LinMot®

Servo Drives

The wide product range of LinMot servo drives allows the rapid implementation in applications from simple two position point to point movements up to complex, high-precision multi-axis synchronization with electronic line shaft.

LinMot Drives cover the entire power range from the 24 to 72VDC low voltage range up to powering high performance servo motors with direct connection to 3phase 480VAC.

A 1100
B 1100
C 1100
C 1200
E 1100
E 1200
C1400
E 1400

✓ **Wide range of applications from point to point to complex multi-axis applications**

✓ **Serial communication, field buses and realtime ETHERNET**

✓ **Internally stored motion profiles or program sequences**

✓ **Control of position, velocity, acceleration and force**

✓ **Integrated safety functions for switching off the power output stage**

✓ **Compact design and easy commissioning**

LinMot®

C 1200
Compact Drive / NC Motion

- » 24...72VDC
- » Absolute / relative
  positioning commands
- » Limited jerk
  motion commands
- » Time Curves
- » Real Time (Streaming)
- » Synchronous control
  (Drive profiles)
- » PLC or Stand-Alone Solutions
- » Configuration over Industrial
  Ethernet (EoE)
- » Digital and Analog IO's
- » Safe Torque Off
- » Interface for optional incremental
  and absolute sensor
- » Supports Plug and Play
- » UL 508C

C 1100
Compact-Drive / Point to Point

- » 24...72VDC
- » Absolute / relative
  positioning commands
- » Limited jerk
  motion commands
- » Time Curves
- » Real Time (Streaming)
- » PLC or Stand-Alone Solutions
- » Digital and Analog IO's
- » Safe Torque Off
- » Safe Limited Speed Ready
- » Interface for optional incremental
  and absolute sensor
- » Supports Plug and Play
- » UL 508C

A 1100
Small drive for instrument engineering

- » 24...72VDC
- » Absolute / relative
  positioning commands
- » Limited jerk
  motion commands
- » Time Curves
- » PLC or Stand-Alone Solutions
- » Digital IO's
- » Supports Plug and Play
- » UL 508C

B 1100
Standard

- » 24...72VDC
- » Absolute / relative positioning commands
- » Limited jerk motion commands
- » PLC or Stand-Alone Solutions
- » Digital und Analog IO's
- » Interface for optional incremental sensor
- » Position Encoder Simulation (RS 422)
- » ± 10 VDC Force / Speed Control

DeviceNet / CANopen

E1100
Universal

- » 24...72VDC
- » Absolute / relative positioning commands
- » Limited jerk motion commands
- » Time Curves
- » Real Time (Streaming)
- » Master Encoder Synchronization (In/Out)
- » PLC or Stand-Alone Solutions
- » Digital and Analog IO's
- » Interface for optional incremental sensor
- » Master / Slave Solutions
- » UL 508C

PROFI / DeviceNet / CANopen

E 1200
High End

- » 24...72VDC
- » Absolute / relative positioning commands
- » Limited jerk motion commands
- » Time Curves
- » Real Time (Streaming)
- » Synchronous control (Drive profiles)
- » Master Encoder Synchronization (In/Out)
- » PLC or Stand-Alone Solutions
- » Industrial Ethernet Configuration / Remote Access Ethernet
- » Digital and Analog IO's
- » Interface for optional incremental and absolute sensor
- » Position Encoder Simulation (RS 422)
- » Master / Slave Solutions
- » ± 10 VDC Force / Speed Control
- » Supports Plug and Play

PROFI / EtherCAT / EtherNet/IP / ETHERNET POWERLINK / sercos / CANopen

LinMot®

E 1400
High feature drive

» 3x400...480VAC
» Controls LinMot motors / AC servomotors
» Absolute / relative positioning commands
» Limited jerk motion commands
» Time Curves
» Real Time (Streaming)
» Synchronous control (Drive profiles)
» Master Encoder Synchronization (In/Out)
» PLC or Stand-Alone Solutions
» Industrial Ethernet Configuration
   / Remote Access Ethernet
» Digital and Analog IO's
» Safe Torque Off
» Interface for optional incremental
   and absolute sensor
» Position Encoder Simulation (RS 422)
» Master / Slave Solutions
» ± 10 VDC Force / Speed Control
» Supports Plug and Play

