is only increased when the regulating valve is fully opened.
As these cooling units can communicate with one another via their control system, all cooling units in the room can be operated in harmony with one another.

Instead of keeping one or several units in standby mode, all devices are operated parallel with a lower fan speed. Operating power is saved accordingly; humidification and dehumidification do not work against one another.

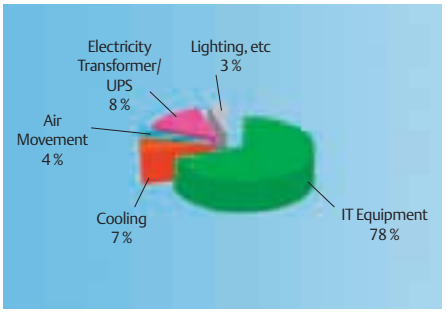
Rack cooling

The rack cooling applies all the principles of the open cooling system (room cooling), and enables even tighter control of all operating parameters.
The essential elements are:

- Complete separation of cold air and warm air
- Operation with higher cooling water temperature
- Spaciously dimensioned heat exchangers
- EC fans
- Fan speed regulation as required

Achievable energy savings

Emerson Network Power cooling systems enable enormous energy savings. The energy requirements for the back cooling can consequently be reduced from 25% to 7%, and for the air circulation from 12% to 4% compared with an average conventional system.
The required investments in the system technology amortize quickly – within months. As rising energy costs must be expected in the future, the cost-effectiveness of energy-saving activities will improve even further as time goes by.



Knürr Miracel® - Serverrack As Smartest Platform

Knürr Miracel®

This unique, modular construction allows for flexible mounting of accessories, as well as a complete cable management system with an extensive range of accessory components.

The server rails guarantee easy mounting of 19" servers of all types plus Knürr accessories.

With fully perforated doors (83% open area) this enclosure is set up for optimal thermal management – far exceeding server OEM requirements for effective heat dissipation.

Features & Benefits

Flexibility:	Higher Availability:	Lowest Total Cost Of Ownership:
▪ Patented aluminum extrusion creates channels allowing for easy mounting almost anywhere in the cabinet. ▪ Cabinet and accessories designed as a system allowing customization with standard accessories. ▪ Complete cable management system provides management for the user's needs and requirements. ▪ Standard power strip mounting bracket allows power strips to be mounted virtually anywhere in the cabinet.	▪ Cabinet and accessory items designed as a complete system, providing a more complete and flexible solution for most applications. ▪ Logical cable management system reduces obstructions to airflow, reducing the adverse effects of heat on computer equipment. ▪ The power strip can be conveniently mounted in the zero U space, making it more accessible for the user.	▪ Simplified installation of components reduces overall installation time, reducing costs. ▪ No specialized components necessary, reducing costs and lead times. ▪ Using a standard cable management system eliminates the need for a special system, reducing costs. ▪ Maximizes the amount of usable space in the cabinet, ultimately reducing cabinet count.

Liebert HPM™ For Precision Air Cooling

OPEN Cooling Architecture | Level: Room

Liebert HPM S

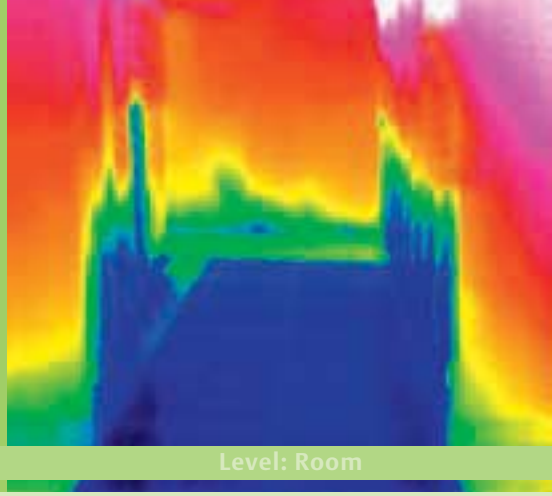
Liebert HPM S precision air conditioning system provides complete environmental control, including precise temperature, humidity and air filtration.

Designed to fit in the crowded confines of an equipment room, Data Center or laboratory, it offers an extremely compact footprint for facilities where space is at a premium. All of the critical components are accessible from the front, so the unit can be installed in a corner or flush against other equipment.

