



We will make your data centre
fit for the future
Clever cooling systems for cool clusters

SCHÄFER IT Systems – your specialist for data centre infrastructure

SCHAFER IT Systems is an innovative manufacturer of rack cooling and enclosure solutions for data centres, as well as rack solutions for network applications. In addition, SCHÄFER offers support for planning and a range of other services on a partnership basis. Along with its partner enterprises – all specialists in their particular fields – SCHÄFER IT Systems can supply convincing, tailor-made solutions and is the competent company to contact for the “data centre of the future”.

Goals and visions

The physical infrastructure within a data centre has a massive influence on reliability and availability. If the worst comes to the worst, all other investments in IT could turn out to be pointless without a secure IT infrastructure basis. In the event of server failure or insufficient power distribution, worrying about software

solutions will be a waste of time. Data centres are rarely filled to maximum capacity. They have to grow with the demands placed upon them. That applies to the available computing performance as well as the necessary housing systems.

SCHÄFER IT Racks and solution concepts make an active contribution to energy efficiency and have a positive influence on all infrastructure components of the entire data centre!

SCHAFER IT Systems achieves cost and energy savings for you!

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SCHAFER makes sure you cut costs and save resources

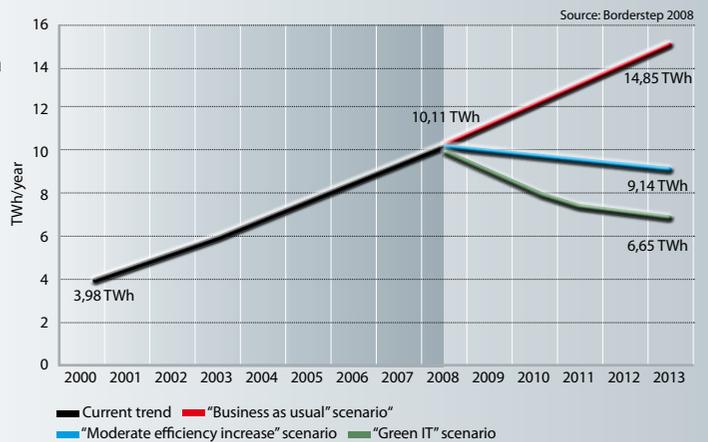
In companies today, computing performance is constantly increasing, as organisational procedures are increasingly being supported by IT and modern programs require powerful servers. In many data centres, particularly in the “computer rooms” in small and medium sized companies which have “grown” over time, IT systems are not sufficiently protected. To prevent data loss and guarantee reliable operation in the long-term, there needs to be specific investment in infrastructure. This can usually be offset by increases in energy efficiency and reductions in operating costs achieved by having a properly built up infrastructure.

What is definitely required are individual analyses and specific, needs-oriented solutions, regardless of whether an existing data centre is being optimised or a completely new IT infrastructure is being set up. With the help of the right planners, customers can achieve measurable time and cost benefits. When it comes to the necessary infrastructure measures, there are no patent remedies, as the requirements and conditions in small and medium sized businesses especially are too varied.

The best concepts are created where experienced data centre planners, rack manufacturers, air-conditioning engineers and

other specialists work hand in hand. Rack manufacturers like SCHÄFER – themselves part of such a network of experts – offer flexible, tailor-made air and water cooled rack systems, which include rack management, fire protection, enclosure and raised floor solutions to provide you with reliability, cost-cutting and energy-saving potential.

Power consumption of servers and data centres in Germany



Appropriate measures will reduce costs and energy despite increasing server density. The condition for achieving this aim is to get the usable cooling capacity to exactly the place where it is needed.

For instance:

To make ice cubes, there's no need to cool the entire house or the fridge, just the freezer compartment!



The source of air should be placed as close as possible to the source of heat!

High availability – there is no universal strategy

“We aspire to the highest standards of availability and reliability!”

IT systems have become more reliable, but the consequences of the remaining risk of failure are more serious than ever. They can even jeopardize a company's existence.

High availability systems can help here, but their proprietary technology has so far made them too expensive for most users. Data centres are complex. If software, hardware and IT infrastructure are perfectly coordinated, IT services can be reliable, available, energy efficient and economical.

Availability is usually defined as the amount of time a system is actually available over a set period, usually a year. If a system can fail one day over 365 days, availability of 99.73 % must be guaranteed. High availability systems must achieve availability of 99.9% for IT infrastructure and for carrier installations 99.999 % is required.

The key factor for a smooth functioning data centre are safety components that precisely co-ordinated. The structural and infra-structural requirements provide the real basis.

Our server and network cabinets fulfil all the basic requirements and selection criteria for a perfect data centre:

Cabinet systems and protection of servers and equipment, sophisticated cooling concepts, cost and energy-saving potential.

