Linear motors for medical diagnostic applications


(Source: Dunkermotoren)

Medical diagnostic labs scale up to meet growing demand. The electric linear motors with CANopen connectivity from Dunkermotoren (Germany) are suitable for such applications due to their precision, flexibility, and reliability, states the manufacturer.

In the high-stakes world of medical diagnostics, where accuracy and speed can directly impact patient outcomes, the performance of every component matters. Among the unsung heroes of this field are electric linear motors quietly powering everything from fluid handling systems to complex robotic pick-and-place mechanisms. As diagnostic labs scale up to meet growing demand, these motors are becoming indispensable for their precision, flexibility, and reliability.

Each application brings with it a multitude of requirements that must be considered when designing a diagnostic machine. Smooth running, good controllability, high accuracy, a long service life, freedom from wear and maintenance are essential criteria of linear motors. Especially, they generate little to no wear particulate, which is critical for maintaining clean diagnostic conditions.

In the medical diagnostics sector, it is important to be at the cutting edge of technology, which induces designers to look for solutions that improve the mentioned criteria. Each subsequent generation of devices improves the reliability of the overall system and increases the machine performance. In particular, the increasing number of tests, such as blood counts, leads to automation of the test equipment. Large laboratories are already looking for compact, modular test cells that can be expanded with little effort, even as demand increases. Another important criterion is the rapid reporting and transfer of test results to the doctor and patient.

With the electric linear motors, Dunkermotoren offers a solution for a flexible use. From individual axes to multi-axis systems, the linear modules can be tailored to the customer's needs. The linear motors in the ServoLinear and ServoTube series provide maximum acceleration, speed and precision, without the backlash or hysteresis typically associated with gear- or thread-based systems, informs the company. Due to the integrated sine-cosine encoder, the absolute position can be determined with accuracies of up to 6 µm. For higher requirements of 1 µm, precision-accurate linear absolute encoders can be used.

A linear motor from Dunkermotoren is modular and can be adapted to any application in different versions. Many of the motors are self-guided, eliminating the need for additional guiding mechanisms in compact systems. The devices are available in different configurations such as actuators, TwinGuide systems, modules, or stainless-steel versions.

Depending on the application, running performances of more than 50000 km can be achieved. This functions without the need for lubrication, which simplifies maintenance and reduces contamination risk in sensitive environments. The 3-phase ServoLinear motors with integrated 1-Vpp sin/cos feedback can be connected to servo controllers from various manufacturers. The connection principle of the linear motors is comparable to that of a commercially available rotary servo motor with a sin/cos encoder system. Thus, they can be flexibly integrated into machine manufacturer's control concept.

Servo controller

Dunkermotoren offers a linear motor package for the ServoTubes 25/38 and ServoLinear 38 with the DME 230x4 or DME400x8 servo controller series. The controller hardware and settings are matched to the linear motors and make commissioning even easier. The motors can be controller e.g., via CANopen or digital signals (24-V inputs or outputs). If the latter is the case, the customer has the option of saving a sequence program in the controller. With a maximum of 500 programming lines, complex travel profiles can be implemented without a higher-level network system.

Figure 1: Actuator version (Source: Dunkermotoren)

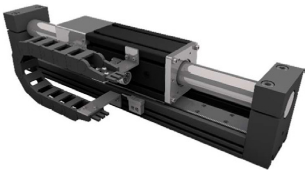

Figure 2: Modul version (Source: Dunkermotoren)

Figure 3: Twin-guided version (Source: Dunkermotoren)

Figure 4: Stainless-steel version (Source: Dunkermotoren)

In addition, the motors operate with virtually no mechanical noise, which is an important factor in maintaining a quiet lab environment. Compared to other linear technologies, the acquisition costs are quickly amortized due to increased performance and lower operating costs, adds Dunkermotoren. However, if the rod-guided direct motors are used within a multi-axis system, two linear motors can also perform complex movements independently of each other. A gantry is usually constructed as an XYZ or XYYZ variant. With the linear motor multi-axis systems, several motors can be moved differently on one axis. With this type of multi-axis system, higher machine outputs can be achieved than with typical pick-and-place robots.

Figure 5: For larger loads and only low dynamics in the Z-axis, it is possible to use the electric lifting cylinders of the CASM series (Source: Dunkermotoren)

By using programmable S-ramps, the linear motors can handle very sensitive products without causing damage to the samples or components. This is also the case, if these movements are carried out simultaneously and under maximum dynamics. For larger loads and only low dynamics in the Z-axis, it is possible to use the electric lifting cylinders of the CASM series. The series is a suitable for 1:1 replacement of pneumatic cylinders in sizes NEMA 32 to NEMA 63. It also allows the Z-axis to be held in position, even when the system is de-energized.

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