Features & Benefits

Flexibility:	Higher Availability:	Lowest Total Cost Of Ownership:
▪ Small footprint. ▪ Total front access for service. ▪ Provides a complete environmental control package, including both precision air conditioning and humidity control. ▪ Upflow, downflow and displacement models available. ▪ Air, water, glycol and chilled water units available. ▪ Advanced microprocessor control.	▪ Built with Liebert quality components from the most trusted name in the industry. ▪ Engineered for year-round operation. ▪ Multiple options for communications and real-time monitoring event notification. ▪ Reliable hermetic scroll compressor technology in combination with standard hot gas bypass gives flexibility to adjust to various room loads. ▪ Optional digital scroll compressor provides continuous load modulation and advanced flexibility.	▪ Refrigeration system utilizes Scroll compressor for maximum energy efficiency. ▪ Fast response microprocessor controls minimize short cycling and other wasteful operating patterns. ▪ Liebert precision air conditioning products are supported by the Service Network - the largest network of service providers in our industry - for installation, start-up and preventive maintenance. ▪ Even more cost effective by using digital scroll compressor, with lower energy consumption and less wear and tear.

Knürr CoolFlex®
Dynamic Cold Aisle Containment For Energy Efficient Upgrade Of All Data Centers



Knürr CoolFlex® – The Smart Way To Reduce The Costs

One future-proof and cost-effective option is to constantly separate the cold air zone from the warm air zone.
The Dynamic Cold Aisle Containment ensures that the cold air flowing though the raised floor is channelled through the cabinets. Special feature: as a result all installed servers are provided with consistant cold air over the entire height of the cabinet.

This containment means that the usual heat mixing on the Data Centre ceiling no longer has any effect on the cold aisle, and hot air short cuts are no longer possible. This significantly improves cooling efficiency, resulting in the reduction of cold air required. This in turn then means that energy costs also fall considerably!

The Knürr CoolFlex® principle essentially means a constant separation of cold zones and warm zones, and incorporates the following factors:

- Raised floor sealing:
  Cable entries in the cabinets can be effectively sealed with Koldlok® brush systems; perforated panels are only used in the cold zone

- Cabinets sealing with trims and 19” blanking panels
- Customised cold aisle containment using standard components – compatible with all manufacturer cabinets.

Dynamic cold aisle containment from Knürr with supplemental cooling units produces a consistent temperature over the entire height of the cold aisle.
This significantly reduces the air speed intake, and the air temperature intake can be increased (20 - 25°C).

This, of course, has advantages for both the operator and the environment (lower energy costs for driving fans in the CRAC equipment, suitable air temperature intake for servers, more pleasant working conditions).

The higher intake air temperature also allows the inflow water temperature to be decreased, which results in further energy savings. Plus, higher inflow temperatures provide more time for cooling through free cooling.

Increasing The Heat Per Rack Reduces The Total Data Center Surface And, With High Density Technology, Cooling Can Be Provided Only Where It Is Needed

High Density Supplemental Cooling

Traditional room-cooling systems have proven very effective at maintaining a safe, controlled environment for IT equipment. However, optimizing Data Center energy efficiency requires a shift from traditional Data Centers (2 to 3 kW per rack) to an environment that can support much higher densities (in excess of 30 kW).

This requires an approach to cooling that shifts some of the cooling load from traditional AHUs to supplemental cooling units. Supplemental cooling units are mounted above or alongside equipment racks, and pull hot air directly from the hot aisle and deliver cold air to the cold aisle.

These savings are achieved because supplemental cooling focuses on cooling closer to the source of heat, reducing the fan power required to move air. They also use more efficient heat exchangers and deliver only sensible cooling, which is ideal for the dry heat generated by electronic equipment.

