

# 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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