

John Deere Electronic Solutions introduces the PD400 modular inverter for hybrid electric vehicles



Compact and efficient machines are critical to heavy-industry customers' success. With the numerous complex systems and their many parts, it is no surprise that utilizing space efficiently can be a challenge for engineers. The newly released PD400 modular inverter from John Deere Electronic Solutions (JDES) provides space saving and flexibility to system designers with a solution for high-voltage / high-power hybrid electric vehicles. The PD400 all-in-one system eliminates the need for multiple interfaces, while also matching exact system requirements, simplifying work, and allowing system designers to optimize machine performance in the often-extreme conditions of off-highway and heavy-duty applications.

One of the many considerations when designing an electronic system is whether the system will utilize more than one inverter. In most modern hybrid machinery systems, using at least two inverters is increasingly common. One often controls the ground drive functions and the other supplies power to various systems, such as steering, electronics, and energy regeneration. The new PD400 modular design can be configured with a single or dual inverter for maximum design flexibility. An optional brake chopper can be used for energy regeneration, allowing for creative hybrid configurations utilizing a battery or an engine as a flywheel to store the energy recovered. However, a problem that can arise with the use of multiple inverters is the potential for resonance, which could damage hardware or provide unpredictable power output. By interconnecting the inverters into a dual inverter, the PD400 protects both itself and the machine's other systems from resonance at a low cost while freeing up space with its compact design.

Another benefit of the compact design is its impact on energy loss and heat control. One by-product of inverter operation is the generation of heat and thus loss of energy through the conductors and at connection points. This problem only increases in severity as multiple inverters are integrated into an electrical system. Not only does the loss of energy impact the efficiency of the machine, the additional heat can adversely impact hydraulics and electronics — systems that can fail when exposed to excess or unanticipated heat. Cooling these systems in turn requires much more effort and can be wasteful. The PD400 all-in-one solution, however, eliminates multiple connector and cooling interfaces to decrease cost, minimize space requirements to allow for more design flexibility, and reduce energy losses for improved efficiency.



Additional features also include an optional DC-DC converter as a potential monitoring feature for preventative maintenance use.

Because the inverter's performance relies not only on the quality of its features but also on its proper implementation in a machine, the PD400 is engineered with system integration in mind. To facilitate easy system design, the PD400 has a common electronic control architecture that supports the full suite of JDES advanced motor control software. This optimizes performance of both permanent magnet and induction motors common in hybrid electric applications by ensuring accurately synchronized and foolproof integration. PD400 software is designed to work at maximum efficiency with complete monitoring capabilities, enabling operators the unique ability to precisely manipulate the controls under various operating conditions and fine-tune operating parameters during implementation. This ensures quick and easy assembly for manufacturers and simple modification by end users. In order to minimize the effect that thermal output from the inverter may have on a system, a thermal management system is liquid-cooled for robust and reliable performance over the life of the system.

The Pd400 modular inverter is the latest addition to the JDES inverter lineup — which includes the PD300, PD550 Single and the PD550 Dual — the entire lineup is suited for a variety of off-highway and heavy-duty vehicle applications, such as waste management, agriculture and drilling. Working in a wide range of application settings gives JDES engineers a vast amount of experience to draw on when collaborating with original equipment manufacturers on machines, as well as a confidence in the products quality. Be developing these reliable and adaptable technologies, JDES increases end customers' productivity and uptime. **For more information, visit John Deere Electronic solutions at www.JohnDeere.com/JDES**

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