Liebert XDH

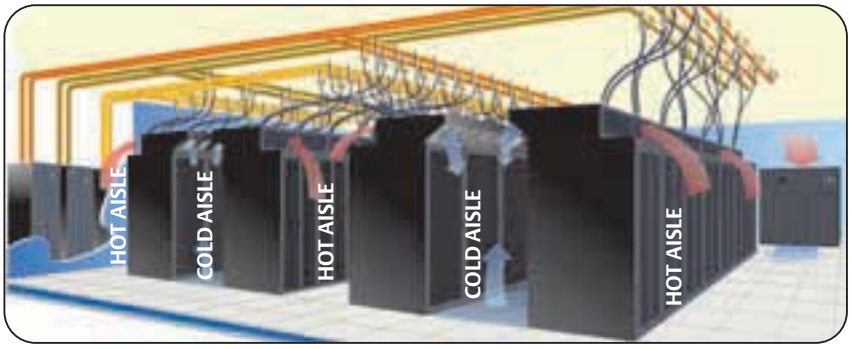
Knürr CoolLoop® T

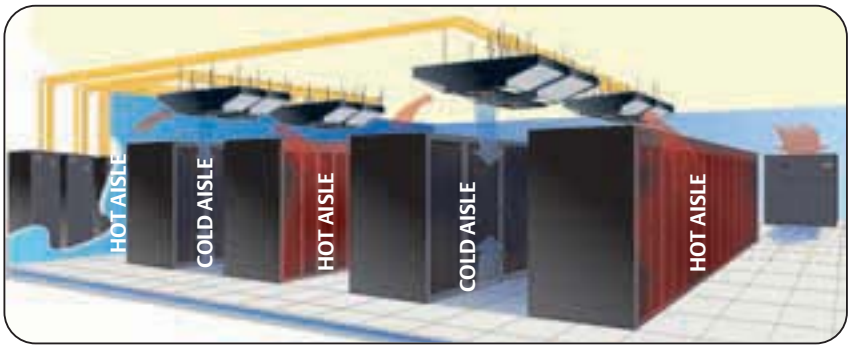
Supplemental Cooling: Closed unit with warm air suction from the rear and cool air expulsion at the front – blown vertically over the entire height of the cabinet.

No Need To Over Chill Data Centers To Eliminate Hot Spots Emerson Network Power Has The Answer To Both Environmental And Economic Issues: Liebert XD Solution

Liebert XD Solution

Today, more than ever, environmental and economic issues are pushing business continuity professionals to lobby for energy-efficient, environmentally friendly solutions in their Data Centers. The Liebert XD solution is the answer on both fronts. With a hybrid approach that requires 15-50% less chiller plant capacity, as well as less diesel generator and switchgear capacity required, the potential energy consumption for your centers is reduced by up to 40%.





The significant energy savings achieved by the Liebert XD solution are attributed to these factors:

- Locating cooling units closer to the load reduces the energy required to move the air and results in less mixing of hot and cold air.
- Micro channel coils provide minimal air pressure drop losses and improved thermal heat transfer.
- No need to over-chill Data Centers to eliminate hot spots.

In your Data Center environment, the flexible configuration of Liebert XD system modules ensures scalability for future growth.

Liebert XD Features & Benefits

Flexibility:	Higher Availability:	Lowest Total Cost Of Ownership:
▪ Floor-mount or rack-mount modules, plus a choice of cooling capacities, cover any application requirements. ▪ Plug and play for initial installation and future growth. ▪ Can cool more than 30 kW per rack.	▪ The Liebert XD solution assures continuous operation of critical IT systems under extreme heat conditions. ▪ Designed to work with the hot aisle/cold aisle approach in both raised floor and non-raised floor applications, by efficiently drawing hot air out of equipment racks and moving cool air into the cold aisle.	▪ Total energy savings potential of up to 40% can be achieved with the Liebert XD solution. ▪ Minimal floor space requirements allow more room for IT equipment. ▪ Liebert precision air conditioning products are supported by the Liebert Service Network - the largest network of service providers in our industry - for installation, start-up and preventive maintenance.

Knürr CoolAdd® – Retrofit Solution When Cold Air Is No Longer Enough!

Knürr CoolAdd® – Retrofit solution when cold air is no longer enough

Data Centers are subject to constant changes: new server technologies, changing T-requirements and economic pressures mean that modifications form an inevitable part of day-today life in Data Centers.

At the same time, rapid technological advances combined with continuously rising expectations for Data Center technology place existing infrastructures under further pressure. It is not always possible to build from scratch in order to meet these increased demands. In most cases, planning must be restricted within the confines of existing structures.

