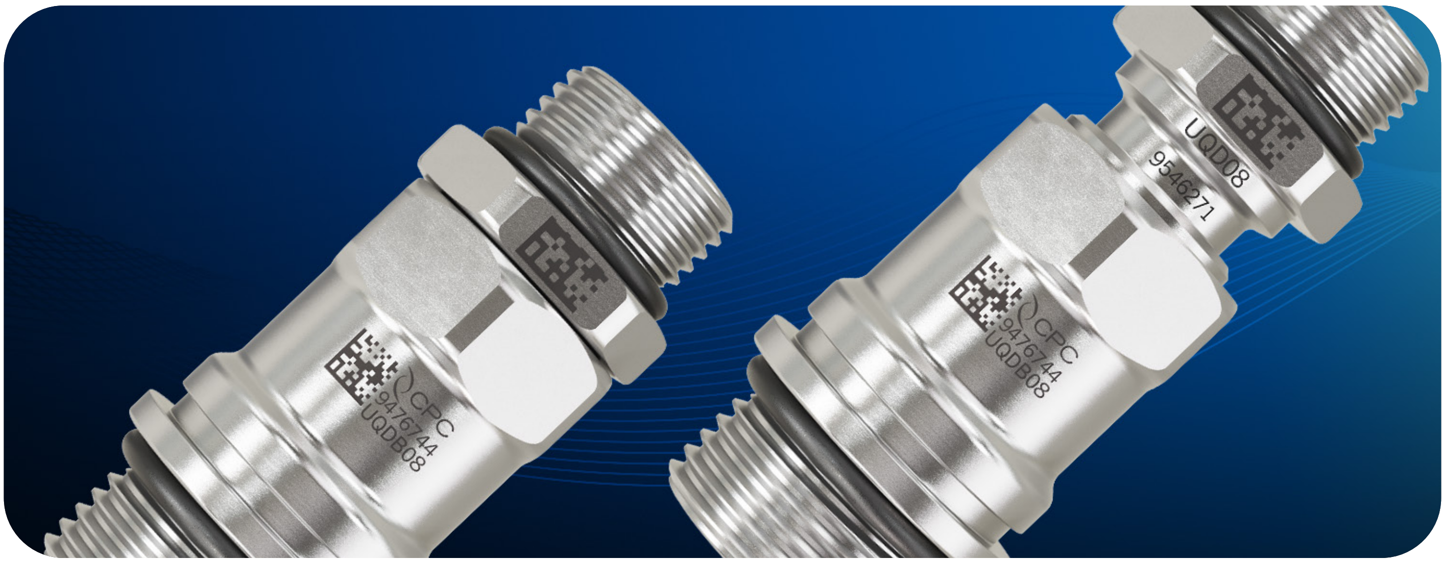
UQD v1 to UQD v2 OCP Specification Comparison



By
CPC Thermal Technology Team

As AI infrastructure continues to scale, thermal management requirements are evolving far beyond the capabilities of traditional air cooling. GPU-dense AI clusters now demand higher coolant flow rates, tighter thermal control, and infrastructure that can scale efficiently across multi-vendor deployments.

Universal Quick Disconnects (UQDs) have become a foundational component in modern liquid cooling architectures by enabling modular, serviceable, and interoperable coolant connections.

While UQD v1 established the basis for a broader liquid cooling ecosystem, UQD v2 introduces major improvements focused on flow optimization, mechanical standardization, and deployment flexibility for next-generation AI systems.

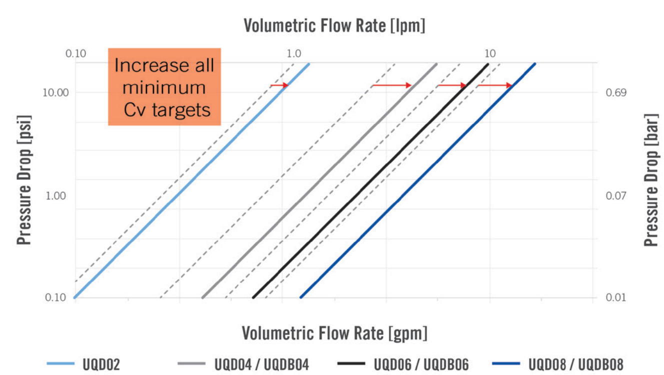
For AI infrastructure engineers, thermal engineers, and system designers, these updates represent measurable gains in cooling efficiency and operational scalability.

UQD V2 DELIVERS PRESSURE DROP REDUCTION

One of the most important technical improvements in UQD v2 is the reduction in pressure drop across multiple nominal connector sizes.

Compared to UQD v1, UQD v2 achieves the following reductions in pressure drop at rated flow:

The specification also improves minimum Cv performance, enabling more efficient coolant flow under demanding AI thermal conditions.



