

Optimising CDU cooling in data centers with S-Flow ultrasonic flow measurement

Data centers

Mots clés

- Coolant distribution unit (CDU)
- Data center liquid cooling
- CDU flow measurement
- Energy efficiency
- Cooling system supervision



The rise of artificial intelligence, cloud computing, and high-performance computing (HPC) is driving a rapid increase in thermal density in data centers. IT racks, also known as computer racks, can now reach several dozen kilowatts, making air cooling insufficient.

In this context, liquid cooling is an essential solution.

The architectures are based on hydraulic loops that efficiently extract heat as close as possible to critical components.

Cooling Distribution Units (CDUs) play a central role in this architecture. They ensure the distribution, regulation and control of the fluid to the racks, guaranteeing performance and continuity of service. Flow stability directly determines the overall performance of the system.



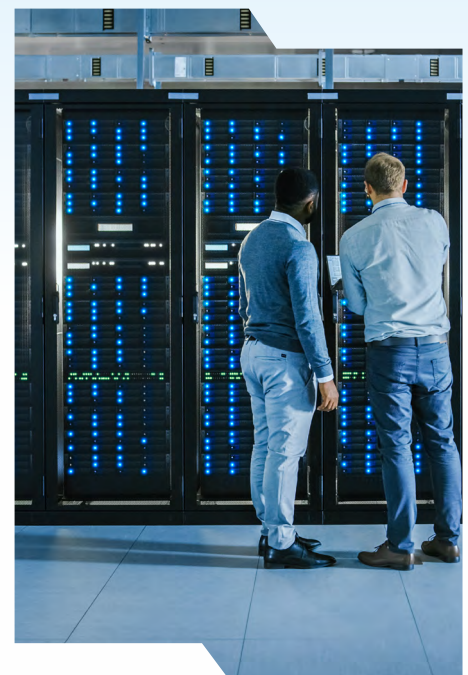
The challenges faced by CDU manufacturers

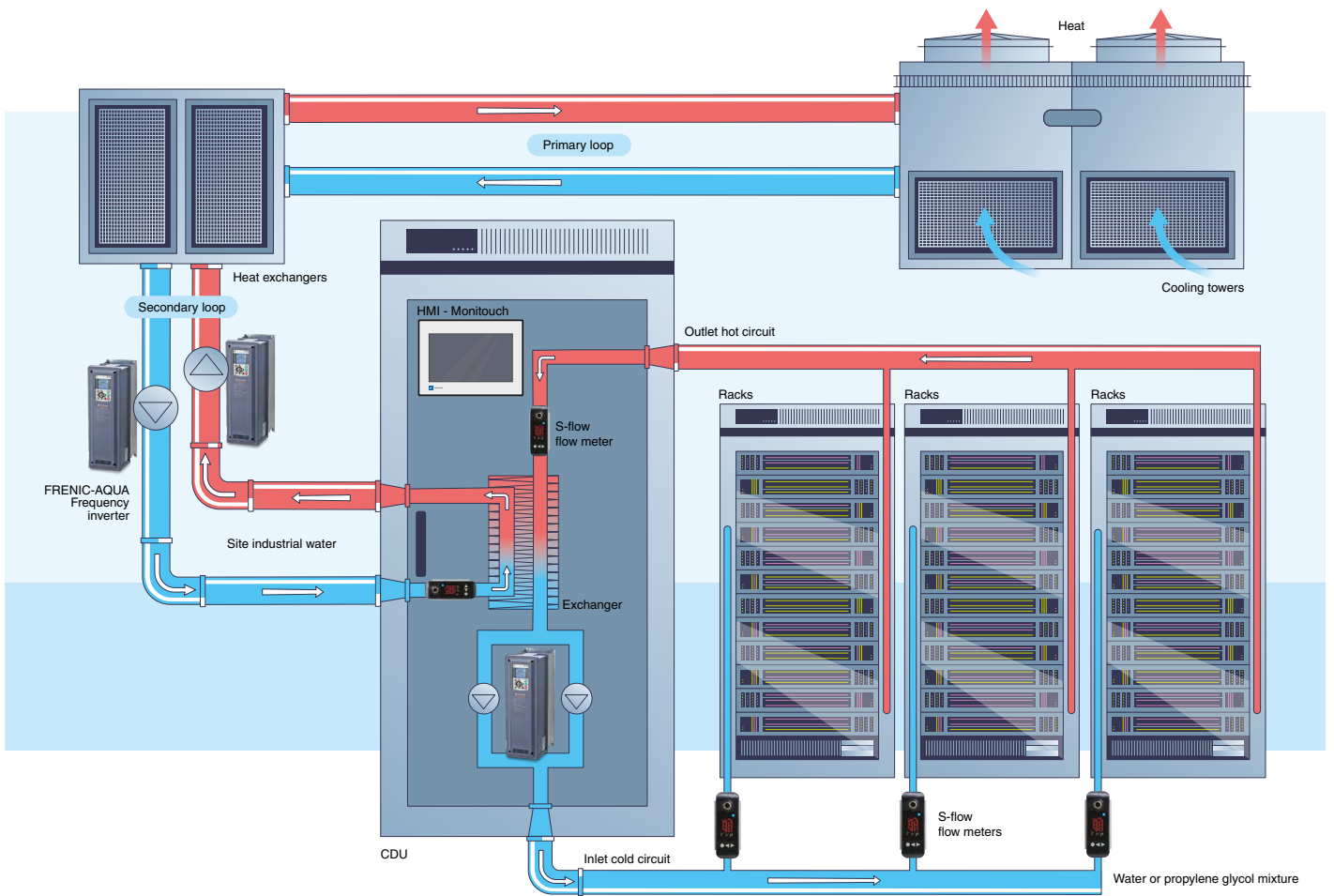
Today's CDU manufacturers must meet increasingly stringent technical requirements, in a context where architectures are becoming both more compact and more demanding in terms of performance.