The migration of new servers within existing Data Centers places a great demand on an existing infrastructure. In most cases, technical limitations are met and overcome through retrofitting. However, even if it is possible to adjust the network infrastructure and electrical supply at reasonable operating expense, current air conditioning technology reaches its limitations very quickly. Overheating within such installations is thus inevitable. Hotspots within the entire Data Center inevitably lead to the slow-down of data processors until a complete shutdown occurs.

Knürr CoolAdd® represents the ideal retrofit solution for Data Centers and ITrooms. It safeguards against the risk of hotspots and helps to avoid overheating of the server racks. A special feature of this quick and highly effective solution is that the existing server rack remains within the Data Center. In addition, the entire wiring may remain as it is, without the need for any alterations!

Therefore, CoolAdd® is an easy-to-use replacement for the server's rear door. It operates on the following technical principle: safe cooling of the servers' emitted air temperature in order to meet the required supply air temperature. CoolAdd® consists of three basic components:

- connection adaptor for the existing server rack
- air-water-heat-exchanger (fixed to the rack)
- backdoor with fans

The server’s thermal power loss is transferred into the Data Center’s cold water installation by means of the airwater-heat-exchanger. Powerful fans ensure optimum cooling-out.

Convenient installation: CoolAdd® may be mounted on all currently available server racks.

The installation is mounted onto an adaptor frame. As a second step, the heat-exchanger is fixed onto the existing rack. It is recommended that the cold water supply is connected through the base. Fans are positioned at the door in order to maintain perfect access to the entire installation within the rack.

A Closed Architecture Design For Cooling And Servers In One Cabinet: Great Solution For Saving Space And Handling The Heat Load In The Space

Knürr CoolTherm®

The most energy-efficient method of server cooling is the closed air loop cabinet. The world's first product featuring this method is the Knürr CoolTherm®. It follows the closed architecture design and hosts the air to water heat exchanger, the fans and servers in one cabinet. The shortest possible air path ensures the lowest power consumption for the infrastructure fans.

The use of EC-fans also enforces the low-energy approach. A strict separation of warm and cold zone inside the closed loop cabinet also minimizes the air flow rate and allows for maximum reduction of power consumption.

The design of the heat exchanger ensures optimal air cooling temperature of the server with a very high chilled water feed temperature.

This very low temperature difference between chilled water and cooling air extends the free cooling periods to the maximum and significantly improves the coefficient of performance (COP) of the chilled water plant. The increase in energy efficiency is outstanding.

Knürr CoolTherm®, Energy-efficient Server Cabinet Technology

Minimize energy costs in a Data Center and reduce carbon dioxide emissions. With highly developed innovative system along with an enhanced thermal management as presented by High Density Cooling Solutions, Knürr CoolTherm® sets a benchmark with regards to economic efficiency (TCO).

Knürr provides with this Premium Technology the perfect platform for setting up a scalable solution. Knürr CoolTherm® is a integrated solution concept for heat loads with an effective cooling capacity from 4 /8 /12 / 17 / 25 to 35 kW.

Knürr CoolTherm® also minimizes the floor space requirement in the Data Center. The heat load per Rack in high-end computing applications exceeds the 35kW threshold.

Only a closed architecture design is able to manage huge heat density.

At the same time, the heat load to the room is negligible, resulting in a notable reduction in strain on the Data Center infrastructure such as lower raised floor and fewer CRAC units.

- A closed loop cabinet causes very low noise emission.
- Each individual rack is individually controlled in terms of optimal heat management and lowest consumption.
- The even air distribution temperature to all servers, irrespective of the height of the cabinet, is another excellent feature.
- And for extreme reliability and availability, a dual feed heat exchanger is also available.

Knürr CoolLoop®
Side-mounted Modular Cooling Unit
For All Server Racks (10 – 30 kW)

CLOSED Cooling Architecture

Level: Room

Knürr CoolLoop®

The Knürr CoolLoop® has a modular setup that can be equipped with one to four fan units. Cooling is therefore adapted to suit the actual requirement within the Data Center. The cooling range per Knürr CoolLoop® is 10 – 30 kW. Selection of the required capacity can be determined by the Data Center operator. This ensures investment security for the Data Center operator, and only provides the required cooling power relative to the heat load produced by the Data Center.

