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Compact Drive for Multi-axis Applications

in One Stroke in the Drive Technology Match

More performance and dynamics, less installation space and that at reduced costs – these are the demands that machine and robot manufacturers place on electrical drive technology today. With the SDD 1000 series, the automation system provider SIGMATEK meets exactly these market demands: Compact, highly precise multi-axis drive systems with an attractive price/performance ratio.

Compact Dimensions: 21.2 cm wide, 21.6 cm deep and depending on the number of axes, 46.5 and 58.5 cm height for drives with 4 or 6 axes respectively.

Modern drive technology is essential for the efficiency of production machines and robots. Current statistics show that on average, six drive axes per application are required in machine manufacturing. The number, according to a study by Quest TechnoMarketing (2013), will increase to ten electronic drives per machine in 2016. The complete automation solution provider SIGMATEK took this market trend into consideration when developing its new compact multi-axis servo drives. Up to 6 motors can be controlled with a compact servo drive from the DIAS Drive 1000 series. This series includes drives with three, four or six drive regulators – each integrated into one housing. The machine manufacturer can therefore perfectly define the number of axes for the application and fully utilize the advantages of compact drives: With their compact construction, they save significant space in the control cabinet and are also substantially more economic than single axes or a modular system.

DIAS-Drive 1000 Facts – 6 Axes

- Power: Rated current: 5 A to 20 A per axis.
- Peak current: 10 A to 40 A per axis.
- Power supply: Supply voltage 3x 380...3x 480 V AC
  Rated supply current 20 A at 400 V.
- Intermediate circuit: Rated output power 14 kVA.
- Encoder systems: Resolver, EnDat 2.1, Hiperface DSL.
- Safety functions: Safe Brake Control (SBC), Safe Torque Off (STO), SS1 (Safe Stop 1), SO (Safe Out).
- Dimensions: 212 x 585 x 216 mm (W x H x D).

Installation Space and Costs Reduced

The 6-axis device measures only 21 cm in width, 59 cm in height and has an installation depth of 22 cm. With the servo amplifiers of the SDD 1000 series, the term „compact multi-axis servo drive“ is raised to a new level.

Bringing drive technology for six motors into this extremely compact form – that was a real challenge for the engineering team, especially with the electronic and mechanical aspects. This low constructional volume is made possible by the use of the most modern drive technology and material savings, since the six drive regulators share the housing as well as the controller and intermediate circuit. And of course, the many connectors, screws and intermediate circuit connections have been eliminated. That this allows the equipment costs to be reduced and the stability increased at the same time is clear.

The 6-axis drive variant with three smaller axes (10 A/20 A) and three larger axes (20 A/40 A), which are often found in robot applications, will be presented for the first time at the SPS IPC Drives in Nuremberg and available in early 2015, just as the three and four-axis drive regulators.

High Performance

The multi-axis drives of the SDD 1000 series have an on-board controller, which assumes the task of running the positioning and regulating algorithms. The controller also communicates with the primary control system and ➔