PROFIBUS / PROFINET / EtherNet/IP / EtherCAT / sercos the automation bus / ETHERNET POWERLINK / CANopen

C1400
Universal

» 1x200...240VAC
» For LinMot P10/AC servomotors
» 100 programmable motion profiles
» 255 storable motion commands
» Interface for incremental or absolute
   sensors
» RS232 configuration interface

PROFIBUS / PROFINET / sercos the automation bus / ETHERNET POWERLINK / EtherCAT

LinMot®

ME OUT

ME IN

CMD OUT

CMD IN

6 Force DHCP
5 Bootstrap
4 ME CAN Term
3 CMD CAN Term
2 CMD RS485 Term
1 AnIn2 Pull Down

OFF   ON

1   +5VDC
9   Sens A
2   Sens /A
10   Sens B
3   Sens /B
11   Sens Z
4   Sens /Z
12   Sens Alarm
5   GND
13   Hall Sw U
6   Hall Sw /U
14   Hall Sw V
7   Hall Sw /V
15   Hall Sw W
8   Hall Sw /W

X13 EXT POS SENS

Error   24V
Warning   EN   OK

CONFIG RS232   X19

X4.11 QuickStop, PTC2
X4.10 IO, PTC1
X4.9 IO, LIM+
X4.8 IO, LIM-
X4.7 IO, HSW
X4.6 IO, TRIG
X4.5 IO, CAP
X4.4 IO, AN
X4.3 IO, /BRK
X4.2 +24VDC
X4.1 DGND

X4 LOGIC SUPPLY / CONTROL

ID HIGH (5..8)   S1

ID LOW (1..4)   S2

RT BUS Error   OK

REAL TIME
ETHERNET   X17
                         X18

LinMot Talk and LinMot Designer

Correctly size and monitor your linear motors

Complete control in configuration and operating modes

A linear drive application starts with the correct sizing of the linear motor. LinMot provides designers with an easy to use tool. LinMot Designer calculates the parameters required to select a drive and linear motor for a given motion sequence and load case, and relates them to the selected linear motor and servo drive.

Using LinMot Talk PC interface, the engineer can configure LinMot servo drives. The motors are also monitored during operation and the current motion sequences are analysed (monitoring).

The integrated control panel gives the user direct access to the control and status words, as well as all commands that are invoked by the upper-level controller.

Design with LinMot Designer

» Specification of all global data
» Simulation of motions
» Determination of kinematic data
» Calculating motor power draw
» Approval of selected motor
» "Cost efficiency" tab that compares energy use between pneumatic cylinders and linear motors
» Design of rotary motors

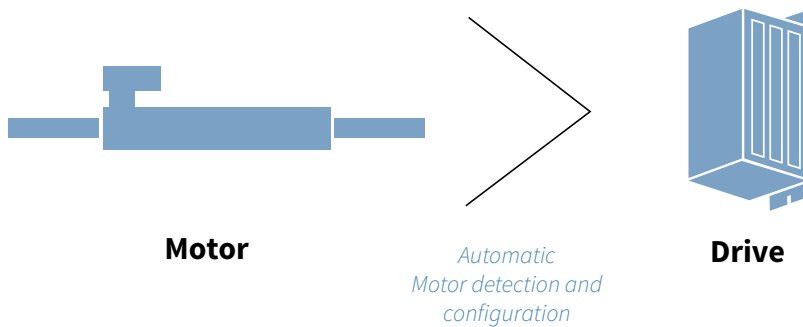### Configuration with LinMot Talk

» Drive and motor configuration
» Configuration of application data
» Create and save motion sequences
» Controller optimization and status monitoring
» Records and measurements with oscilloscope
» Reading error history (error management)

Commissioning by a click

Proven technology to get moving quickly.