The Knürr CoolLoop® represents the highest standards in data room cooling capacities. The main focus is selecting the methods and procedures that save the most energy by using the most modern components. This is why the tried, tested and proven EC fan technology is used consistently.
The air path is constantly monitored and adjusted through the heat exchangers and moisture eliminators, which results in minimum energy consumption by the fans.

The Knürr CoolLoop® not only sets standards with regard to pressure loss, but relatively high cold water pre run temperature for optimum server cooling also ensures improved use of the cold water system with a high coefficient of performance (COP).
The design also enables a high level of free cooling, which facilitates significant savings potential with cold water generation. Short air paths and the arrangement of the fans after the heat exchanger also help to reduce energy consumption.

Rear view with water connections

Knürr CoolLoop®

It is the world's first solution for Data Center server cooling that can be operated as both an open and closed system.

The system can be set to either directly cool the adjacent cabinet (closed system), or to supplement the Data Center cooling (open system). A system of valves ensures that the correct cooling level is provided for every server.

Knürr CoolLoop® T

The cooling power is only available as a supplement to the Data Center cooling, supporting the computer room air conditioning units (CRAC).

Together with the Knürr CoolFlex®, cold aisle containment system, this combination presents the ideal addition for optimum medium power range server cooling.

Liebert XDFN – Designed To Serve As An Integrated System In Small Data Centers

Liebert XDFN

The Liebert XDFN is an integrated equipment cabinet with built in cooling, power distribution, racks for server location, monitoring and fire extinguish system offering full redundancy and back up ventilation.Liebert XDFN is designed in order to provide cooling system for servers up to about 25 kW maximum (net cooling).

Liebert XDFN provides a safe protection to customers servers from risks related to server over heating providing a complete solution for redundancy, power protection, fire extinguish, back up ventilation. In order to cover different heat loadsand number of racks, multiple configurations or Liebert XDFN are available.

Frequently Asked Questions

Question	Resolution
What makes the Liebert XDFN the right choice?	▪ Innovative Design - The Liebert XDFN includes advanced features not found in competing systems, including Digital Scroll cooling technology, adaptive controls, the broadest selection of heat rejection methods – air, water, glycol and chilled water. ▪ A Total Solution - Because the Liebert XDFN is designed as an integrated system, it has more flexibility for installation and reconfiguration than a traditional ceiling mounted cooling system with the associated rack and ductwork. ▪ Sized Right - Liebert XDFN is available in several sizes with net cooling capacity up to 25kW, so is sufficient for most rack equipment being deployed.
What are some of the best places to consider using the Liebert XDFN?	▪ Network closets with high-density servers and switches. ▪ Small Data Centers with high-density server deployments, including IDFs and MDFs. ▪ Wiring closets housing VoIP systems and other sensitive equipment. ▪ Telecom shelters. ▪ Manufacturing facilities with remote mission-critical IT equipment. ▪ Warehouses with RFID installations
How easy is installation?	▪ Eliminates high heat up to 25kW net per rack. ▪ Provides N+1 redundancy. ▪ Includes emergency ventilation in the event of an unplanned shutdown. ▪ Multiple configurations available. ▪ Each rack up to 42U equipment. ▪ Lower energy costs through the use of a Digital Scroll compressor for continual and precise adjustments in cooling. ▪ Multiple coolant options - air, water/glycol or chilled water. ▪ Easily adaptable, plug-and-play installation. Self-contained.

Cold Water Supply Into The Data Center: Knürr CoolTrans®

CLOSED Cooling Architecture

Level: Room

Knürr CoolTrans® – The link between building technology and Data Center

Water supply within a Data Center poses specific challenges for the installation of cooling water systems. Water cooling is in fact required due to the high discharge of thermal energy by state-of-the-art servers. Water-cooled server racks help to minimize the distance between cooling systems and servers.

Knürr CoolTherm®, the closed server rack featuring a water-cooled circulating air system, and Knürr CoolAdd®, the watercooled retrofit solution for a wide variety of current server racks produced by different manufacturers, function on the basis of a failure-proof connection with the cold water supply available in any building.
It is not however simply a matter of diverting the existing cold water supply into the Data Center. The Knürr CoolTrans® couples the building's main cold water circulation system with the Data Center's secondary cold water system by means of a water-towater heat exchanger.