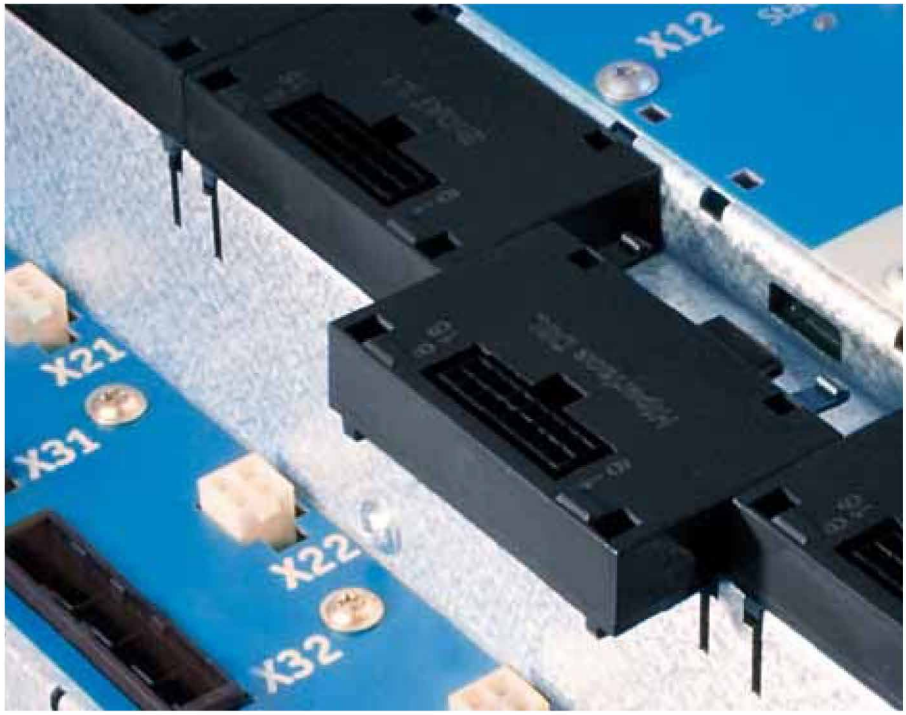
ensures fast cross traffic in the drive, as required for example, with interpolating axis motion or when a Safety stop should be made. Conventional axis-based safety functions such as »Safe Brake Control« (SBC), »Safe Torque off« (STO), »Safe Stop 1« (SS1) and »Safe Out« (SO) simplify the integration of the drive technology into the Safety concept (SIL 3 or SIL CL 3 according to EN 62061 and according to PL e, Cat. 4 in compliance with EN ISO 13849-1). With the safe output (SO), Safety-relevant components such as valves can be controlled.

For the SDD 1000 series, the motor control algorithm was further developed. Whereby, precision and dynamics could be additionally increased. The position settings are made in the PLC and then sent to the drive via the real-time capable Ethernet bus system VARAN. Very short controller cycle times (62.5 µs) provide extraordinarily exact positioning at a higher speed. SIGMATEK consciously limited the functions of the drives to current, speed and position control.

In the internal data analyzer of the DIAS Drives, data can be recorded with scan rates of up to 62.5 µs and displayed in the software tool online. Since the configuration parameters are centrally managed in the control system, configuring the drive components individually is unnecessary. The initial start-up times are thereby reduced and errors avoided.

Flexible Complete System

The DIAS Drives 1000 are designed for multi-axis applications such as those often found in serial machine manufacturing – examples of this are food processing and packaging technology, the plastics industry, handling equipment and robotic applications. During development SIGMATEK focused on designing a flexible system to allow individualization in serial production. Various performance levels can be packaged in the same mechanism. Adapting to market-specific requirements is therefore simple.



The various encoder modules are externally connectible and thereby increase flexibility when adapting the feedback systems to the respective application.

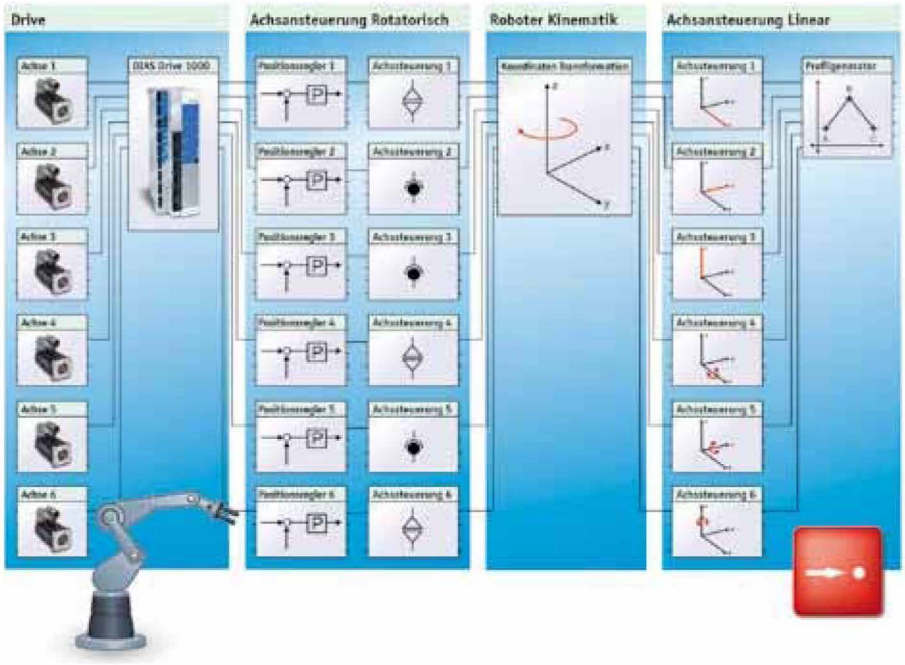
External plug-in encoder systems provide flexibility. Resolver, EnDat 2.1 and Hiperface DSL are currently available. The various feedback modules or new encoder variants can be easily added or exchanged. Users therefore always have the exact feedback systems needed for their application. The feedback system used is recognized by the drive automatically. Hiperface DSL allows the transmission of processing signals and power in a single cable. The one-cable solution saves space, wiring and increases clarity.