The influence of optimal infrastructure planning on

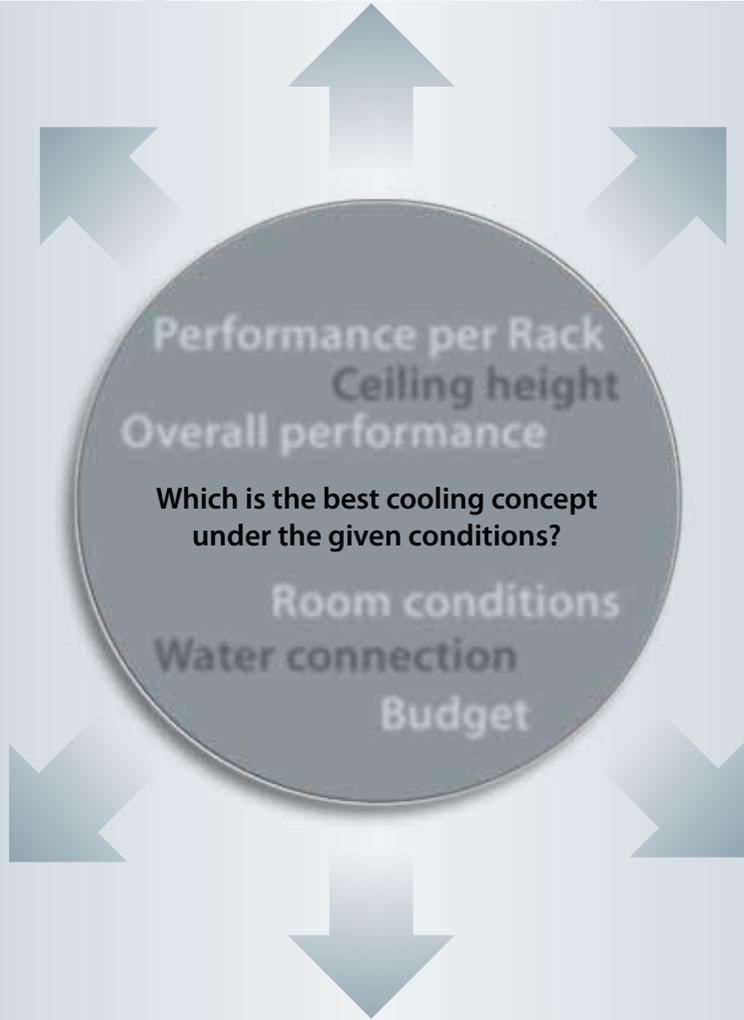


...is greater than you think!

That's why SCHÄFER regards physical safety as the key feature when equipping data centres, in order to guarantee the trouble-free operation of the highly sensitive systems. The IT experts at SCHÄFER can advise you on optimum physical protection, precision cooling, redundant power supply, “emergency boxes”, automatic door opening systems, RMS, temperature and humidity monitoring etc., to speed up error detection and correction. No data centre operator can afford to take risks with availability and efficiency – they're simply indispensable!

	Tier 1	Tier 2	Tier 3	Tier 4
Redundancy	N	N + 1	N + 1	N + N oder 2 (N + 1)
No. of distribution paths	only 1	only 1	1 active 1 passive	2 active
Single points of failure	many + human error	many + human error	some + human error	non + human error
Concurrently maintainable	no	no	yes	yes
Fault tolerant	no	no	no	yes
Annual downtime caused by data centre infrastructure	28,8	22,0	1,6	0,4
Availability	99,671 %	99,749 %	99,982 %	99,995 %

Source: The Uptime Institute



Cold/warm aisle alignment

“Modern Rack cooling concepts provide effective server cooling with a low power consumption!”

Energy efficient rack cooling concepts

For data centre infrastructures that are both reliable and energy efficient, there are no magic formulas, only needs-related tailor-made solutions. This includes selection of the right rack system and a suitable cooling concept.

Cold/warm aisle

Modern rack cooling concepts provide efficient server cooling while keeping electricity consumption low. The principle all these concepts are based on involves directing the cold air to the servers as precisely as possible. The racks are set up face to face in rows on the raised floor (cold/warm aisle). A precision cooling device feeds cold air into the data centre’s raised floor via ventilation panels at defined points. The cold air is fed to the servers from the front through passively ventilated cabinets doors.

Behind the racks, the warm air is extracted via the ceiling by a cooling device and returned as cold air to the raised floor and back into circulation. The cold air aisles in front and warm air aisles behind the cabinets are clearly separated from each other. This principle is based on the precise routing of air to achieve a greater cooling effect.



up to 4 kW/Rack

Cold aisle enclosure COLD SECTION

“Our objective is to develop calculation methods and data centre solutions further, as well as to find new technologies for improving energy efficiency in data centres.”



Effective cold-air routing

The purpose of an enclosure is the complete structural separation of the cold aisle in front of the servers and the hot aisle behind the servers. To achieve this, data centres are equipped with raised floors, rack rows are aligned face to face and the aisles between them are fitted with ceilings and sliding doors to enclose the cold aisle.

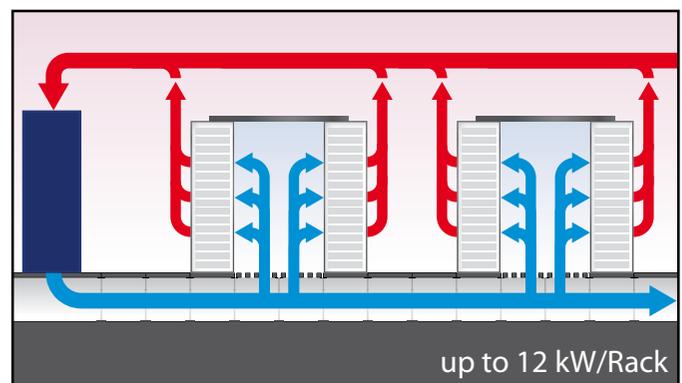
The cold air directed through the raised floor is exclusively released into cold aisles. Enclosure of the cold/warm aisles facilitates the targeted routing of cold air from the raised floor to the hotspots in the cabinets and the warm air back into the cooling cycle via the rear of the racks by effectively preventing warm and cold in the data centre from mixing. Enclosures are a globally recognised and proven solution for reducing energy needs and cutting costs while achieving the required cooling performance. For rack extensions, the Cold Section door elements can simply be reattached to the end cabinets and additional ceiling panels added.

