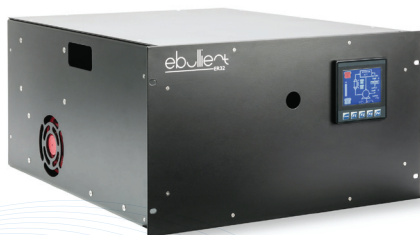


**DESIGN NEEDS:**

- Non-spill, quick disconnect couplings that allow servers to be connected to and disconnected from cooling manifolds without shutting down the entire cooling system or affecting neighboring servers.
- Robust, simple, secure, compact and lightweight.
- Economical and practical for a range of users from large data centers to small businesses.
- Customize solution for compatibility with existing components
- Proven performance over time.

SOLUTION:

NS4 Series couplings feature non-spill valves in a compact size at an excellent price. These innovative couplings are durable, lightweight, chemically-resistant and easy to use. The design effectively eliminates spills, minimizes downtime and enhances operator safety.



Ebullient's DirectJet™ 32 Fluid Distribution Unit will cool up to 32 servers.

Non-spill connectors create liquid cooling confidence for IT operations of all sizes



ebullient
precision **COOLING SYSTEMS**

“Data center hydrophobia” — the fear of mixing expensive electronics, high-voltage power and liquids. Ebullient, Inc. has found the antidote to liquid cooling jitters in CPC’s non-spill, quick disconnect couplings.

Ebullient’s corporate motto is “Cool with Confidence™”— and CPC connectors help Ebullient do just that for their precision liquid cooling systems for electronic hardware.

Recent surveys of IT and data center leaders indicate only a small percent of data centers currently use liquid cooling. The tide is changing, though, as the massive data management needs of cloud computing, Big Data, and multi-center scientific research take liquid cooling further into the mainstream. Exascale machines tackling enormous data sets generate significant heat, too, contributing to the growing interest in liquid cooling. At the same time, an increasing number of small companies also want the ease and efficiency of direct liquid cooling systems.

“We’ve put a lot of time and attention into designing cooling systems that are easy to operate,” said Rob Morell, Director of Product Development at Ebullient. “CPC’s non-spill, quick disconnect couplings allow servers to be connected to or disconnected from our cooling system without shutting it down or affecting neighboring servers. Our customers want the hot-swappable capability and leak-free performance to simplify their hardware maintenance.”





Color-coded NS4 couplings in Ebullient manifold on a standard server rack.

Ebullient DirectJet™ cooling modules replace air-cooled heat sinks and sit atop the processors within the server. Quick disconnect couplings attach the module's flexible tubing to manifolds mounted on the server rack. A pump directs fluid through the system, which draws heat from the CPU or GPU as it circulates back out. The modular, scalable system delivers quiet, reliable, consistent cooling and enables rapid installation in any server, regardless of make or model.

The company's systems can cool up to 480 servers for enterprise customers. Ebullient also helps small and medium-sized businesses that need onsite servers for their critical business functions, but lack purpose-built rooms to adequately house—and cool—their servers. Simple, effective, install-it-and-leave-it cooling systems streamline equipment servicing for both large and small IT teams.

The right solution for lasting performance

"Ebullient had a long list of criteria for connectors that centered on ease of use, durability, and of course, little or no fluid spillage," said David Vranish, CPC liquid cooling applications engineer. While easy connection and disconnection and leak-free performance topped the list of needs, Ebullient wanted compact, lightweight and economical couplings that were tough enough to withstand installation and servicing, and readily available as their business expands.

Before contacting CPC, Ebullient evaluated dry break quick disconnect products intended for other industries but deemed them too expensive, too large and difficult to integrate into their system. They also explored using metal double-shutoff ball valve couplings, but found them difficult to operate, costly and lacking non-spill performance.

"CPC offered an extremely durable plastic coupler, more than robust enough for our application," said Morell. "The CPC NS4 Series connectors provide excellent dimensional stability, a compact size, and none of the downsides of metal including metal-on-metal wear or other issues that can ultimately lead to leaks or failure," said Morell.

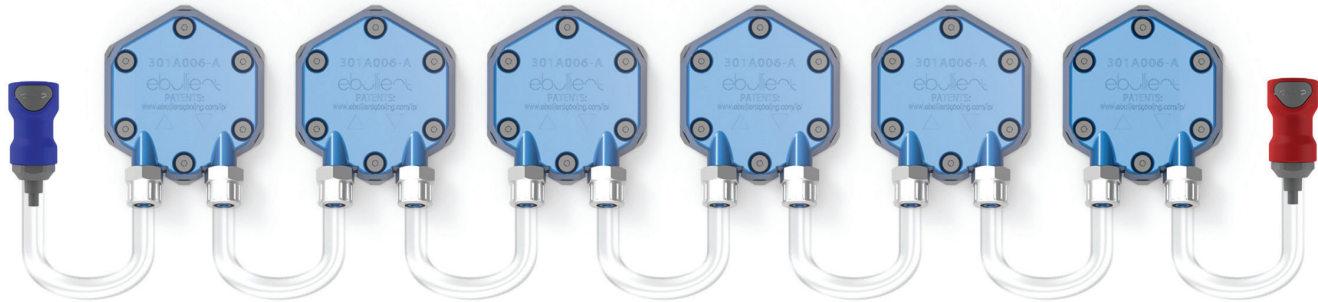
"CPC is the only domestic supplier of high-quality, non-spill plastic connectors," said Vranish. "Certainly, not all plastics perform equally. CPC products, however, offer strength and durability that far surpass most customers' needs for connection cycles and longevity in the field. They're built to last—and they do." Proof is in the performance and customer acceptance. For more than a decade, customers have deployed NS Series couplings, with sales and volume experiencing double-digit annual growth.

