Application range

Modern high-production equipment demands increasingly numerically driven movements with extreme performance in acceleration, speed, and precision. Conventional systems — a rotating electrical motor plus mechanical transmission elements (gearboxes, belt drives, or rack-and-pinion) — can meet these requirements only with great effort.

In many cases, linear direct-drive technology is an optimal alternative, offering significant benefits:

Benefit	**Description**
High velocity and acceleration	Enables extremely fast and dynamic motion
Excellent control quality and positioning behaviour	Very high precision and repeatability
Direct power transfer	No mechanical transmission elements such as ball screws, toothed belts, or gear racks
Maintenance-free drive	No wearing parts on the motor
Simplified machine structure	Fewer components, easier integration
High static and dynamic load rigidity	Robust and stable under load

Because the drive is installed directly into the machine, there are no wearing mechanical components. The result is a power train with no or minimal backlash, which permits very high control quality — gains in the position control loop (Kv factor) of more than 20 m/min/mm. In conventional electromagnetic systems, positioning tasks with high feed rates, or highly accelerated short-stroke movements in quick succession, lead to premature wear of mechanical parts and thus to failures and significant costs. In these applications, linear direct drives offer decisive advantages.

Considering the benefits above, the following applications are suitable for linear synchronous direct drives:

Application
High-speed cutting in transfer lines and machining centres
Grinding of camshafts and crankshafts
Laser machining
Precision and ultra-precision machining
Sheet-metal working
Material handling, textile and packaging machines
Free-form surface machining
Wood working
Machining of printed circuit boards
...and many more

Through a practical combination of motor technology and intelligent digital drive controllers, the linear direct-drive technique offers new solutions with significantly better performance. The current development status of NILAB's synchronous linear technique permits a very high force range: feed drive systems from a fraction of N up to 27000 N per motor, and speeds up to 270 m/min.

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