COLD SECTION for solving the two most significant thermal challenges in data centres

- Preventing recirculation
(warm and cold air mixing together)
- Preventing height loss of cold air prevented

Arguments in favour

- Economical solution
- Scalability of additional cooling (LOOPUS)
- Raised floor enables cooling capacity to be adjusted
- Easy assembly
- Optional extension to cold/warm aisle
- Enclosure creates structural separation



Air-conditioning via the raised floor and by enclosing the cold aisles

SWAP PANEL 9 raised floor system

Modular raised floor panels with exchangeable segments which allow a variety of ventilation options and an even more precise concentration of cold air at individual hotspots are a very useful addition to any enclosure system.

Within the overall concept of directing cold and warm air in the data centre as effectively as possible to achieve needs-related cooling requirements, they provide greater flexibility and add the "fine tuning" to the air supply for the cold aisles.

The modular and flexible SWAP PANEL 9 elevated floor system from SCHÄFER IT Systems now offers a range of different floor elements specially adapted to use in data centres.

An innovative frame accommodates 9 tiles (each 200 x 200 mm) which can be adapted to very different functional requirements: standard and heavy duty loads, ventilation and cable routing. Breaking up the rigid 600 x 600 mm pattern makes precisely routed air circulation and cable routing possible.

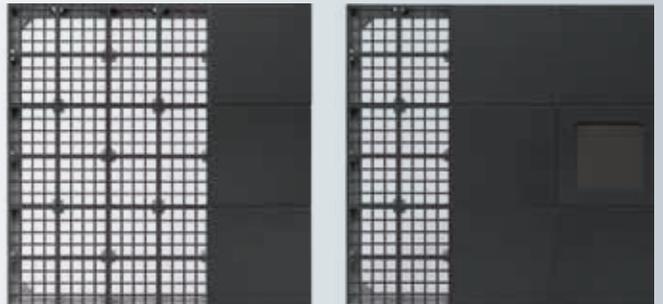
SWAP PANEL 9 elevated floor elements are compatible with standard 600 x 600 mm elevated floor panels.

So existing floors can be fitted with the new system quickly and flexibly.

Elevated floor systems in data centres must comply with certain essential criteria, such as **walkability, accessibility, air flow capacity and cable routing**.



Basic frame



Modular inserts in the variations, size: approx. 200 mm x 200 mm

- Air-flow elements (approx. 60 % open area)
- Cable routing elements
- Solid elements (standard and heavy duty)



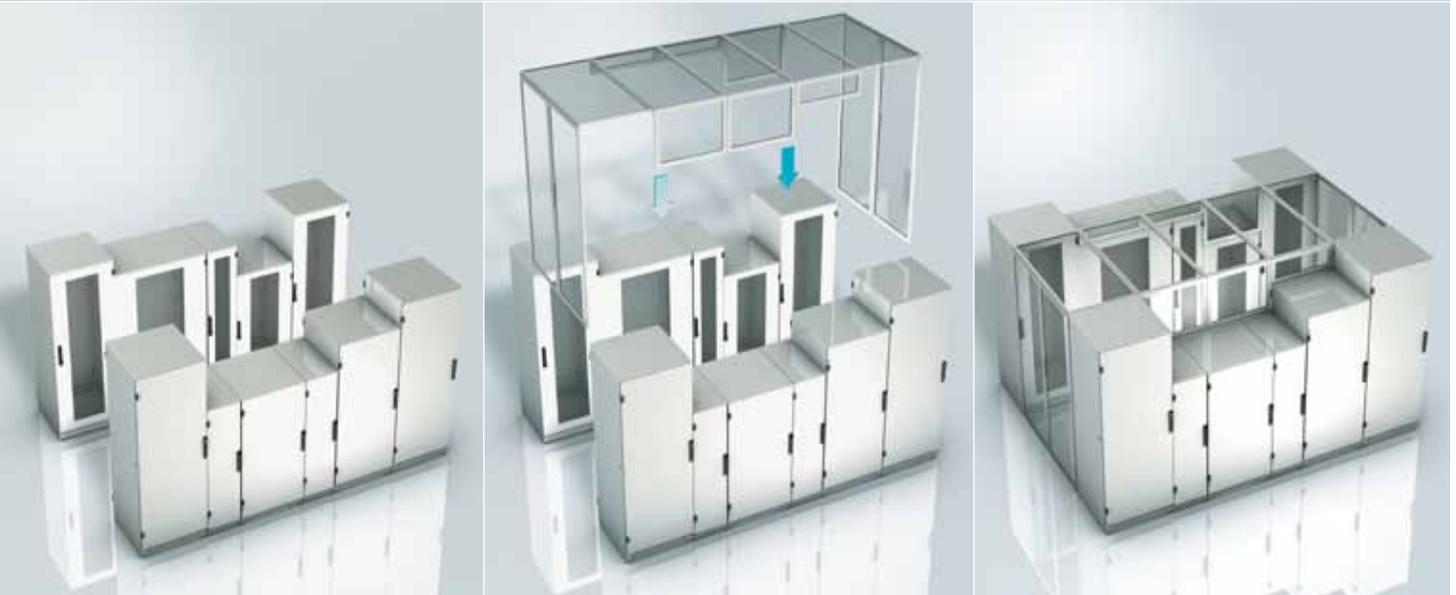
Enclosure concepts for existing IT-structures – the “skyline” enclosures

“Developing energy-efficient solutions for data centres is our contribution to guaranteeing a reliable exchange of information.”