Service, expertise deliver a custom product

To speed product development and qualification along, CPC modified its proven NS4 non-spill coupling with a custom thread to fit Ebullient's existing manifold. CPC also worked with Ebullient engineers to provide the correct seal and lubrication combination for their media and application requirements. Customization allowed the coupling to quickly and efficiently integrate into the cooling system. Ebullient's manifolds are now supplied with the male component of CPC's coupling ready to accept the female mating piece attached to the tubing.

"CPC's engineering expertise enabled Ebullient to implement the desired threaded connector in a timely, cost-effective way," said Vranish. "The modification was simple for us to deliver while absolutely critical to the success of the cooling loop."

During installation in the server, inflow and outflow tubing is inserted into the cooling module and tightened with a ferruleless polytube fitting (PTF) nut for a secure fit. At the manifold, users simply depress the ergonomic thumb-latch on the female side of the connector to attach the tubing to the male component on the manifold, which opens the valves on each side of the coupling and immediately initiates leak-free fluid flow.



CPC's NS4 couplings used in Ebullient's DirectJet™ Module Loops.

The couplings used in the Ebullient system often remain connected for long periods of time. If disconnection is required, however, valves within each side of the NS4 coupling close upon disconnection avoiding spills.

“We know customers are particularly concerned with the electrical and corrosive vulnerabilities in-server water poses. Galvanic corrosion, rusting and oxidation can pose problems when metal parts are used in water-based cooling systems. In contrast, our system uses a dielectric heat transfer fluid, not water. Regardless, leaks and spills are not acceptable. Avoiding them is the price of entry in the liquid cooling field,” said Morell.

The durable glass-filled polypropylene body of the NS4 connector features user-friendly soft-touch overmolding, compatible with a variety of chemicals including Ebullient's engineered cooling solution.

The NS4 connector also meets flow requirements with minimal pressure loss—must-haves for optimal coolant flow.

Leak-free from start to finish

A comprehensive, whole-solution approach—not just supplying connectors from a catalogue—led to optimizing the Ebullient direct liquid cooling system. The custom connector thread enabled secure attachment to the existing Ebullient hardware. CPC product performance standards reduced costs associated with rework and quality control testing. Close collaboration between CPC and Ebullient on the manufacturing process

ensured the systems shipped with leak-free connections.

“From prototype to final product, CPC has delivered excellent performance, flow characteristics and esthetics,” said Morell. “CPC's robust quality assurance process enabled us to feel absolutely confident in incorporating these couplings. These connectors are critical to our product and its basic functionality, and therefore its success in the marketplace.”

The High-Performance Plastics Advantage for Liquid Cooling Systems

For more than 40 years, innovative coupling and connection technologies from CPC have enabled quick, safe and easy connection and disconnection of flexible tubing used in a wide array of applications. The company's first connectors were metal, but as materials evolved, CPC added robust advanced thermoplastic designs creating the industry's broadest portfolio of connection solutions.

High-performance thermoplastics are incorporated into critical, demanding applications including cutting-edge vehicles, military avionics and life support systems. Durable reliable thermoplastics are also an excellent material of choice for connectors used in direct liquid cooling. Lightweight, cost-effective, non-corroding and non-spill plastic quick disconnects allow fast, simple service while protecting essential and expensive computing equipment.



Key Considerations: High-Performance Thermoplastic vs. All-Metal Quick Disconnects

PERFORMANCE FACTOR	CPC NS SERIES	STANDARD METAL QUICK DISCONNECTS
Fluid loss	Non-spill, dripless; disconnect under pressure with no spills	Susceptible to fluid loss due to mechanical wear of metal parts and/or degradation due to corrosion
Corrosion risk	No corrosion risk for all-plastic components and little risk for metal/poly combos	All metals—copper, brass and even stainless steel—are susceptible to oxidation or corrosion over time
Ease of use	Simple, lightweight, compact, contoured thumb latch for convenient one-handed connection	Complicated, bulky, heavy; ball-and-sleeve connectors require two-handed connection
Heat transfer	Thermal insulators	Thermally conductive
Valve cycling	Plastic or metal/poly valves experience lower friction than all-metal valves; compatible with many chemicals	After repeated use, metal valves can wear away the protective coating within metal housing, exposing raw metal to coolant and leading to corrosion
Durability	Stable, durable, high-performance thermoplastics; withstand heat and humidity without losing structural integrity	Appropriate for extreme rough-use conditions (construction, mining), but typically not required to achieve desired technical performance in liquid cooling
Reliability	Product tested to 10,000 cycles—far beyond the small number of connect and disconnect cycles in actual use	Claims of up to 5,000 connection cycles
Value	Delivers durability and performance at a lower cost than metals	Expensive and unnecessary when the same specifications can be met with a high-performance thermoplastics

**ABOUT CPC**

CPC is the leading provider of quick disconnect couplings, fittings and connectors for life sciences, specialty industrial and chemical handling markets. Used in a broad range of applications, innovative coupling and connection technologies from CPC allow flexible tubing to be quickly and safely connected and disconnected.

Smart fluid handling to take you forward, faster.