Configuration via PnP

Motor — *Automatic Motor detection and configuration* — **Drive**

Configuration via PLC

SPS Libraries

Programming Examples

Function blocks — **PLC** — **Drive**


SPS Libraries and Programming Examples

LinMot Drives have all common fieldbus interfaces available for connection to a master controller.

In order to realize simple control concept integration, extensive function blocks and programming examples are provided for the customer. These function blocks allow for direct and quick LinMot drive integration.

The function blocks run standard functions as well as commands such as drive parameterization and configuration directly from the controller. The complete drive configuration of the corresponding axis is thus stored on the controller.

Maintenance or replacement can be easily realized via automatic drives detection and configuration over the communication bus. Thus manual and time-consuming configuration of the drives in case of failure is eliminated.
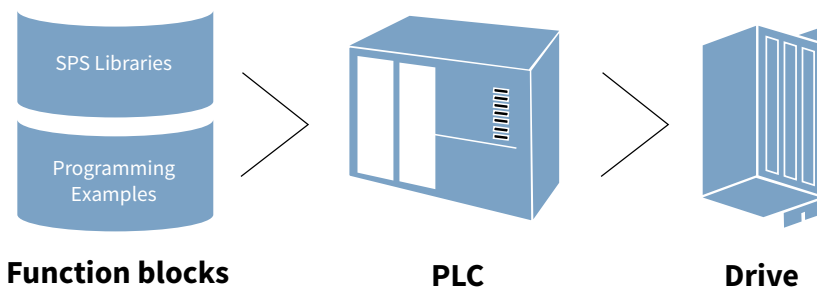
Automatic motor configuration

Plug & Play technology, well established in the computer industry, is now used by LinMot for commissioning linear motors.

With Plug & Play motors, the parameters are saved directly to the stator. The servo drive reads these values when it boots up, and sets the parameters accordingly. This automatic device detection eliminates the selection of the required model parameters from an extensive library.

Immediately after installing and connecting the cable, the motor can be moved immediately. Without having the configuration software to boot, first commands can be sent directly by the PLC control. Initial commissioning and replacement with a motor are thus very simple operations.

LinMot®

The right linear motor for every application

Food Products

LinMot drives provide machine builders with optimal components for putting the manufacturing and packaging processes in motion in the food products industry. In combination with freely programmable motion parameters via the drive, the motors provide a high level of flexibility for various applications.

» Beverage filling
» Single and multiple closures
» Weight products
» Metering products

» Sorting using pushers or pull noses
» Reject products
» Cutting food products
» Packaging

» Placing products in packages
» Sealing
» Compressing
» etc.

Textile Machines

Modern weaving machines profit by the LinMot technology for years. In the machines, the motors are used for example for laying and positioning of additional threads. Especially when it comes to the stitch weaving, they take over the work of the stitch drive axes. Also for the precise winding of textile yarn, the machine engineers prefer to use linear motors. For this purpose, LinMot has programmed a complete function block that controls the entire winding process and can be easily started by the PLC.
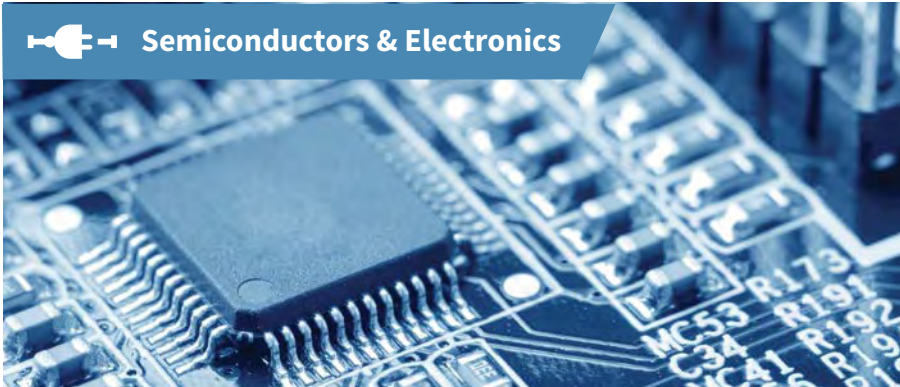
Wood Processing

