

Digital Communications on CoolX accelerated program development for a revolutionary Surgical Robotic surgery system

INDUSTRY

Surgical Robotics

SOLUTION

CoolX1800

EQUIPMENT

Surgical Robotic arm and console

CHALLENGE

The customer required a power supply to deliver five discrete 48 V outputs to drive multiple motors. Each motor required up to 150 W continuous power with 225 W peak power required on startup. In addition, the customer also needed a 12 V/200 W for system electronics. The system tower is compact, so system size and weight were important considerations. Furthermore, the system will be used in hospitals all over the world and will need to be able to operate without derating from 90 VAC to right up to 264 VAC input line voltages.

The startup time for the overall system was quite long due to the various startup protocols and checks that needed to be carried out prior to commencing a treatment. This took several minutes to complete and was an inconvenience to the surgeon (particularly if this was taking place during an operation) and the patient, as it was prolonging their time on the operating table and increasing the risk to the patient.

SOLUTION

The solution proposed by the AE team was the CoolX1800 with 5 x CmD modules set at 48 V for the discrete motor driving, and a CmB module to deliver 12 V for the system electronics. The high-power density of the CoolX, in particular its low profile 1U height greatly eased the customer integration of the power supply in the system. With its exceptional low line power output of 1350 W, the CoolX

was approximately 40% smaller than the competitor offerings. Weighing just 1.5 kg, it helped reduce the overall system weight of the tower and console. The customer opted for the low leakage current version (<150 uA), which ensured their system leakage current was well below the 300 uA safety limit.

The 25 W auxiliary output on the CoolX allowed the power supply and system to stay “ON” and ready for immediate use as the output of the power supply could be enabled in milliseconds, once required.



RESULT

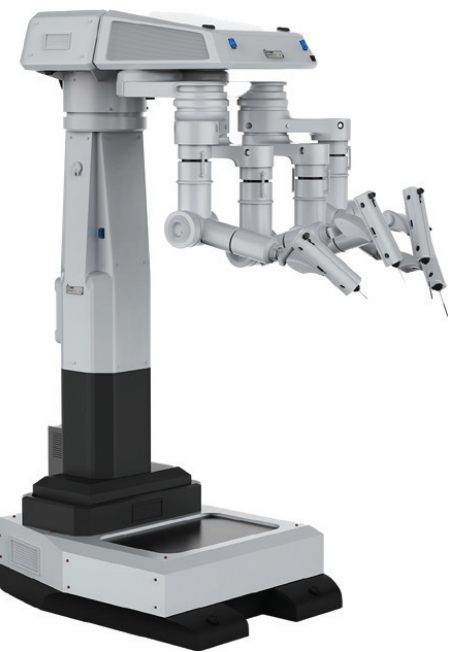
The CoolX1800 high power density, combined with 1U height and lightweight construction, allowed the customer to achieve their system size targets. The initial product samples were supplied within one week of the customer defining their initial specification. Our field applications engineer visited on the day of arrival to assist and provide support for the customer in initial integration, permitting the customer to get up and running with system bench testing immediately. During the visit, our FAE demonstrated the PMBus Digital Communications and control capability of the CoolX. This feature allowed the customer to track and monitor the actual power demands of the motors and system electronics during normal and abnormal application conditions.

During their system development, the customer used the PMBus Digital communications to monitor the power supply parameters under various operating conditions. By monitoring and logging the output voltage and current, they observed that a particular start sequence of several motors, could draw more current from the 48 V output than was expected (and specified by the motors). Repeated operation under this mode would have damaged the long-term reliability of the system and could be very detrimental if it occurred in an operation. This prompted the customer to qualify different motors for longer life.

CONCLUSION

Speed of delivery of production ready samples, with the support of Advanced Energy's locally based expert field applications engineering team ensured the customers initial testing and integration was conducted without delay, including introducing the system engineers to the PMBus Digital Communications and control capabilities on the CoolX. Utilizing the PMBus features of the CoolX, the customer was able to identify an issue that would have impacted their long-term system reliability. Based on this positive outcome, the customer subsequently utilized more of the PMBus features to monitor more parameters during their development and system testing reducing their qualification time

The compact nature of the CoolX and its power rating at low line operation (100 VAC) also ensured that the system could be marketed to its full potential in all markets including Japan.



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