CAN Newsletter Online

SPS IPC DRIVES 2015

CANopen drives and motion controllers

Several companies launched on the market-leading German fair for industrial automation new CiA 402 compliant drives and motion controllers. Some of them feature safe torque-off (STO) functionality.

THE CiA 402 CANOPEN DEVICE PROFILE for drives and motion control is one of the most implemented standards in the electrical actuators. It is internationally standardized in IEC 61800-7-201/301. The first version was already published in 1996. It is a very general specification covering frequency inverters, servo controllers, and stepper drives. The profile has many options including the specified finite state automaton (FSA), which is criticized by some system designers. On the other hand, it can be used for nearly any electrical-powered motor.

Due to the CAN-based hardware inverters and motion controllers can be implemented with a very small footprint, much smaller compared to other communication technologies. CANopen and CiA 402 don't require powerful MCUs with a lot of memory on chip and large external communication modules. And the prices are also very reasonable. Nevertheless, it was not expected, that in Nuremberg several companies introduced new CiA 402 products. They addressed markets with not so challenging bandwidth requirements, but with limited space and low-budgets. Some providers said with the tongue in cheek that they would give the CANopen motion controller for free when the sales volume for the motor is huge enough.

The trend is small and reduction to essentials: A typical example i500 series of inverters (Photo: Lenze)

Easy commissioning and compact

One of the most impressive inverter launches was the i500 family by Lenze (Germany). It addresses applications such as pumps and fans, conveyor, traveling, winding, former, tool, and hoist drives. There are three set-up methods by means of a keypad, a smartphone app, and the Easy Starter engineering tool. The i510 is suitable for up to 2,2 kW providing CANopen connectivity. The i550 features also CANopen, but also other communication interfaces. It is rated for up to 45 kW and provides additional functions including STO.

The i500 family is more than just a facelift for an existing range of inverters. It uses for example the latest IGBT technology, a step-less controlled fan, and an active balancing of the intermediate circuit voltages, which all helps to keep the energy consumption as low as possible. Because it was possible to increase the power density, the inverters have become smaller, and due to the lower heat losses and the sophisticated cooling system they can also be installed side by side in the control cabinet. Up to the 11-kW power level, the i500 series fits in the popular flat "150 model" control cabinets. The products meet the requirements of efficiency class IE2 in the new EN 50598-2 standard, which will soon come into force.

The success of the development work is reflected in the compact design and in the impressive way the modular devices can be put together to really fulfill customer requirements - and to top it off, all this is combined with user-friendliness. "We have been very stringent in selecting only the latest available components for this new device," emphasized Bernd Muellller, Lenze's Inverter Product Manager.

Motion controller for six axes

Servotronix (Israel) claimed that the SoftMC3 motion controller is the smallest multi-axis controller on the market. It measures 98 mm x 67 mm x 31 mm. The device provides CANopen or Ethercat connectivity and implements the CiA 402 profile. Due to the Ethercat interface, it was not possible to shrink the size further, said the company at its booth in Nuremberg. The product with an embedded Linux operating system is suitable for mechanical stages, gantry tables, Delta and Scara robots. It is based on an iRMX6 (ARM) processor and comes with software modules for conveyor tracking, advanced spatial interpolation for all kinematics, and on-the-fly motion control functionality. The motion controller can also be integrated into the company's closed-loop stepper motors.

The compact SoftMC3 motion controller features a CANopen interface accessible on the RJ45 connector (Photo: Servotronix)

The Robodrive servo inverter is able to output 3,4 kW (Photo: TQ-Systems)

STO functionality is on the agenda: TQ-Systems (Germany) has expanded its CANopen servo inverter with a basic functional safety feature. The Robodrive measuring 220 mm x 140 mm x 40 mm operates at a cycle frequency of up to 100 kHz. To be able to process the data volume in real-time, an FPGA is used. The special circuit makes it possible to operate motors with low inductivity while simultaneously minimizing ripple. The supply voltage ranges from 12 V_{DC} to 100 V_{DC}; the maximum current is specified as 40 A. The servo inverters can be operated with electrical motors such as BLDC, AC and DC stepper as well as reluctance motors.

For battery-powered applications

Already last year introduced, Dunkermotoren (Germany) showed in Nuremberg the BG 95 brushless DC motor with integrated CANopen motion controller (CiA 402 compliant). The product provides an 1-kW output power and a 24-V_{DC} power supply. This makes it suitable for autonomous vehicles and any other battery-powered system. At 3650 rotations per minute, the continuous torque is 2,9 Nm, and the maximum torque is 10,4 Nm. The black anodized housing allows good heat dissipation. The product is now

available and can be combined with planetary and worm gearboxes as well as encoders and brakes.

The DSV 1030 servo controller by Engel (Germany) also provides a CANopen interface and supports the CiA 402 profile. In opposite to all other supported communication interfaces, CANopen doesn't require an Anybus add-on module. It is already on board of the controller. The BISS interface for multi-turn encoder is a new feature. The product is suitable for driverless transportation systems requiring a 48-V_{DC} power supply featuring a rated current of 28 A and a peak current of 84 A. It measures 190 mm x 100 mm x 32 mm. The company also offers integrated solutions with motion controller and motor.

The DCmind is a BLDC motor and motion controller combination. The supplier, Crouzet (France), introduced at the SPS fair an optional CANopen interface. The product features STO support. The 9 V_{DC} to 75 V_{DC} voltage range and the back-up battery supply is another safeguard feature. The output power ranges from 34 W to 192 W. The product supports torque, velocity, and positioning control. According to the French company the product is suitable for vales and pumps, access control, as well as the energy sector.

Another CANopen connectable drive provides Intec. The PCS drive family features STO function and can integrate optionally multi-turn encoders. Besides single axis versions, there is also a controller for four motors available. It supports the CiA 402 profile.

Price matters: The Blue Servo has been developed from-the-scratch, in order to reduce the costs (Photo: Metronix))

Price matters

The Blue Servo drive family by Metronix (Germany) is designed for Ethernet applications, but still customers require CANopen connectivity. Therefore the products come with CiA 402 support. As many other motion controllers, the Blue Servo features STO functionality. The initial choice of six packaged, panel-mountable single- and three-phase drives offers continuous output ranges from 0,5 kW to 6 kW. The new platform has been designed-from-scratch.

One of the goals was cost reduction. "Downwards price pressure is here to stay and with this brand new drive family, we began the design project with a goal of reducing hardware costs significantly compared with current European drive ranges," said Frank Essmann of Metronix. "We looked at the problem from all angles and as a result the new drives have some interesting features that help lower costs." One of those features is the two-board design. This satisfies one common request: Integration of OEM's application-specific drive electronics with Metronix's power stage. In the past, additional expansion modules were necessary. The product will be available in sample quantities beginning of 2016.

Besides price and size, the easy configuration becomes more important. In particular, if you consider markets with not the well-educated system designers, or OEMs without detailed knowledge and long experiences in configuring drives and motion controllers. At the end, it is also a price issue.