Server cabinets come from many different manufacturers and in many different shapes and sizes. Our flexible concept offers an optimal way of putting a roof over existing rows of cabinets.

These existing infrastructures can be equipped with tailored cooling solutions which are flexible, energy efficient and, above all, reliable.

This means data centres will be able to build up systems over the long term and provide them with modern cooling systems, even if they are from different manufacturers.



Fire protection for enclosures

Early fire detection and extinguishing systems are important components of any data centre and are included in COLD SECTION. The enclosure is a separate fire compartment.



Enclosures with row-based side coolers as an open loop system with COLD SECTION

“Flexible air-conditioning concepts make it possible to adapt to the constantly changing demands in data centres.”

Energy-efficient enclosures

When low room heights do not permit a raised floor or the installation of a raised floor air conditioning system, Open Loop with Cold Section can be the solution.

Open Loop with side coolers

The enclosure of racks open at both the front and rear with side coolers is a water-cooled rack air-conditioning system known as Open Loop. For this solution, the side coolers extract the warm air from surrounding area from the rear and blow the cooled air back out into the enclosed cold aisle. Due to the side coolers, the structure doesn't need a raised floor cooling system, though they can also be used in addition. In conventional data centre installations, these solutions make it possible to manage high heat loads per rack while at the same time implementing flexible and energetically favourable cooling.

As there is no need for a raised floor, savings can already be made on the actual building of the data centre.

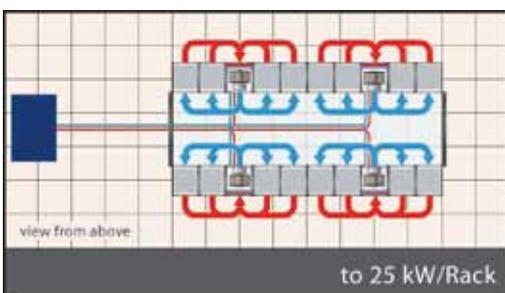
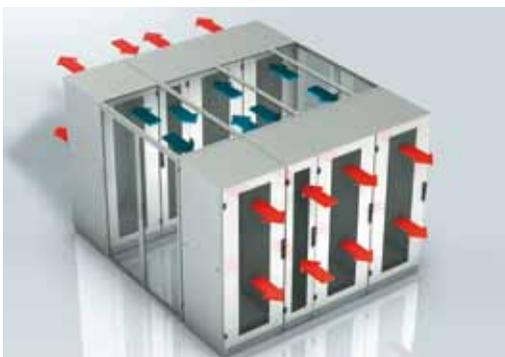
These solutions have also proven to be very effective in ongoing

data centre operations, as the system-related pressure loss in a raised floor solution can be far higher than when using side coolers.

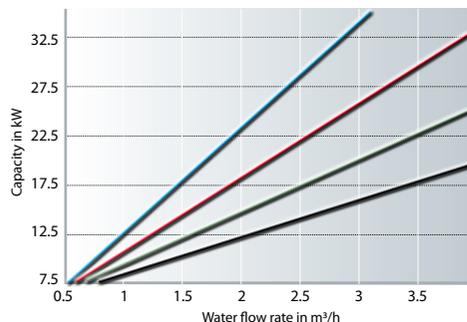
In addition, the small volume of air that needs cooling in the cold aisle of the closed enclosure system has proved to be an economical advantage. The temperature of these small air volumes can be quickly adjusted to the effective needs of the data centre and the specific needs of individual racks.



OLS side cooler



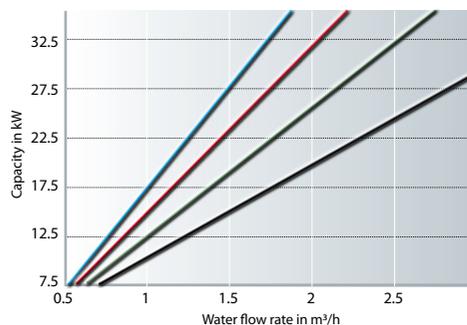
Loopus OLS effective cooling capacity*)



Server inlet temperature 20° C

Water outflow temperatures
Δt 5-10K

- 8° C
- 10° C
- 12° C
- 14° C



Server inlet temperature 24° C

Water outflow temperatures
Δt 5-10K

- 8° C
- 10° C
- 12° C
- 14° C

*) Graph data are proximity data. For calculating cooling requirement, precise data are needed.

Enclosures with row-based side coolers as a closed loop system with COLD SECTION

“Saving energy is simply a matter of ecological common sense.”