Linear technology ensures automatic step width adjustment, for example, in order to guarantee optimal material cuts. In addition to this, there are other possible applications.

» Automatic step width adjustment
» Rapid transport of several drills

» Precise cuts for endless materials
» Handling of material

» etc.

Semiconductors & Electronics

In the semiconductor industry, the availability of systems and machines is an absolute requirement.

Modern electronics production must be capable of handling frequent product changes. With innovative drive solutions from LinMot and intelligent drive and controls components, production and conveying applications can be implemented effectively.

- » Front-end machines
- » Back-end machines
- » Wafer handling
- » Semiconductor handling
- » Semiconductor inspection machines
- » Semiconductor packaging machines
- » Populating machines
- » Flying probe testers
- » Depaneling
- » CD/DVD production systems & packaging machines
- » etc.

Automotive

Linear drive components from LinMot lead to greater flexibility and productivity in the automotive industry. They can effectively provide not only functional and durability tests for automobiles, but also applications all along the manufacturing process. This especially includes applications in the areas of assembly, material management, and error inspection.

- » Functional and durability tests
- » Assembling
- » Material management
- » Error inspection
- » etc.

Laboratory Automation

Automated workstations or laboratory equipment require a high level of flexibility and reproducibility from the selected drives.

LinMot components meet these requirements and are quiet, low-maintenance, clean-room-compatible and ensure smooth movements. The unusually compact LinMot drives are ideal for use in automated equipment because they take up very little space themselves.

- » Handling
- » Loading and unloading
- » Pick & place
- » Insertion
- » Closures
- » etc.

LinMot®

Medical & Pharmaceutical

The range of applications for linear drives in the medical and pharmaceutical sector is very broad.

For handling blood samples, counting and filling pills, or packing challenging medications, LinMot drive components provide a high level of dynamics and precision for implementing these tasks.

The hygienic design of the linear motors makes it possible to cleanly process these highly sensitive products in accordance with clean room regulations.

» Flexible filling stations
» Metering and counting
» Insertion
» Closures
» Pressing of closures

» Pressing of closures
» Carton packaging
» Labeling
» Pick and place systems
» Product handling and palletizing

» Blister & tray handling
» Packing systems for blisters & trays
» etc.

Handling & Assembling

In addition to an increased flexibility, a modern facility requires a maximum production speed and a secure traceability in the form of a complete electronic process documentation.

With freely programmable and highly dynamic linear motors, the plant engineer finds the optimal components for a modern production machine.

» Feeders
» Transfer systems
» Pick & place modules
» Palletizing units
» Stacking units
» XY tables

» Precision pressing
» Sorting systems
» Automatic screwdrivers
» Metering units
» Gluing stations
» Quality assurance

» Test fixtures
» Camera positioning
» Lighting positioning
» etc.

Printing & Labeling

Sensitive products can be printed more quickly using linear motor technology, because the printing process is performed using position, speed, and force control. The force impacts associated with pneumatic solutions do not occur.

In general, the freely programmable force and motion profiles lead to decisive process improvements in comparison with other types of drives, opening up many fields of application.

- » Inspection systems
- » Paper feeding
- » Decorating
- » Color mixing systems
- » Pad printing
- » Screen printing
- » Doctor blade controls
- » Labeling
- » etc.

Packaging

The highly dynamic and durable drives ensure high productivity and availability. The programmable drives can be adapted quickly to new products and types of packaging at the push of a button, providing continuous monitoring of motion parameters.

