May the "force" be with you...

...could be the motto of the new SA 38 and SC 38 linear motor series from Dunkermotoren. In contrast to the similar saying ("May the power be with you") from Star Wars, this is a "real" product feature and not science fiction.

Due to the compact design of the linear motor, it fits only partially on the belt of a Jedi Ritter but is rather suitable for use in high-performance machines. As in films, new ideas and solutions have to be created when the "normal" or even the standard version reaches its limits. In the blockbuster this is the invisible "power", in relation to the linear motor it is new technical possibilities and possibilities. Back to the reality and performance of the new linear motor from Dunkermotoren.

How are linear movements implemented in devices and machines today?

Numerous linear applications, with the exception of simple point-to-point positioning, which is the paradigm discipline of the pneumatic cylinder, are carried out by classical belt or spindle systems. The drive train consists either of a stepper motor, a BLDC motor or a servo motor. This has been the state of the art for decades, but will it continue to be so in the future? A direct linear motor of the ServoTube series has many technical advantages (integrated feedback system, maintenance-free plain bearings, high IP protection, low-noise movement, etc.), but ultimately cannot replace all conventional techniques. In which applications does the use of a linear motor make sense? This is quite easy to answer: In applications where belt or spindle applications reach their performance limits or where the advantages of both systems are required. On the one hand, the belt axes are highly dynamic, but not highly precise. The spindle axes, on the other hand, stand for high-precision positioning, but these losses have been recorded in the dynamic range. Thus, the application case of the direct drive is obvious: fast
and precise positioning with little or no maintenance. The SA 38 and SC 38 combine the disciplines of the sprinter (belt) and the weightlifter (spindle) in a single product.

The new 38 series with the three different overall lengths (3806, 3810 and 3814) differs technically from the previous version in almost all areas. Only the outer diameter of 38 mm of the thrust tube has remained the same. The remaining parts of the engine have been completely revised. However, the successful engine concept of the actuator (SA 38xx with integrated plain bearing) and the component (SC 38xx) has been retained. Many customer requests have been collected over the last few years and have been incorporated into the new product. Greater power in a smaller space was one of the main requirements for a linear motor. A doubling of the peak force and continuous force, as well as almost identical outer dimensions, are the result of the new development. This was achieved by adapting the housing, windings and magnetic characteristics. A larger number of magnets and also higher quality magnets are the logical consequence, but this also changes the complete characteristics of the integrated SIN/COS feedback system. The previous optimal sine and cosine and the resulting Lissajou circle (blue) are a thing of the past. The feedback signal changes to a rectangle with roundings (red).

Graphic: Sine/cosine feedback signals

The feedback systems available on the market look similar. Special servocontrollers and software logarithms are required to control a motor well with this signal. But wouldn't it be advantageous for users to use their existing servo amplifier and simply adjust parameters? Does the user's controller concept have to be completely changed just because rotary servo motors are replaced by linear motors? Dunkermotoren's condition for the introduction of a linear series is to be able to operate it with a commercially available servocontroller. The newly developed evaluation unit of the feedback system compensates the raw signals of the Hall sensors and delivers a perfect 1 Vpp SIN/COS feedback signal for the customer's controller.
In contrast to the old servo tube series, the magnetic rod and thus the position information is recorded and evaluated with several Hall sensors. Thus, a high absolute positioning accuracy is achieved even if the magnetic rod is mechanically located outside the center of the motor. Additional encoder interfaces such as SSI, BISS or TTL will be available for projects in the future. Here, too, emphasis was placed on the modularity of the entire linear concept.

If the motor ever starts to "sweat", two cooling water connections are available on the engine. An additional heat sink is therefore no longer required, as the motor housing has internal cooling channels. In this compact design (80 mm x 80 mm), the new SA / SC 38xx sets new standards for cooled linear motors. Until today, machine builders were forced to add additional modules, which almost doubled the motor weight.

Furthermore, the voltage range of the new series has been extended. The series can therefore also be operated with servo controllers which have connection voltages of 1 x 230 VAC, 3 x 400 VAC or 3 x 480 VAC. The connection technology of the older linear series 25 and 38 with permanently attached cable has also been replaced by rotatable, industrially suitable angular connectors. For the motor phase and feedback connectors, connection cables of different lengths and suitable for drag chains are available. The mechanical connection of the motor to the machine takes place via the motor housing. The aluminium profile has slots on all sides for T-slot nuts. Last but not least, the maintenance-free plain bearing concept has been further improved over the years. The only component subject to wear on a SA 38 can now be easily replaced after thousands of kilometres of service.

With this new development and the technologies used in it, Dunkermotoren has succeeded in ensuring that the bar-guided linear motor will no longer be found only in niche applications in the future but will establish itself alongside the classic linear systems. In addition to the user requirements mentioned above, the design of the linear series has also been designed for modularity.
In contrast to the linear flatbed motor, the integration of a bar-guided linear motor into a machine is mechanically easier. Even if the magnetic rod is located outside the center of the motor, it retains its force constant due to the design.

Where will the new linear motor series be found in machines/devices in the future? One of the main areas of application for the SA/SC 3806, 3810 or 3814 will be high-speed applications in the food and packaging industries. Drives in the logistics sector are also reaching their technical limits due to the increasing online ordering behavior in the B2C sector.

Since Dunkermotoren has been a system supplier in drive technology for decades, it will not remain just a solo motor. Pick & place modules, complete linear axes and a version designed for the food industry will soon follow and facilitate system integration at the customer’s site.

Finally, a parallel to the film can be made again. In the end, it is usually the good that wins - our linear motor will certainly also bring good performance to your machine.

Powerful, precise high-speed drive technology made in Germany!

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