The completely closed, water-cooled server rack system with air-water heat exchangers enables a cold/warm closed loop system to be implemented in a minimum of space and so represents an energy-efficient solution for the management of high heat loads.

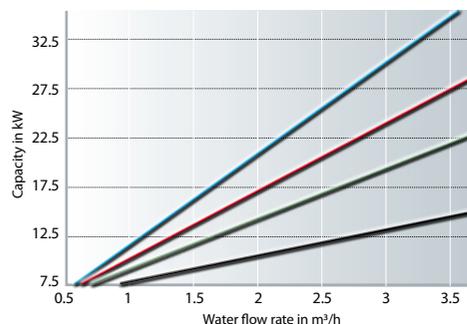


This enclosed closed loop system contains racks and side coolers which are closed at the rear and either open or fitted with passively vented doors at the front. Here, too, the side coolers suck in warm air directly from the back of the cabinets and cool it down using the integrated air/water heat exchanger. It is then expelled into the cold aisle.

CLS side cooler (with side vents)



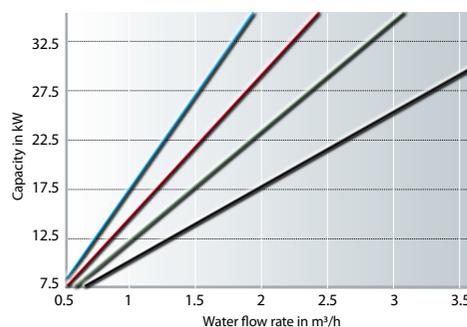
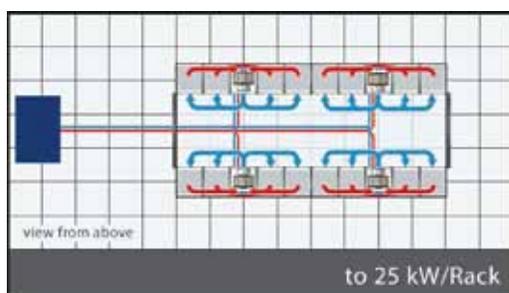
Loopus CLS effective cooling capacity: *)



Server inlet temperature 20° C

Water outflow temperatures
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- 8° C
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Server inlet temperature 24° C

Water outflow temperatures
 Δt 5-10K

- 8° C
- 10° C
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*) Graph data are proximity data. For calculating cooling requirement, precise data are needed.

Water-cooled rack with heat exchanger below the server: UNIQL

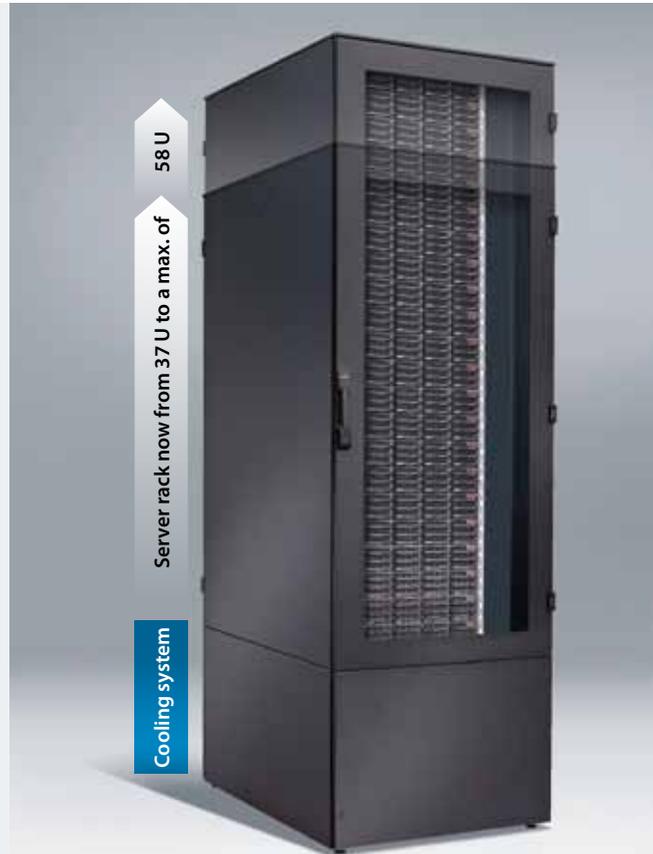
“The optimal platform for high-performance computers!”

UNIQL, the self-sufficient mini data centre was developed for high-performance computers and cluster solutions. Via a cooling unit integrated in a separate rack, a supply of cold air is permanently circulated to the front of the servers installed in the racks. Operating on the “Cooling on demand” principle, the precise level of effective cooling to meet the server’s thermal requirements is circulated to them, leading to considerable energy savings compared to static cooling systems.

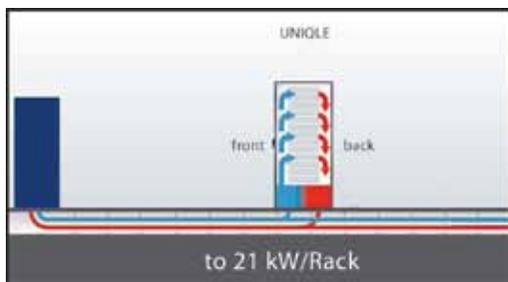
The warm air expelled at the rear of the servers by fans is sucked in by the cooling unit and re-cooled over the heat exchanger.

