

## Article

# Why Danfoss' OCP Open Rack V3 Blind Mate Quick connector (OCP ORV3 BMQC) is the right solution for your data center liquid cooling system?

In this article, Amit Shende of Danfoss Power Solutions, explores the challenges associated with the application of thermal management in specific systems, such as data centers, and demonstrates the relevance of the Danfoss OCP ORV3 BMQC solution.

## Introduction

In many industries, thermal management is a crucial issue when it comes to cooling systems. We have seen increasing innovation in the field of system cooling, to find even more practical, economical and sustainable solutions for end-users.

In the data center industry, the energy and heat generated by computer systems are such that liquid cooling solutions are now becoming the preferred choice.

With the amount of data and information being exchanged increasing exponentially, IT equipment must keep up with the trend and needs ever more innovative and efficient cooling systems.

Liquid cooling is the best solution here, offering greater efficiency than air cooling, a significantly reduced carbon footprint, and an improved heat transfer.

Danfoss is committed to delivering cooling system components specially designed for this application.



Let's take a look at how our brand-new Danfoss BMQC meets the needs of end-users, based on the various constraints of this application area.

## The blind spot

In certain data center rack configurations, such as the Open Rack V3 designed by OCP (Open Compute Project), the place where the connection is made is inaccessible or invisible. With this type of configuration, the cooling circuit passes at the rear of the rack to cool the servers down directly from the manifolds. This means that the operator has no access and cannot see where the connection is made.

This presents a major challenge for the operator, as the connection must be made and secured to ensure that the circuit functions correctly.

Danfoss (along with other experts in the data center industry) has helped to publish technical product specifications to design a blind mate quick connector.

The Danfoss BMQC aligns itself to make the connection.



This push-to-connect connector offers 5 mm of pure radial offset between the socket axis and the plug cup axis; and 2.7° of angular offset with ORV3 tubing layout per BMQC specifications. This wide alignment tolerance allows the female cone to align with the male part to facilitate and guarantee the blind connection.

Danfoss holds a patent for its unique centring mechanism.

These various advantages show the relevance of the Danfoss BMQC in this type of specific application.

## The reliability

In liquid cooling applications, components must be designed with reliable materials and be highly compatible with the fluids being transferred.

As well as compatibility, corrosion resistance is important in these applications. Poor resistance can lead to damage to fast-moving products and, therefore, increase maintenance costs and effort.

That is why, body and inner components (such as seals) materials are crucial in product sustainability.

For example, Danfoss has designed the BMQC using 303 stainless-steel to achieve high- corrosion resistance.

This material also offers a great compatibility and a long life in thermal management applications.

Finally, the dual EPDM seals provide excellent compatibility with the fluids transferred.

These material characteristics ensure a good product reliability.



**The risk of leakage**

Highly critical applications - like data center liquid cooling - demand 100% uptime and leak-free operations. This means that all components must be up to scratch to avoid leaks. If a component of the liquid cooling system were to leak, it would damage the entire system and increase downtime.

The result for the end user would be increased costs, wasted time, and major maintenance efforts to replace the part.

For this type of challenge, Danfoss BMQC is designed for absolute minimum spillage to allow safe use in direct electrical environment. Our BMQC comes with dual sealing and is also tested 100% with helium in our manufacturing plants. This stage of the process enables us to guarantee the high reliability of the products in application.

With these characteristics, the Danfoss OCP ORV3 BMQC has a reduced risk of leakage and helps to improve the overall efficiency of the system.

We'll look at this point in more detail in the next section on P.U.E.



**The system efficiency (with P.U.E.)**

In thermal management applications, such as data center cooling, we often refer to P.U.E. (Power Usage Effectiveness). This indicator was developed by a consortium from the IT world called GreenGrid, in order to talk about Eco-responsibility in IT equipment.

Infrastructures, such as data centers use a lot of energy and if the efficiency is not optimal, the data center will use more energy and therefore incur more costs.

The P.U.E. ratio is used to calculate the energy efficiency of the cooling system: The lower the PUE, the more the system is improved.

Danfoss aims to offer the right solution for the user's cooling system.

Therefore, to optimize the efficiency of the thermal management, we often think about the components (such as quick couplings) of the cooling system.

The higher the flow rate and the lower the pressure drop, the less energy is wasted and the more efficient the system.

Our Danfoss BMQC offers OCP standard specifications with high-flow and low-pressure drop.



**The impact on environment**

We know that infrastructures, such as data centers consume a lot of energy and give off a lot of heat. Danfoss is committed to sustainable development and strives to deliver innovative and sustainable solutions for its customers.

The use of liquid cooling in this case with the Danfoss BMQC allows a considerable reduction in carbon footprint. The BMQC coupling helps to optimize the efficiency of the system as we have seen, and reduces energy consumption. Liquid cooling has minimal water usage and provides consistency in the thermal management of the data center.

Lastly, the use of materials, such as stainless steel or EPDM seals (REACH/RoHS compliant) is also a step in the right direction for the environment.



**Conclusion**

We discussed common challenges in thermal management systems and noted why this coupling is the right choice for these applications.

Indeed, the Danfoss OCP ORV3 BMQC offers an interchangeable design thanks to its compliance with OCP standards, a blind connection thanks to radial and angular alignment, an ease of connection with its push-to-connect system, high fluid compatibility and high corrosion resistance. Also, the Danfoss BMQC provides high flow and low pressure drop to improve the P.U.E. of the cooling system. Specifically designed together with OCP group, the BMQC is available in a 5mm size and is connectable and disconnectable under pressure.

Our Danfoss BMQC can be configured for different hose / tubing layout to reduce the overall space need in your application.

Finally, our Danfoss BMQC can be used in liquid cooling applications with other Danfoss hand mate couplings. Our complete portfolio can meet application demands.

