

APPLICATION SPOTLIGHT

SOLVING A CRITICAL CDU DESIGN CHALLENGE FOR A HIGH-DENSITY DATA CENTER DEPLOYMENT

When standard valves couldn't keep pace with next-generation cooling demands, US Valve engineered a solution built around the system, not the other way around.

THE CHALLENGE

A data center operator planning a new liquid cooling deployment needed a valve solution that could support the demands of high-density computing. The engineering team faced tight space constraints inside the CDU, aggressive flow requirements, low pressure drop targets, and long-term reliability expectations, all with little appetite for added maintenance or integration complexity.

Every CDU manufacturer has unique layouts, connections, and performance targets. Like many CDU designers, they found that standard catalog valves forced trade-offs their application couldn't afford.

Most off-the-shelf available valves met only part of the six requirements below, forcing trade-offs.

ALL SIX REQUIREMENTS. NO TRADE-OFFS.

- ✓ **FLOW PERFORMANCE:**
  Up to 6x higher flow coefficients than poppet-style valves*
- ✓ **INSTALLATION FOOTPRINT:**
  Integrated isolation and backflow prevention in a fraction of the footprint
- ✓ **INTEGRATION:**
  Laser-welded integration with existing piping and layouts
- ✓ **PRESSURE DROP:**
  Lower pressure drop under all conditions*
- ✓ **MINIMIZE LEAK PATHS:**
  Zero external leak paths: no external hinge pins or covers*
- ✓ **SERVICEABILITY:**
  Internally retained design minimizes maintenance

Modifying the CDU around one of these standard valves was not viable and would add engineering complexity and risk to the overall system design. Like many project teams for specialized industries, they needed a valve engineered specifically for the application, not an application engineered around the valve.

Faced with these challenges, the project team turned to US Valve. Drawing on more than 70 years of custom in-house valve engineering experience, US Valve worked closely with the project team to design a purpose-built solution that met all CDU performance requirements without trade-offs and integrated seamlessly into the overall cooling system.

THE US VALVE APPROACH

01 Custom designs, connections, and piping solutions

02 Rapid prototyping and manufacturing capacity to meet your demand

03 Design support with CFD analysis for space-constrained systems

04 IDEX portfolio integration for complete CDU solutions



THE SOLUTION

Built on US Valve's patented IRX® (Internally Retained Elastomer Hinge) technology, the engineering team built a configuration optimized for high-flow performance, low pressure drop, reliable backflow prevention, and a compact installation footprint.

WHY IT WORKED:

- ✓ **CUSTOM FIT:** Application-specific face-to-face dimensions and connection configurations with no forced redesign around a catalog part.
- ✓ **LEAK-FREE RELIABILITY:** Patented internally retained architecture eliminates external hinge pins, covers, and associated leak paths, improving long-term reliability and minimizing maintenance concerns.
- ✓ **ENHANCED HYDRAULIC PERFORMANCE:** Exceeded performance requirements giving up to 6x higher flow coefficients than traditional poppet-style check valves, with lower pressure losses and improved system efficiency.
- ✓ **INTEGRATION FLEXIBILITY:** Laser-welding capability enabled seamless integration with existing piping assemblies and system layouts.

IRX-B COMBINATION BALL AND CHECK VALVE

U.S. PATENT PENDING 63/916,729

Patented, footprint-saving combo valve that delivers isolation and check valve performance in a single, high-flow body.



KEY BENEFITS:

- ✓ 51%+ reduction in valve footprint by combining two valves into one*
- ✓ Prevents backflow during operation and isolates for maintenance
- ✓ Same maximum flow and low pressure drop as a standalone IR check
- ✓ Simplifies CDU design and reduces potential leak paths
- ✓ Custom end connections and piping configurations for tight spaces

IRX INTERNALLY RETAINED CHECK VALVE

U.S. PATENT 12,422,051 B2

Leakproof, IR (internally retained) check valve engineered to maximize CDU efficiency.



KEY BENEFITS:

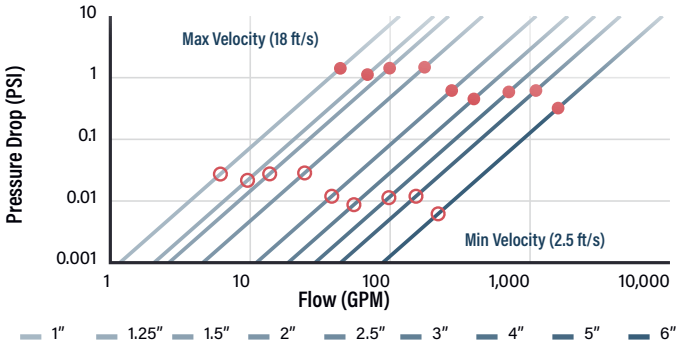
- ✓ Industry's lowest pressure drop for maximum flow
- ✓ Patented, internally retained design eliminates leak paths
- ✓ Protects against backflow and pressure spikes in CDU systems
- ✓ Custom end connections engineered for your cooling layout

BUILT TO OUTPERFORM POPPET STYLE

NOMINAL SIZE	USV IRX-B / IRX FLOW COEFFICIENT	POPPET-STYLE FLOW COEFFICIENT	USV IRX-B / IRX FLOW ADVANTAGE*
1"	37	18	2x
1.25"	65	29	2x
1.5"	83	44	2x
2"	145	55	3x
2.5"	350	80	4x
3"	590	145	4x
4"	920	164	6x
5"	1400	360	4x
6"	2800	458	6x

*USV IRX has lower pressure drop under all conditions.

IRX-B / IRX PRESSURE DROP PERFORMANCE BY VALVE SIZE



RESULTS FROM THE CDU:

IMPROVED CDU PERFORMANCE: reduced flow restrictions and minimized pressure losses supported more efficient coolant distribution and higher-density rack deployments.

SPACE OPTIMIZATION: delivered integrated isolation with high-flow, low-pressure-drop backflow prevention in a fraction of the footprint.

REDUCED DESIGN COMPLEXITY: eliminated the need for additional adapters, layout modifications, and secondary engineering iterations.

LONG-TERM RELIABILITY: peace of mind backed by ISO 9001-certified quality processes and US-based engineering and assembly.

UP TO **6x**
HIGHER FLOW COEFFICIENTS*

Zero
EXTERNAL LEAK PATHS*

51%+
FOOTPRINT REDUCTION*

17%
IMPROVED COOLING EFFICIENCY*

THE DIFFERENCE WAS US VALVE:

Most valve suppliers offer products from a catalog. US Valve starts with the application and engineers solutions built for system requirements, not the limitations of an off-the-shelf part.

EXPERIENCING A SIMILAR CHALLENGE?

When standard valve offerings don't meet your system requirements, US Valve delivers custom-engineered solutions designed around your application. Contact our engineering team today for a complimentary application review.

CONTACT US

usvalve.com/contact-us

Scan to start an application review

TRUSTED BY TODAY'S MOST CRITICAL INDUSTRIES

1M+ Valves Delivered **17%** Cooling Gains* **6X** Higher Flow*
51%+ Space Savings* (IRX-B) ✓ Custom Lengths and Connections

VERIFIED AND TESTED

ISO 9001 Certified · Patented Tech · US Engineered and Assembled
70+ Years of Experience · Manufactured and Tested in Linthicum, MD

*All data based on theoretical conditions. IRX® is a registered trademark of US Valve.