The thermal energy generated in this process is fed back to a precision air-conditioning unit over water or another coolant. Using 37 U to 58 U, the UNIQL system can be assembled on less than one square meter of space, depending on what is available. This is possible due to the separation of the air-water heat exchanger and the SCHÄFER server cabinets (available in heights of 1800 to 2000 mm) into two units.

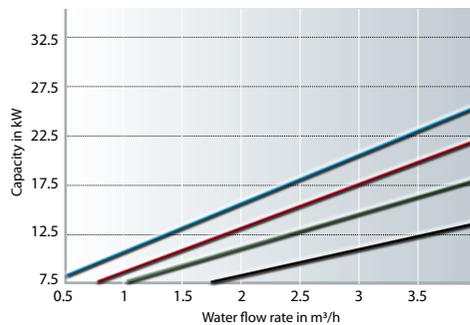
This way, UNIQL combines user-friendly scalability of data centre solutions with extreme energy efficiency.



UNIQL, the high-density air-conditioned cabinet solution, based on the Smart Profile family, is available as a single cabinet solution and in a modular two-cabinet version, both using the same cooling principle



UNIQL effective cooling capacity*)

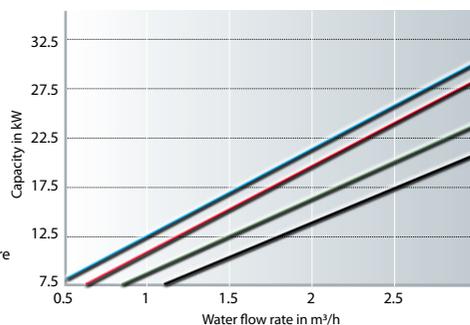
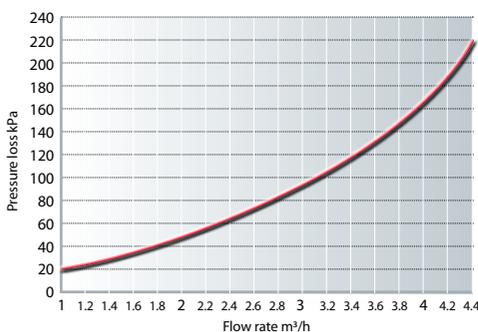


Server inlet temperature 20° C

Water outflow temperatures
Δt 5-10K

- 8° C
- 10° C
- 12° C
- 14° C

Pressure loss Δp Uniqle water kPa



Server inlet temperature 24° C

Water outflow temperatures
Δt 5-10K

- 8° C
- 10° C
- 12° C
- 14° C

*) Graph data are proximity data. For calculating cooling requirement, precise data are needed.

Water cooled server cabinet solutions with row-based side cooler: self-sufficient closed loop system

“The completely closed cycle.”

This highly efficient cooling concept has a slim side cooler mounted directly next to the rack – or between two server racks which are closed both at the front and rear.

Cooled air is fed into the closed server rack through the air vent slits in the rack's side panels. The warm air given off by the servers is sucked in on the rack's rear side by the side cooler.

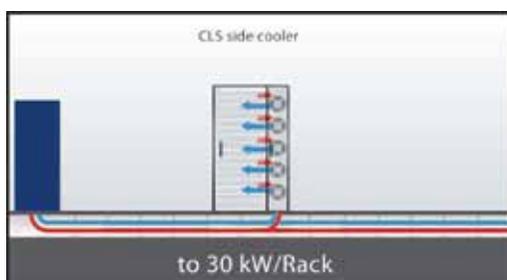
This circulating air is then cooled by a regulated cold-water heat exchanger and fed back into the rack over its entire height by 5 EC ventilators.

The Closed Loop System is a self-sufficient mini data centre. Its high heat load dissipation per rack of up to 30 kW enables it to fulfil all requirements of high availability and reliability necessary for high-performance computers, thus guaranteeing the highest levels of space and energy efficiency.

Closed Loop can of course be used in combination with classical cooling solutions.



CLS side cooler



Fire early recognition and extinguishing systems

Space-optimised fire protection for server cabinets

- Handy and space-saving 19" insert
- Integrated smoke extraction system
- 1 or 2 U
- Fire extinguishing agent: Novec 1230 and HFC 227ea

Our goal is customer satisfaction

“The optimum ratio between cooling performance and energy consumption can be found in the combination of solution possibilities!”

In many data centres, savings can be made very simply – especially regarding the required cooling energy, which often makes up as much as 50 % of energy costs.

Both for modernising existing or constructing new data centres, companies can choose from a range of air-conditioning technologies. Particularly in data centres which have long been in operation, hotspots can often be found that can lead to inefficient and error-prone processes.

Properly optimised cooling concepts can frequently lead to reductions in energy consumption of between 30 and 70 %!