NOMINAL SIZE		02	04	06	08
V2	Min Cv	0.30	1.20	2.20	3.60
	Δpsi @ Rated Flow	3.36	2.01	1.86	1.70
	Δpsi v. V1	-30.6%	-55.6%	-47.1%	-51.8%

These improvements provide several system-level benefits:

- Reduced pump power requirements
- Improved thermal efficiency
- Better coolant flow distribution
- Increased cooling headroom for high-power GPUs
- Improved scalability for dense AI racks

For hyperscale AI clusters and enterprise GPU deployments, these flow optimizations can directly improve rack-level thermal stability and operational efficiency.

CLOSING THE SPECIFICATION GAPS LEFT BY UQD V1

While UQD v1 enabled the growth of a multi-supplier ecosystem, several mechanical and interoperability parameters remained loosely defined. This created inconsistencies during deployment and integration across vendors.

UQD v2 introduces tighter standardization through fully defined geometry and installation guidance.

Key specification improvements include:

- Standardized plug lead-in geometry
- Defined control panel distance requirements with UQDB sockets
- Installation guidance
- Improved testing and supplier cross-validation requirements

These changes reduce deployment variability while simplifying system validation for OEMs and infrastructure teams operating across multiple vendors.

HYBRID CONFIGURATION SUPPORT EXPANDS DEPLOYMENT FLEXIBILITY

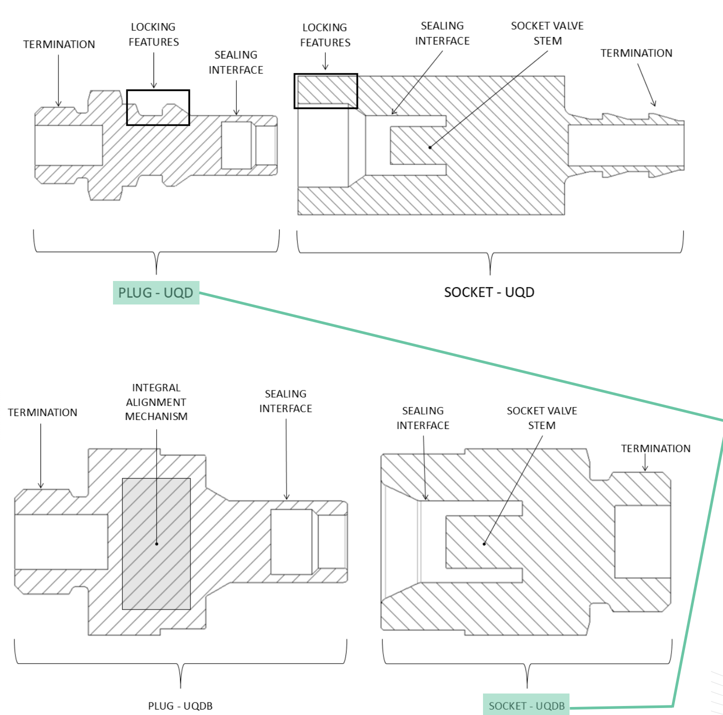
AI infrastructure deployments increasingly require flexible and modular cooling topologies. UQD v2 introduces support for hybrid configurations that allow infrastructure teams to adapt cooling strategies to varying rack densities and deployment models.

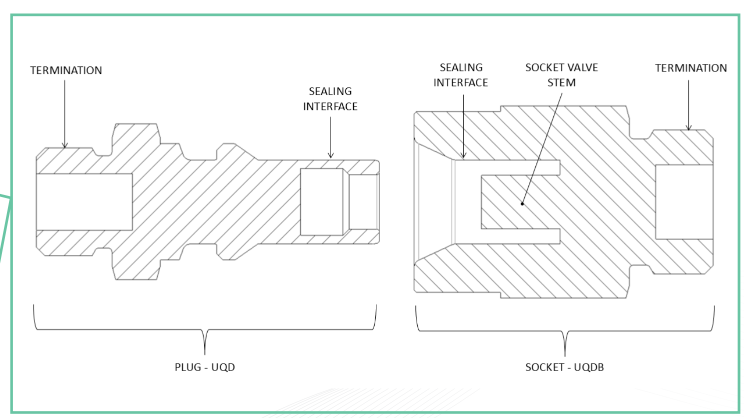
This flexibility is valuable in scenarios such as:

- Incremental AI cluster expansion
- Mixed workload environments
- Modular rack deployments
- High-serviceability infrastructure designs

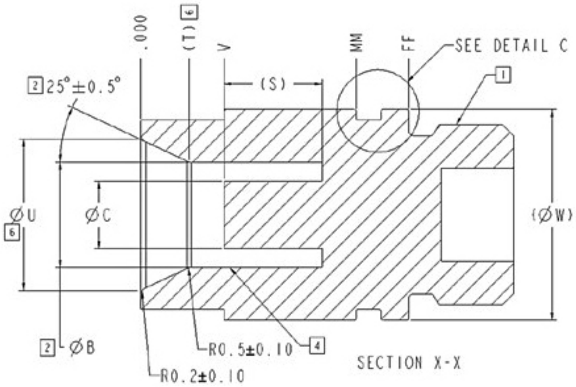
By improving interoperability while maintaining standardized geometry, UQD v2 enables more adaptable liquid cooling architectures without sacrificing compatibility or reliability.

