PROFESSIONAL ARTICLE

of Dunkermotoren GmbH in August 2020

Linear motors - the perfect motor solution for the diagnostics market

In the medical diagnostics market, electric motors are used in a variety of applications - from simple material handling to complex pick & place applications. The type of medium can vary, from liquids of varying viscosity to solids such as human or animal tissue. This also results in the enormous range of product variations of electric motors for controlling medical devices. Integrated in various applications, electric motors facilitate the daily work in the medical field.

Each individual application brings with it a multitude of requirements that must be taken into account in the specifications for the design of a diagnostic machine. For example, smooth running, good controllability, high accuracy and service life, freedom from wear and maintenance are indispensable criteria for manufacturers of diagnostic machines. Particularly in the medical/ diagnostics sector, it is of enormous importance to always be at the cutting edge of technology in order to present the most innovative solutions to doctors and patients. This causes designers to always be on the lookout for new solutions that will bring about an improvement in the above-mentioned criteria. With each subsequent generation of equipment, the reliability of the overall system is improved and the machine performance is increased. Especially the increasing number of tests, for example blood counts, inevitably leads to an automation of the test equipment. Large laboratories are already looking for compact, modular test cells that can be expanded with little effort even if demand continues to grow. Another important criterion is fast diagnosis and transmission of test results to the doctor and patient.

Dunkermotoren presents a unique solution for sample handling. With the electric linear motors (ServoTubes), Dunkermotoren offers the market a solution that is very flexible in its application. From single axes to multi-axis systems, highly dynamic and flexible linear modules are developed especially for the customer's machine. The linear motors of the ServoTube series impress with their high acceleration and speed, which clearly sets them apart from other linear module technologies, such as spindle or belt systems. These characteristics combined with a high-resolution linear encoder result in positioning accuracies of less than 0.01 mm. However,

if the accuracy requirements are in the 0.1 mm range, this can be achieved with the standard integrated SIN/ COS encoder, without an additional linear encoder.

A linear motor of the ServoTube series is available in various configurations:

as actuator, pick & place actuator or as a module.

Bild 1. Aktuator (STA und XTA)

Bild 2. Pick & Place Aktuator (XTR)

Bild 3. Linearmodul (SM und XM)

Bild 1. Linearmodul mit Faltenbalgabdeckung (BM)

Each individual ServoTube design offers a high degree of precision and a long service life - depending on the application, mileages of more than 50,000 km can be achieved. With very little maintenance and extreme reliability the ServoTubes convince all along the line.

The 3-phase motor with the integrated 1 Vss SIN/ COS feedback can be connected to numerous servo controllers from various well-known manufacturers. The connection principle of the ServoTubes is comparable to that of a standard rotary servo motor with encoder system. Therefore, integration into the control concept of the machine manufacturer is also simple and

less time-consuming. We have created a suitable how-to video for this purpose, which you can watch on our homepage or our Dunkermotoren social media channels.

Dunkermotoren offers a perfectly matched linear motor package for the ServoTubes 25 and 38 with the DME 230x4 servo controller series. The controller's hardware and settings are matched to the linear motors and make commissioning even easier. The customer's control takes place in two ways. Either via one of the widely used bus systems (Profinet, Ethercat or CANopen) or digital signals (24 V inputs or outputs). If the latter is the case, the customer has the option of storing a sequence program in the controller. With a maximum of 500 programming lines, complex motion profiles can be implemented without a higher-level bus system.

Even the use of a single linear motor for fast applications offers the customer enormous advantages - especially in comparison to the pneumatic solution, since the initial costs are amortized within a short time due to the increased machine performance and the lower operating costs.

However, if the rod-guided direct motors are used within a multi-axis system, two linear motors can also perform highly complex movements independently of each other. A gantry is usually constructed as an XYY, or XYYZ variant. With Dunkermotoren's linear motor multi-axis systems, several motors can be moved differently from each other on one axis. With this type of multi-axis system, higher machine performance is achieved than with typical Pick & Place robots.

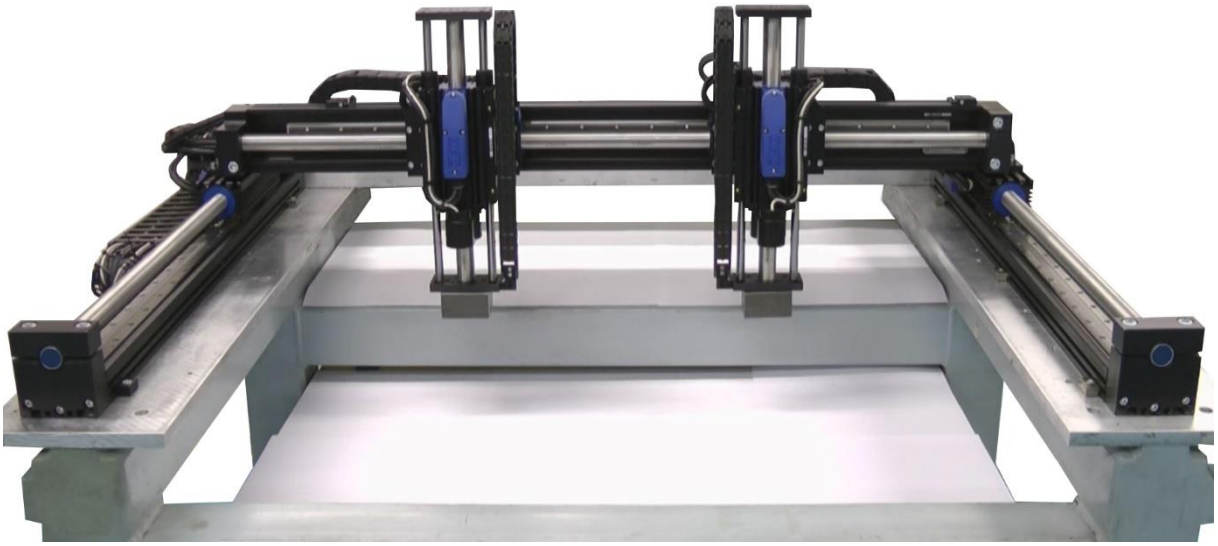

Figure 5: X, YY, ZZ multi-axis system with two independently moving Y/Z axes

By using a programmed S-ramp it is possible for the ServoTube motors to evenly move even very sensitive products without causing the slightest damage to the samples or components. Not even if these movements are simultaneous and under highest dynamics. If the linear motors are used as a Z-axis, the question often arises how they react in a currentless state. In most cases, the magnetic rod is not held and falls down, so to speak. For these applications, ServoTubes from Dunkermotoren have integrated a holding brake for the 25 size. The wrap spring brake on the STA25 or XTR25 holds loads up to 20 kg. For larger loads, there is the option of using another linear product (CASM cylinder) from Dunkermotoren. The CASM series (electric lifting cylinders) is also suitable as a perfect 1:1 replacement for pneumatic cylinders in sizes 32 - 63.

In conclusion, ServoTube series motors, regardless of their design, increase the machine performance of a diagnostic machine without sacrificing the flexibility and function of previously used technologies. In the future, fully automatic Pick & Place portals will increasingly find their way into large laboratories, if only because of the increased demand for examinations. The topic of security in companies worldwide is of great importance and should therefore not be

neglected. Particularly in the case of hazardous media for laboratory personnel, consideration should be given to having the handling and analysis tasks carried out by a multi-axis system.

Your contact for public relations:

Dunkermotoren GmbH
Janina Dietsche
Allmendstr. 11
D-79848 Bonndorf
Telefon: +49 7703 930-546
E-Mail: Janina.Dietsche@ametek.com