In many of these applications, linear motors are used as replacements for pneumatic cylinders, in order to make machines and systems more flexible, productive, and reliable while simultaneously reducing the energy cost for each package.

- » Insertion
- » Feeding
- » Guiding
- » Carton packaging
- » Sealing
- » Labeling
- » Unloading
- » Discharge
- » etc.

Electric linear motion
Superior to pneumatic cylinders in
many applications.

Electricity instead of air

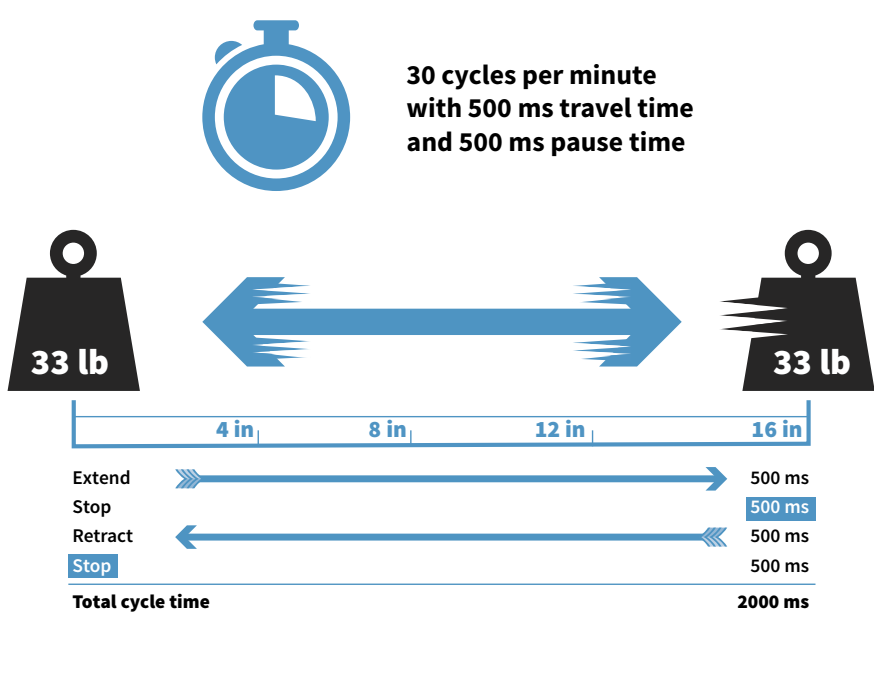**Energy and cost savings - Unique Advantages of electric linear motion technology**

Machine design engineers have found numerous situations where linear direct drives provide distinct advantages over pneumatic actuators. These include: If more than two end positions are needed, if the positions are to be changed by software, if running synchronously with a main drive is required or the dynamics / life of a pneumatic cylinder is simply no longer sufficient.

Due to the high operating costs of pneumatic cylinders, linear motors may also prove to be a cost efficient alternative in simple point to point motions even with only two end positions.

This is especially true when the motions are in a cyclic operation and carried out regularly. Many times pneumatic cylinders must be oversized due to the speed and load conditions. In many cases the pneumatic cylinder energy and maintenance costs exceed the investment costs within a few weeks.

A typical cost comparison shows the impressive cost savings with LinMot linear motors.