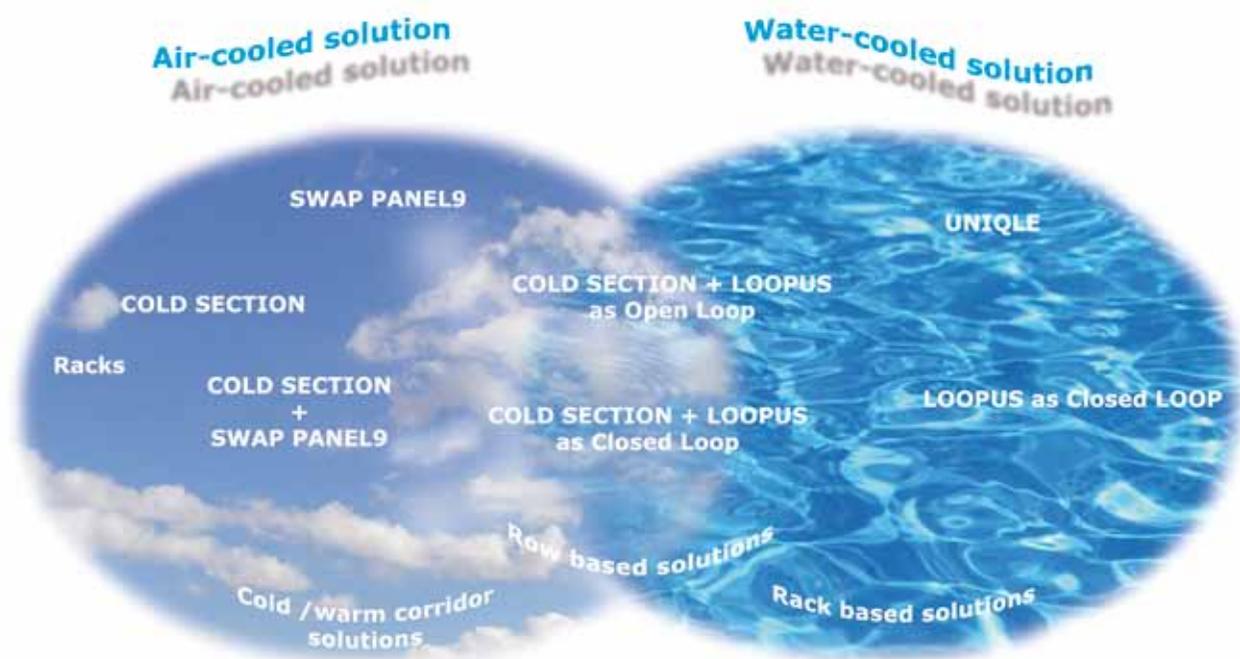
The relatively low investment costs combined with increased availability means amortisation will be achieved very quickly.

For **air-cooled** systems, for instance, this also involves the correct “face-to-face” alignment of existing cabinets.

By installing enclosures to form cold and warm aisles, covering open cabinet units and sealing the raised floor, the volume of air required for cooling can be adapted precisely to specific needs. Combined with a controlled temperature increase in the computer room, you can verifiably achieve considerable increases in efficiency.

Where these measures prove insufficient, **water-cooled** systems from the SCHÄFER portfolio like LOOPUS and UNIQLÉ are needed. Low in power consumption, they support the air-conditioning process. With this range of products, SCHÄFER is the competent company to contact on matters relating to “Green IT” and the “data centre of the future”.

For larger scale modernisation and conversions, SCHÄFER can, in addition to the already mentioned services, offer consulting in all relevant fields, such as data centre planning, free cooling, security and fire protection through their highly specialised partner enterprises. Their expertise ranges from analysis of a data centre operator’s specific requirements to the development of solutions tailored to individual needs.



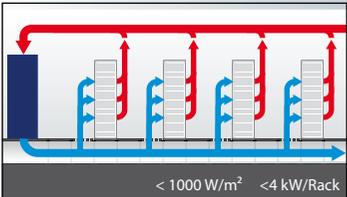
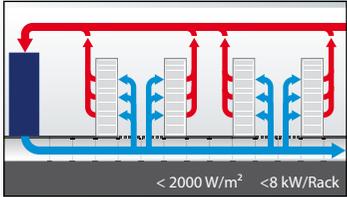
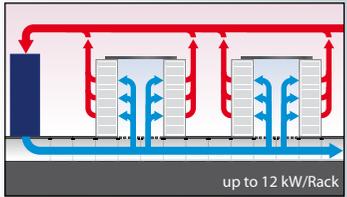
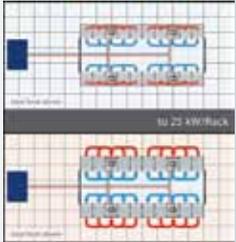
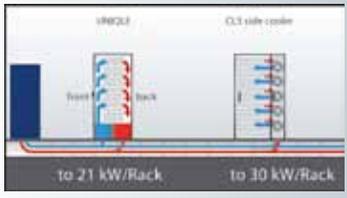
The right air-conditioning concept is based on the required effective cooling capacity per rack and the available spatial conditions



Planning guide: air-conditioning concepts for data centres

Any optimisation of data centres is based on a solid analysis of the actual state. For this, all relevant parameters regarding energy consumption and thermal loads are determined and evaluated. Only then can the appropriate measures for effectively optimising

and improving the consumption values be reliably selected. Considerable efficiency increases and noticeable reductions in operating costs can be achieved with relatively little cost and effort!