One Cooling System for 6 Axes

In regard to heat management, a clever solution was needed for such a compact design. The SIGMATEK developers decided on a fan-based concept and an internal intermediate circuit, which provide efficient energy use and distribution. In such a compact system, bus bar management and cooling can be optimally implemented since the entire system can better handle the changing peaks and generated

> We could adapt the number and performance of our multi-axis compact system to the application. This flexibility is further applied in the motor feedback systems. Currently, Resolver, EnDat 2.1 and Hiperface DSL can be implemented.

DI (FH) Bernd Hildebrandt, Sales Manager Austria at Sigmatek GmbH & Co KG



Internally, the technology module „6-axis articulated arm robot“ appears simplified as shown above. The application engineer must only insert it into his project and set the appropriate parameters - such as speed, acceleration, motion sequence and curve.

temperatures (simultaneity of the loads). The energy generated while braking is used to power the other components. For this purpose, a 24 V supply is integrated that is also supplied from the intermediate circuit and powers the remaining electronics. During power-down, the controller continues to provide energy for a short time. A controlled still-stand can therefore be implemented.

From One Source

When the drive technology is a part of the automation system, as at SIGMATEK and therewith seamlessly integrated into the control as well as safety technology and a universal engineering platform is implemented, the degree of integration is high and the productivity of the machine increases accordingly.

The LASAL MOTION package, responsible for motion control, is seamlessly integrated into the PLC programming and project development tool LASAL CLASS. Regulation algorithms, process control and axis motion are well handled without unnecessary interfaces and overlap in the machine as well as in the software – and are therewith from one source. At SIGMATEK, the all-in-one engineering also includes the safety technology which can be implemented in the TÜV certified functions of the integrated LASAL Safety Designer. LASAL is object-oriented and meets the IEC standard 61131-3. With its modularity and graphic representation, the proven development platform opens maximum flexibility to implement individual customer requests for the user. A further, more important aspect of this complete approach: The engineering times and costs can be considerably reduced.

Large Drive Library

For frequently needed functions, a large selection of predefined motion function components and technology modules are available in the drive library. Examples of this are modules for positioning or path control, as well as electronic cams, electronic cam switches, flying saw, CNC functions and interpolating movements of up to nine axes, jerk-limited profiles or dynamic safety zone monitoring. Templates for various robot kinematics, such as articulated, Delta, Scara and Portal are available. The applications technician selects the appropriate module, includes it in his project and after setting a few parameters, can start it directly or run a simulation. Motion control tasks can therefore be comfortably implemented without the user having to program anything.

During development of LASAL MOTION, a great deal of attention was given to ease of use and efficient axis commands. Several axes can be synchronized with just one command call, for example. Synchronization can be achieved through speed, position, position offset, with gearing on real or virtual axes. For precise diagnostics, all relevant statistical values such as minimum and maximum voltage, average tracking error, temperature curve or controller load per axis are available for regulation. Extensive oscilloscope functions accelerate the initial start-up and allow optimization of the machine. Version control is also integrated in addition to multi-user or multi-project structures. Several engineers can therefore work on complex project applications at the same time. In view of „intelligent smart factory“, LASAL now also supports the OPC UA communication protocol so that machine data can be transported independent of the manufacturer and platform - and this horizontally as well as vertically between production and company management levels.

The most modern technology, compactly packaged - combined with powerful and efficient handling - make the DIAS Drives of the 1000 series an interesting player in the drive technology match.

www.sigmatek-automation.com
SPS IPC Drives: hall 7 / stand 270