The benefits are...

...the cold water flow temperature is controlled by the dew point temperature within the Data Center. In this way, any complex isolation of the Data Center's water circulation system is overcome.
...since the secondary circulation system is operated above freezing point, use of glycol is no longer necessary. The coolers may be built to a smaller size.
...the water quantity within the Data Center is controlled by the secondary circulation system.
... temperature and pressure fluctuations within the primary circulation system are compensated for. The flow temperature can be controlled.
...the option of monitoring the secondary circulation system, including failure alarm management, protects constant operation and reports technical faults within the installation.

In addition, the relatively high flow temperature of 12°C and over allows for a high degree of free cooling in many climate zones, resulting in energy savings. In these cases, the system's capacity factor, i.e. the ratio between cooling performance and power consumption, increases drastically.

The Knürr CoolTrans® allows the mixture of cold water produced by free cooling with the main cold water supply.

Supporting Cooling Modules: Liebert Coolant Chiller And Pumping Unit

CLOSED Cooling Architecture | Level: Room

Liebert XDC

The Liebert XDC Coolant Chiller is a specially designed indoor unit that connects directly to Liebert XDH and Liebert XDV units, providing chilled pumped refrigerant circulation and control. The packaged unit includes Enclosure, Pumps, Heat Exchanger, Scroll Compressors, Receiver Tank, Controls, Valves and Piping.

Liebert XDP

The Liebert XDP Pumping Unit is part of the the highly energy-efficient, high density Liebert XD cooling system. The system can cool more than 500 W/sq. ft. (5400 W/m^2), and utilizes Liebert XD Coolant.

Liebert XDP is specifically designed to support the Liebert XDV and XDO systems. The XDP is an interface between theLiebert XD Coolant circuit and the building chilled water system. It circulates the XD Coolant to the Liebert XDV and XDO modules while maintaining the coolant at a temperature, always above the actual dewpoint.

Features & Benefits

Flexibility:	Higher Availability:	Lowest Total Cost Of Ownership:
▪ Scaleable. ▪ Available in air-cooled, water and glycol configurations.	▪ The Liebert XDC monitors room conditions and prevents coil condensation by maintaining the coolant being pumped to the cooling modules at a temperature above the room dew point. All functions, such as temperature control, switching pumps are automatic. ▪ All functions, such as temperature control and switching pumps, are automatic. ▪ Uses environmentally friendly R-134a and R-407c refrigerant.	▪ Energy efficient. Uses Liebert XD™ pumped refrigerant, an off-the-shelf product that operates at low pressure and becomes a gas at room temperatures, making it ideal for use around electronic equipment. ▪ Floor space efficient. ▪ Easy to install. ▪ Liebert precision air conditioning products are supported by the Liebert Service Network - the largest network of service providers in our industry - for installation, start-up and preventive maintenance.

If The Data Center Is Based On Chilled Water Units The Chiller Configuration Is Key To Energy Efficiency

High-Efficiency Chiller with integrated free cooling

The latest innovation from Emerson is integrated, intelligent free cooling.

A free cooling module incorporated into the chiller uses low outside air temperatures to cool the system water and achieves significant energy savings during the winter months.

The system reduces cooling water temperature so that less cooling capacity is needed from the compressors, or even none at all in particularly low outdoor air temperature conditions.