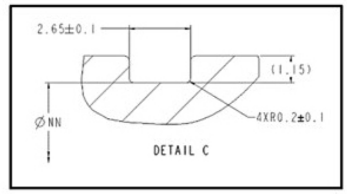
New in V2 | Hybrid Configuration

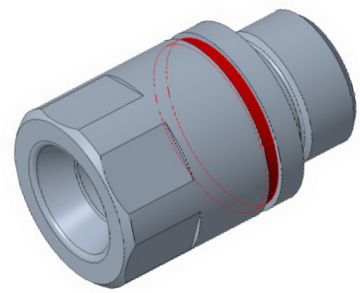




New in V2 I Accessory Groove







- Addition of ‘Detail C’ feature across all UQDB sockets (above)
- Can be used for mating accessories such as funnel extenders (right)

MECHANICAL IMPROVEMENTS ENHANCE RELIABILITY AND SERVICEABILITY

UQD v2 also introduces several practical mechanical refinements that improve installation consistency and maintenance efficiency.

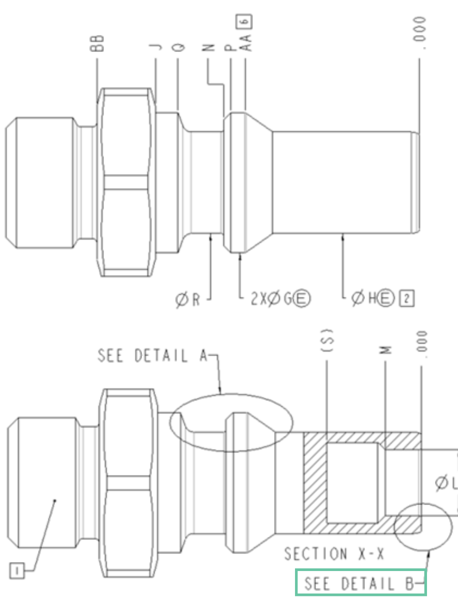
One of the notable additions is the standardized “Detail C” accessory groove across UQDB sockets. This feature supports accessories such as funnel extenders and other connection-assist components.

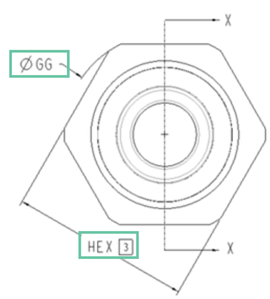
Additional improvements include:

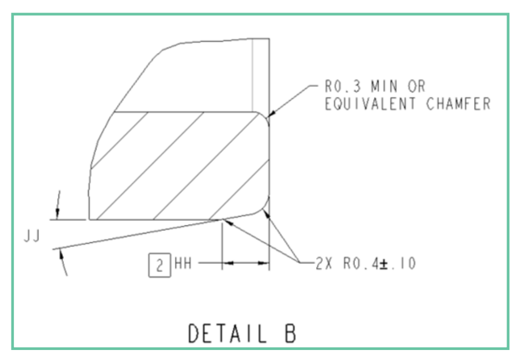
- Better mating alignment consistency
- Improved installation guidance
- Reduced field variability
- Enhanced serviceability in dense rack environments

These refinements help improve operational efficiency in large-scale AI deployments where maintenance accessibility and deployment speed are critical.

Mechanical I UQD Plug Enhancements







- Control panel distance when mated with UQDB socket (undefined in v1)
- Define keep-in-zone and installation guidance (undefined in v1)

DETAIL B – standardize plug lead-in geometry to facilitate reliable connections (undefined in v1)

INTEROPERABILITY AT SCALE FOR AI LIQUID COOLING

As liquid cooling adoption expands across enterprise and hyperscale AI environments, interoperability becomes increasingly important.

UQD v2 strengthens ecosystem consistency through:

- Fully defined geometry specifications
- Standardized testing methodologies
- Improved supplier cross-validation

For infrastructure teams deploying large liquid-cooled AI clusters, these updates reduce compatibility risks and simplify long-term infrastructure planning.

ADDITIONAL RESOURCES

Scan the QR code for additional Liquid Cooling resources:

PREPARING AI INFRASTRUCTURE FOR THE NEXT GENERATION

AI infrastructure is rapidly moving toward higher rack power densities and more advanced liquid cooling architectures. In this environment, connector performance and interoperability are no longer secondary considerations.

UQD v2 represents a major advancement in AI liquid cooling by delivering:

- Significantly lower pressure drop
- Improved coolant flow performance
- Better mechanical standardization
- Expanded hybrid deployment flexibility
- Enhanced interoperability across suppliers

For thermal engineers and AI infrastructure designers, these improvements enable more scalable, serviceable, and thermally efficient cooling architectures capable of supporting the next generation of GPU-intensive AI systems.

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