



CANopen servo amplifier used for screwdriving control

For six decades, Weber has been setting trends in development and production of automatic handheld screwdrivers and stationary tightening systems. For more than 20 years, the company has been cooperating with Sieb & Meyer, a German motion control supplier.

(Source: Adobe Stock)

Weber Schraubautomaten located in Wolfratshausen, Germany, develops and manufactures handheld and stationary screw tightening equipment including feeding systems. The product range comprises electric handheld screwdrivers, spindles for tightening technology, stationary screwdriving systems, tightening units, and tightening systems – each adapted to customer-specific requirements. All these products are designed to make the tightening process as fast and as reliable as possible. "Automation processes for assembly work are very complex," said Christian Schoenig, head of development at Weber. "It is about finding solutions that meet various requirements and parameters." The servo amplifiers by Sieb & Meyer, a CiA member, help with this aim – for several decades now.

The used SD4S ("S" stands for stand-alone) servo amplifier is suited to stationary applications in switch cabinets, and succeeds the SD2S device series, which is also in use at Weber. The close collaboration with Weber proved a stroke of luck for the product development: "We were in close contact with Weber already in the early development stages of the SD4S series," related Ralph Sawallisch, key account manager drive technology at Sieb & Meyer. Beforehand, the specialist for tightening systems has already signaled his interest in testing and using the new servo amplifiers. "We received a lot of important input from Weber, which we have implemented. When the first prototypes were available, Weber was the first customer to put the device through its paces."

When the motion control supplier started the development of the SD4x series, the collaboration of the two companies reached a new phase. "Our main

requirements for SD4S were a smaller size and a reduced price compared to SD2S," remembered Christian Schoenig. "These were prerequisites for the use of the device in our C5S process control." This screwdriving control can perform various screw tightening tasks using different screwdriving methods, which take the torque, angle, and depth into account. The C5S control comes with a wear-free servo drive that ensures an extended service life of the control and the drive unit.

The C5S is suitable to control for tightening tasks that do not require highly precise torque measurement or documentation of the tightening results. The control is used, for example, in furniture production to fasten fittings and hinges. When tightening screws in wood, the torque fluctuates due to the varying texture of the natural material. Therefore, direct measurement of the torque is not necessary, which makes an indirect torque determination by the servo amplifier possible.

In the C5S control, Weber uses the smallest SD4S model so far with an AC-mains supply of 230 V – even smaller devices require a DC voltage between 48 V and 72 V. The SD4S drives the motor of the tightening spindle that tightens the screw via the bit. During this process, the servo amplifier uses the measured motor current to determine the torque at the screw. The torque should be as precise as possible over the rotation angle of the motor. Hereby, SD4S effectively reduces motor cogging. The cogging torque of synchronous servo motors is created by the permanent magnets in the rotor. Depending on the motor design, the effect varies in intensity. The high-dynamic control of SD4x reduces this effect to a minimum so that the resulting torque at the screw is uniform.

"Other fieldbus systems cause further costs on both sides of the bus. Equally important is the fact that SD4S allows controlling servo motors of various manufacturers."

Christian Schoenig ▷



Figure 1: The SD4S servo amplifier family comes in different sizes and features CANopen connectivity (Source: Sieb & Meyer)

Another important feature for Weber is the simple and low-cost connection of the host controller via CANopen. With the multi-parameter set function, users can connect different motors to the servo amplifier without further parameterization effort. The integrated EMC filter reduces the costs for an external filter circuit.



Figure 2: Ralph Sawallisch, key account manager drive technology (Source: Sieb & Meyer)

"For this project, a special motor is used because it comes with a manufacturer-specific rotor position encoder," said Ralph Sawallisch. "We adapted our SD4S device for Weber so that it can reliably evaluate this encoder." Christian Schoenig adds some background information: "There are small-build motors on the world market but they have manufacturer-specific feedback systems. SD4S can evaluate these, which means more flexibility in the motor selection for us. In light of the current supply problems, this opens up alternatives regarding the motors we use. Christian Schoenig appreciated that the servo supplier is flexible and makes no compromises in terms of price and support: "Sieb & Meyer knows the customer and the special use case. The communication is at eye level and we get honest answers."

As of June 1st, Sven Kapitza has taken over as group leader of the Sieb & Meyer service team and coordinates the customer support. Until now, the three-person service team was officially part of the development division "power

electronics". Kapitza previously worked for 12 years in the CNC hardware development. There, he was responsible for the PCD36 application solution, which is based on the MC2 motion controller and the servo amplifiers of series SD2X. PCD36 is used for scoring of printed circuit boards.

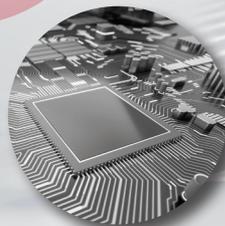
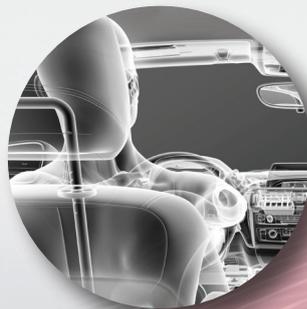


Figure 3: Sven Kapitza, head of the service team (Source: Sieb & Meyer)

The SD4x product family has been exhibited in Nuremberg on the SPS trade show. The product family includes the SD4S, SD4B, and SD4M series. The SD4S series comprises in numerous sizes servo amplifiers in 50-V, 230-V, and 400-V classes. The products feature an output frequency of synchronous motors up to 4000 Hz and of asynchronous motors up to 6000 Hz as well as additional control functions. As a result, the devices operate synchronous motors with magnets embedded in the rotor, so-called interior permanent magnet motors (IPM). The reluctance torque generated by these motors is optimized in real-time depending on the operating point. CANopen and other serial network technologies are supported. The CANopen interface complies with the CiA 301 application layer and communication profile as well as the CiA 402 profile for drives and motion control (internationally standardized in IEC 61800-7-201/-301).

hz (based on information from [Sieb & Meyer](#) and [Weber Schraubautomaten](#))

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