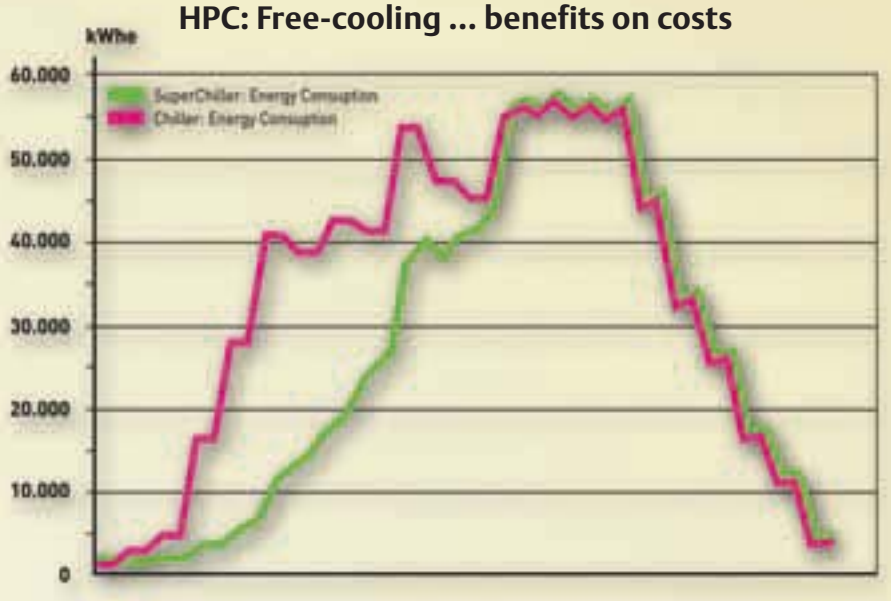
The technology used in the latest generation of Liebert HPC-L chillers by Emerson Network Power has been specially selected for its ability to reduce CO_2 emissions and deliver impressive energy savings. The range represents a concrete response to the latest market needs, especially in the area of Data Centers, where high cooling capacity has to be combined with flexible, compact and energy efficient solutions.

In the Emerson Network Power freecooling chillers, a 3-way valve, in the case of suitable external air temperature, directs the water flow through an additional and integrated free cooling coil, where there is a heat exchange between the cold air and the water flow itself.

The result is that the water temperature is reduced, so that the mechanical capacity required by the compressors is reduced partially or even to zero: the first case is mixed free cooling, the second is total free cooling.
Depending on climate and temperature profiles, surprising savings can be achieved in energy consumption.

City	Milano Lin.
Unit	SBS073
Unit fluid fow	139,0 m³/h
Fluid	Ethylene Glycol 30%
Requested Thermal Load	725,0 kW
Annual absorbed energy SCH	1101328 kWhe
Annual energy saving	332307 kWhe
Electronical Saving	23 %

HPC: Free-cooling ... benefits on costs



Assuming a cost of energy of: **0,1 €/kWhe**, the cost saving is **33.000 €/year**

Annual Energy Saving Of More Than 50 Per Cent Plus Impressively Reductions In CO_2 Emissions

The Emerson Network Power solution enables a typical Data Center to achieve exceptional energy savings thanks to the intelligent integration of the chiller and the close control cooling systems (Liebert HPM, for example).

When thermal load at the Data Center falls, instead of continuing to supply water to the users at the same temperature and regulating cooling capacity by means of a water flow by pass system, Supersaver logic allows the temperature of the close control system cooling water and the chiller set point to rise, thus aligning cooling capacity with demand.

This means that free cooling becomes effective sooner, leading to additional energy savings. In the case of typical functioning parameters and annual climate variations, as in our Amsterdam Data Center, additional energy savings would reach 15%.

And that's not all. The total thermal load of a Data Center is generally shared among a number of chillers, with one or more units installed to ensure redundancy. These units remain in standby during normal system operation. To maximise the effect of free-cooling, Emerson Network Power chillers feature a special control logic that, under free-cooling conditions, brings standby units into the circuit to maximise the effect of free cooling.

Free-cooling and integration between chillers and close control cooling systems made possible by Supersaver logic, plus intelligent standby chiller management, can enable annual energy savings of more than 50 %, with a significant reduction in CO_2 emissions.

For Many Decades, ***Emerson Network Power*** *Has Been A Global Leader In The World Of Business-Critical Systems. The Best Run Companies Have Relied On Our Product Solutions, Technologies And Services*

Bringing Energy Efficient Data Center Technology To Your Business.

Business information is more critical than ever to organizations of any size. All Data Centers are critical to their organizations. Likewise, they all face the same protection issues. Rising heat densities. More demand for reliable power. Ever-changing technologies. Cost and floor space restrictions.

With Knürr, everything from small closets and computer rooms to centralized global Data Centers can capitalize on products and services designed for their individual needs.

