



AKG Fuel Cell Cooling System









Elevating Efficiency in Off-Road equipment: Advanced Thermal Management for Fuel Cell Electric Vehicles

Step into the future of off-road equipment with our state-of-the-art thermal management solutions for fuel cell electric vehicles (FCEVs). As pioneers in the field of off-road cooling solutions, we are proud to introduce our state-of-the-art heat exchangers and thermal management systems that improve performance, efficiency and durability of FCEVs. In the world of alternative drivetrains, optimizing thermal efficiency is critical and our solutions stand at the forefront of innovation. Join us as we advance thermal management for the efficient and sustainable operation of FCEVs. Discover how our precision-engineered heat exchangers are driving the development of sustainable off-road vehicles for a greener future.

Fuel Cell Cooling

Fuel cells require efficient cooling when converting hydrogen and charge air into electrical energy, with only air and water as byproducts instead of exhaust gases. To avoid short circuits within the fuel cell, the use of an electrically insulating coolant is essential. Our vacuum-brazed aluminum heat exchangers are particularly suitable for these coolants. To keep the required conductivity criteria, deionization processes are used to maintain the low conductivity of the coolant. Deionization must be continuously applied when using heat exchangers from other brazing processes. Two fuel cell cooling methods are commonly used: direct and indirect. These are selected depending on the cooling requirements of the fuel cell system. AKG specializes in lightweight, high performance heat exchangers that provide exceptional cooling and heating capabilities for fuel cell applications.

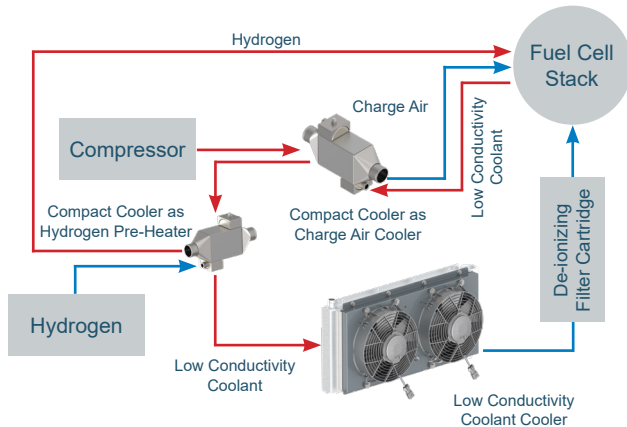
Applications – Markets

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|  Agricultural equipment |  Forestry equipment |
|  Automobile |  Generator set |
|  Commercial vehicle |  Municipal vehicles |
|  Construction equipment |  Rail vehicles |



Direct Fuel Cell Cooling

In direct cooling, the fuel cell stack is cooled by a low conductivity cooling fluid that circulates through each of the heat exchangers in the system. The low conductivity coolant flows into the fuel cell stack, then through a charge air cooler and a hydrogen preheater. Finally, it is cooled by an ambient cooler and the cycle repeats.



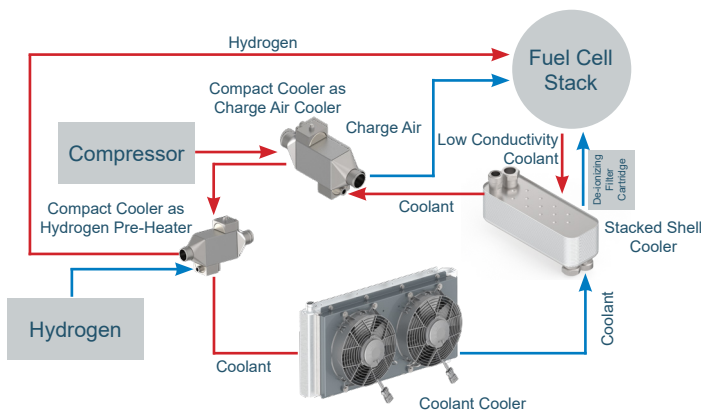
AKG Engineering brings extensive expertise and many years of experience in the development and manufacturing of cooling solutions for fuel cells.

Benefits of direct cooling compared to indirect cooling

- Simpler design with fewer components
- Cost savings due to reduced number of parts
- Higher efficiency through direct cooling

Indirect Fuel Cell Cooling

With indirect cooling, two separate coolant circuits are required, one with regular coolant and a second with low conductivity coolant. The low conductivity coolant circulates only between the fuel cell and a liquid-to-liquid heat exchanger (Stacked Shell Cooler). Here the low conductivity coolant is cooled by a regular coolant. The regular coolant circulates through this stacked shell cooler, followed by a charge air cooler and a hydrogen preheater. Finally, it is cooled by an ambient cooler and the cycle repeats.



With our comprehensive know-how and many years of experience, we design and manufacture your individual, indirect cooling solution for your fuel cell drive.

Benefits of indirect cooling compared to direct cooling

- Reduced volume of expensive, low conductive coolant
- Fewer emissions of ions in the smaller circuit resulting in longer replacement intervals of the deionizing filter cartridge
- Components of the regular coolant circuit can be selected with less requirements for low electrical conductivity

Through our technical expertise in integrating different systems, we not only offer our customers a flexible design, but also meet all of the requirements of fuel cell applications.

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