Operating principle	Diagram		
<p>Air-conditioning via the raised floor without specific arrangement of racks</p>	 <p>< 1000 W/m² < 4 kW/Rack</p>	<p>SP20 Rack: state-of-the-art cabinet solution for all currently available server components. SWAP PANEL 9: raised floor</p>	
<p>Air-conditioning via the raised floor with arrangement of racks in cold / warm aisles</p>	 <p>< 2000 W/m² < 8 kW/Rack</p>	<p>SP20 Rack: state-of-the-art cabinet solution for all currently available server components. SWAP PANEL 9: raised floor</p>	
<p>Air-conditioning via the raised floor and cold aisles enclosures</p>	 <p>up to 12 kW/Rack</p>	<p>COLD SECTION: Cold-aisle enclosure SWAP PANEL 9: raised floor</p>	
<p>Water-cooled air-conditioning Without raised floor and cold aisle enclosures</p>	 <p>to 23 kW/Rack</p>	<p>LOOPUS: Water-cooled solution in combination with COLD SECTION</p>	
<p>Air-conditioning with water-cooled racks (closed system)</p>	 <p>to 21 kW/Rack, to 30 kW/Rack</p>	<p>UNIQUE + LOOPUS: Air-conditioned cabinet with integrated rack management system and on-demand cooling unit</p>	



Remarks	Application (Low Density) < 4 kW/Rack		Application (Medium Density) 4-8 kW/Rack		Application (High Density) 8-12 kW/Rack		Application (High Density) > 12 kW/Rack	
	Application yes	Energy efficiency 	Application limited	Energy efficiency 	Application no	Energy efficiency	Application no	Energy efficiency
A solution for a heterogenic layout of data cabinets in data centres. Performance depends on height of elevated floor and air circulation planning. If possible, warm and cold aisle version is always the better solution. Power losses because only low Δt is possible.	Application yes	Energy efficiency 	Application limited	Energy efficiency 	Application no	Energy efficiency	Application no	Energy efficiency
A solution for a relatively homogenous data centre layout. Performance depends on height of elevated floor and air circulation planning. Optimisation possible by accurate sizing of server loads. Risk of hot spots if performance requirements approach borderline areas.	Application yes	Energy efficiency 	Application yes (extreme care and attention required)	Energy efficiency 	Application nein	Energy efficiency	Application no	Energy efficiency
Advantage over warm/cold aisle because the enclosure provides structural separation. Pay attention to pressure ratios in the cold aisle (could have a negative influence on the server). For several enclosures in one room, careful ventilation planning is required.	Application not needed	Energy efficiency 	Application yes	Energy efficiency 	Application yes	Energy efficiency 	Application limited	Energy efficiency
Advantages of cold aisle enclosure. No raised floor necessary. Shortest possible air paths. Redundancy guarantees high availability (n+x). Scalable.	Application not needed	Energy efficiency 	Application yes	Energy efficiency 	Application yes	Energy efficiency 	Application yes	Energy efficiency
Practically a mini computer centre in itself. High level of heat dissipation possible. It should be taken into account that special solution for detecting and extinguishing fires may be required. Can be used in combination with classical room air-conditioning.	Application not needed	Energy efficiency 	Application yes	Energy efficiency 	Application yes	Energy efficiency 	Application yes	Energy efficiency

Professional and intelligent

Service

You can rely totally on SCHÄFER service quality. Regardless of whether you have a question about one of our products or need advice on a specific project, we can provide competent advice quickly and without complications. With active project support and individual services like express delivery, unloading and carrying, disposal of packaging materials and on-site assembly, we and our specialised partners will provide you with all the assistance you need.



Logistics

From our Express range, we can supply complete customer solutions including the most important accessories straight from stock at short notice.



Customised Branding

You can have your company logo put on all assemblies we supply. This is the simplest, quickest and most economical solution for labelling your products.



Certification

All production plants are certified according to DIN EN ISO 9001:2008 and thus have a professional quality management system in all production processes. Technical testing, measuring and inspection procedures within this system guarantee faultless performance for our customers. The auditing of all quality inspection and production processes by well-known international customers, as well as the customisation of testing processes and cycles is now part of our everyday business at SCHÄFER.

Transfer of inspection records and quality certificates is carried out electronically in most cases and our cooperation with independent inspection institutes guarantees the objective evaluation of production processes.



Consulting

We will show you where you have hidden potential for measurable energy savings and how you can improve your data centre's overall energy efficiency. A fundamental evaluation of your data centre infrastructure will provide us with a holistic view, enabling us to take into account all factors influencing the complex data centre system as a whole.

Partnership Management

SCHÄFER analyses, designs and implements the configuration of your data centre to meet individually specified customer requirements. To do so, SCHÄFER brings in highly specialised, qualified partners to guarantee that the data centre design really does meet the requirements defined by the customer to 100%. Customers receive this highly specialised service from a single source. In addition, service and maintenance specialists are available permanently worldwide with their own service concepts.

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More information?



SCHÄFER IT Systems, innovative manufacturer of made-to-measure network and cabinet solutions for both conventional and complex applications, is part of the internationally successful company SCHÄFER WERKE.

The owner-led group of companies has its headquarters in Neunkirchen in Germany's Siegerland region. The work of all the SCHÄFER WERKE divisions – SCHÄFER IT Systems, SCHÄFER Industrial Solutions, SCHÄFER Interior Systems, SCHÄFER Container Systems, SCHÄFER Perforated Metal, EMW Steel Service Center – is based on high-quality fine steel sheet. The processing of this material is one of the core competencies of this enterprise.

Our production locations



Plant Neunkirchen



Plant Betzdorf



Plant Ledec nad Sázavou (CZ)