Based on unique needs of various Data Centers, we as Emerson Network Power integrated rack systems, with thermal management, power, cooling, monitoring and service as a pre-engineered solution. Plus, we offer optional services and local expertise and support that make your Knürr solution easy to order, configure, manage and implement.

Integrated solutions. Pre-engineered benefits. Energy efficient.

Only Emerson Network Power coupled with Knürr and other dvisions can offer you the advantages of having a fully integrated–and pre-engineered–solution, from rack to room. By consolidating all your products and services with us, you are assured that everything works together as one configured system.

- **Reliability** — Proven mission-critical technologies that minimize single points of failure produce the highest possible reliability for your IT systems, so you can work in confidence.
- **Single Source** — One source to select, configure, install and service all your products and technologies, with a single call to make.
- **Integration** — From rack to room, our products and services form a holistic system. With our name on each, our pre-engineered products are meant to work together.
- **Technical Support** — Local and factory support by application specialists is available if needed. We as Emerson Network Power also have the largest team of factory-trained Customer Engineers across the globe to provide you the breadth and depth needed to guarantee uptime assurance and downtime recovery.
- **Flexible Configurability** — As your IT requirements change, our products and technologies provide an adaptable and cost-effective path to support synchronized growth, so you're not stuck with the unexpected.
- **Energy Efficiency** — It has always been our commitment to our customers, which is why we are able to offer 'Green-IT' solutions that have become the benchmark in the ICT market. The end result? A Data Center infrastructure with the ability to anticipate and adapt to change.

The Fortune 500 companies and the biggest names in computing and communications around the world come to Emerson Network Power for support of their critical technology infrastructure. But we know that Business-Critical Continuity™ can be just as important to small businesses as it is to the largest enterprise. Whether you are a global network service provider, a small internet retailer or you run a Data Center, your business depends on staying connected to your customers. So our goal is to keep you moving forward and your business growing, despite the unknown.

Designed For Your IT-World, Make Energy Efficient.

Achieving mission-critical network availability requires the installation, management, and continuous support of your network's infrastructure.

This continuous availability rests on the power and cooling infrastructure that supports these systems, and requires key components:

- Mission Critical Power

- Mission Critical Cooling

- Rack and Enclosure Systems

- Monitoring and Management

- Proactive Maintenance

In addition, Emerson Network Power has created new power, cooling, rack and enclosure systems as well as monitoring solutions that help deliver continuous availability — and real value beyond the sum of the part.

We offer unsurpassed adaptability, customization, and the ability to integrate across multiple products and services. Here are some ways that our power, cooling and monitoring solutions create significant value for our customers:

Greater knowledge gain of your needs and ability to meet those needs.

Solutions that are more reliable, more comprehensive and more suitable to your needs — delivering greater strategic and operational impact, higher reliability, flexibility and lower total cost of ownership.

Collaborative effort benefits — combining our knowledge, expertise and resources to meet your needs.

The end result is an infrastructure with the ability to anticipate and adapt to change.

EMERSON™
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Emerson Network Power, a business of Emerson (NYSE:EMR), is the global leader in enabling Business-Critical Continuity™. The company is the trusted source for custom,adaptive and ultrareliable solutions that enable and protect its customers' business-critical technology infrastructures. Backed by the largest global services organization in the industry, Emerson Network Power offers a full range of innovative power, precision cooling, connectivity and embedded products and services for computer, communications, healthcare and industrial systems. Key product brands within the Emerson Network Power family include Liebert, Knürr, ASCO, Astec, Lorain.

Knürr system solutions in the world of information and network technology are part of an adaptive Emerson Network Power architecture, which flexibly adjusts to all changes concerning security/safety, high-density and all associated capacities. Companies profit in a sustainable and long-term way from the high IT availability, operative flexibility and impressive reduction in investment and operating costs.

Knürr AG is recognised around the world as one of the leading developers, manufacturers and distributors of rack and enclosure platforms in the indoor and outdoor area, including all relevant active/passive components of 19" structures and the technologies connected with them.

Knürr is certified in accordance with EN ISO 9001 and the EN ISO 14001 standard. Knürr's quality management continuously guarantees the highest level of quality in all areas of the company.

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Emerson Network Power
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