2025 JPMA AWARD

DEVELOPMENT PRIZE

A. NEW DESIGN

A-1 Sintered spur gear for EV cooling module using high-airtightness heat-treated material

Diamet Corporation

This product is a spur gear incorporated into a flow-switching valve for the BEV cooling module.

Amid the increasing complexity of cooling systems in BEVs, this module is expected to see a rise in demand as it allows for centralized management of the cooling function. Initially, resin gears were considered, but due to issues with strength and wear resistance, a sintered gear was ultimately adopted.

To achieve the required specifications, the sintered gear was made from Fe-Cu-Ni-Mo-C material with a density of 7.0 g/㎤ or higher, and the requirements for strength and wear resistance were met by applying a carburizing and quenching treatment. Furthermore, since a part of the component is exposed outside the unit, there was a concern that the porosity of the sintered material might affect the unit's airtightness (sealing capability). To address this, steam treatment was adopted due to its balance of airtightness, cost, and productivity.

The heat treatment process, which combines carburizing and quenching with steam treatment, is a novel design. It was achieved by finding steam treatment conditions that ensure airtightness without compromising the strength-enhancing effect of the carburizing and quenching process. We also took measures against cosmetic defects (stains) caused by the steam treatment and countermeasures to prevent damage to mating parts. By clearing the customer's required levels for performance, quality, and cost, we successfully commenced mass production.