The integration constraints are particularly pronounced. The available spaces, especially in in-row configurations, where cooling equipment is integrated directly between IT racks in rows, are reduced, while the straight lengths required for some equipment remain limited. This means that systems must fit into increasingly dense environments without compromising efficiency.

In addition, there are critical hydraulic constraints. It is essential to preserve flow while avoiding any additional pressure drop, which severely limits the choice of integrable technologies. In addition, CDUs must be able to handle different types of fluids, such as water, glycol mixtures, or other specific fluids depending on the use case.

Operationally, the stakes are just as high. Today, the diversity of projects, their environments and their installations requires almost systematic adaptation. Throughput imbalances between racks, over- or under-flow situations, and lack of visibility into cooling loops can directly impact the thermal performance and stability of facilities.





In this context, the lack of reliable measurement makes it very difficult to operate the systems. It becomes difficult to balance circuits, anticipate drifts or optimise overall energy efficiency. In practice, this lack of visibility can lead to localised overheating or energy overconsumption.

In summary: CDU manufacturers must reconcile thermal performance, hydraulic balance, compactness and ease of integration, while meeting increasing requirements for supervision and reliability.

In this context, flow control becomes a central issue to guarantee the efficiency, availability and differentiation of the solutions offered.



The Fuji Electric Solution

Fuji Electric's ultrasonic flow meter S-flow – FSZ is a particularly suitable answer to the constraints of liquid cooling systems, especially in compact CDU architectures.



Based on transit time ultrasonic measurement technology, it provides accurate and reliable flow measurement, with a low margin of error ($\pm 2\%$), no contact with the fluid and no pressure drop, this flow meter introduces no risk of leakage into the system, thus preserving the hydraulic performance of the system.

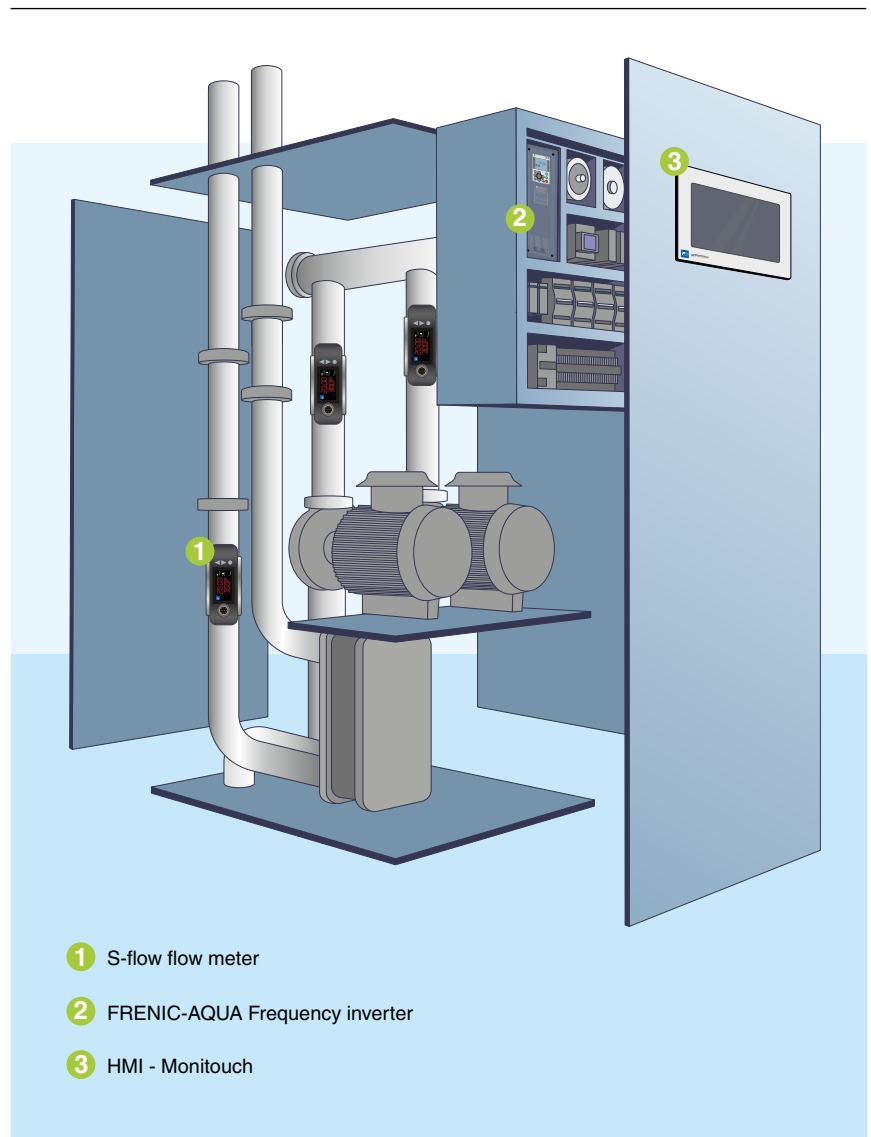
Beyond the flow measurement alone, the ultrasonic flow meter S-flow also integrates temperature measurement, making it possible to enrich the analysis of the thermal operation of circuits and to provide a better understanding of energy exchanges. Its ability to measure at low flow rates, or even from near-zero flow conditions, allows for better detection of transient phases and anomalies. It adapts to different types of fluids, including antifreeze mixtures such as LC25, thanks to advanced settings (kinematic viscosity, speed of sound), ensuring high measurement accuracy, even under complex conditions.

Designed to fit easily into constrained environments, the flow meter is distinguished by its compact size and its ability to adapt to different configurations, particularly in terms of pipe diameters.

Its non-intrusive technology, with no moving parts, eliminates any risk of instrumentation-related leakage, significantly reduces maintenance requirements and contributes to a long sensor life, even in continuous operation. It also allows use on pressurised or high-pressure networks, without impacting the integrity of the installations.

Designed for OEM applications, the S-flow ultrasonic flow meter is naturally integrated into the supervision architectures of the CDUs, allowing real-time data to be sent back to the control systems (BMS / SCADA). This integration facilitates the exploitation of data, the management of installations and the optimisation of the overall performance of the system.

Compared to traditional measurement technologies, the ultrasonic solution has several decisive advantages: simplified installation without modifying the existing network, no intrusion into the pipe, better resistance to varied operating conditions and optimised overall cost. These features make it particularly suitable for mission-critical data center environments, where reliability, accuracy, and cost control are critical.



Your benefits

- + **Secure**
Rack cooling with accurate and continuous flow measurement.
- + **Optimize**
Energy efficiency with perfect control of thermal regulation.
- + **Improving**
The availability of facilities through early detection of drifts.
- + **Reduce**
Maintenance costs with technology without moving parts.
- + **Improve**
Integration into monitoring architectures (BMS / SCADA).



The S-flow ultrasonic flow meter: A suitable answer to CDUs

- **Precise flow measurement without pressure drop**
Ultrasonic transit time technology, without obstacles in the pipe.
- **Suitable for compact CDUs**
Compatible with high-density liquid cooling architectures.
- **Simple installation in constrained environments**
Compact one-piece format, direct integration.
- **Increased reliability and availability**
Technology with no moving parts, insensitive to mechanical wear.



FSZ - S-flow



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