Cost comparison example

Application

30 cycles per minute
with 500 ms travel time
and 500 ms pause time

33 lb   **33 lb**

| 4 in | 8 in | 12 in | 16 in |

Extend		500 ms
Stop		500 ms
Retract		500 ms
Stop		500 ms
Total cycle time		**2000 ms**

Parameter

Positioning time:	500 ms
Required acceleration:	10 m/s2
Required speed:	1 m/s
Expected period of operation:	8000 h

Comparison of technology

Linear Motors

» Acceleration work is performed only during 100 ms.
» At standstill, no energy is expended.
» At a constant speed, only energy to overcome the friction is used.
» Kinetic energy is stored in the DC link capacitor of the servo drives.
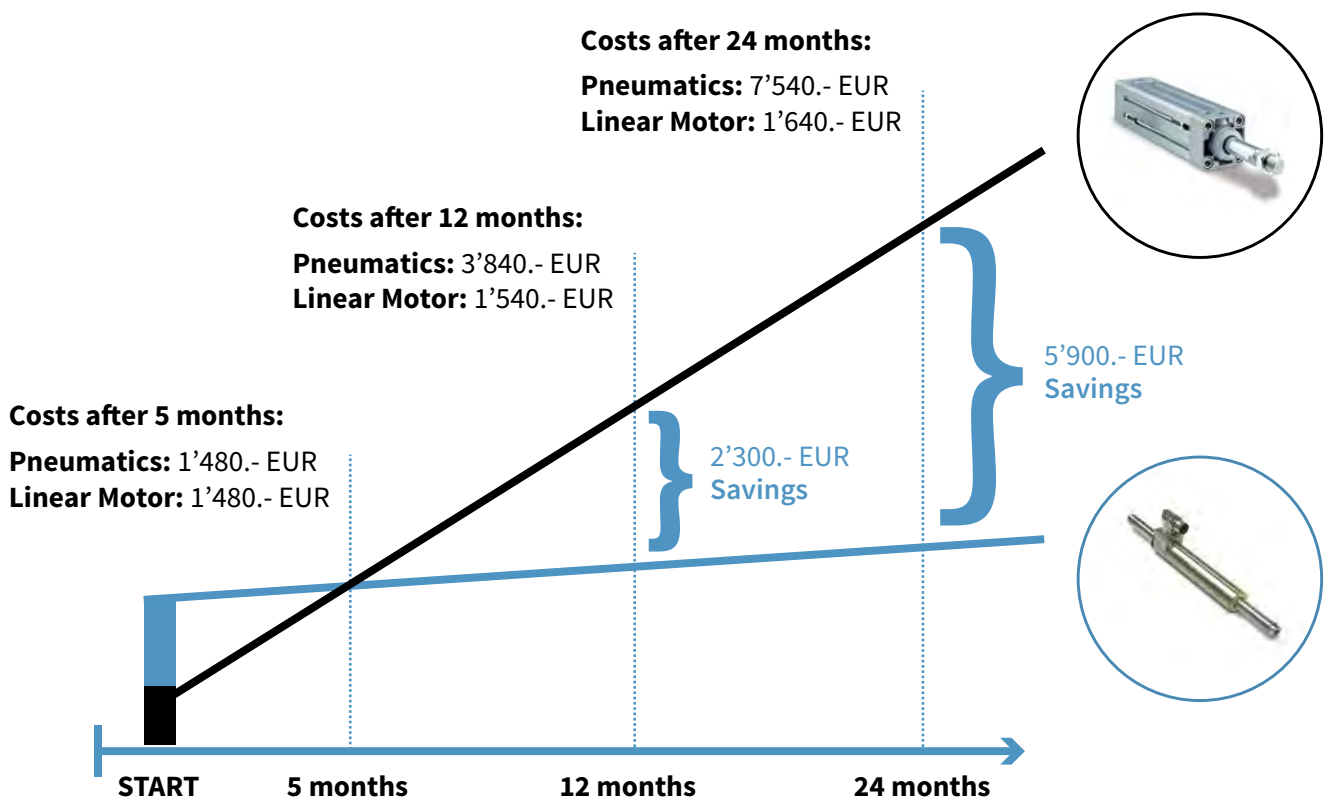» **The measured power consumption for this application is 92 W on average.**

Pneumatic cylinder

» For the required mass and velocity a piston diameter of 50 mm is required.
» During the entire moving time, compressed air power is required.
» Dampers absorb the energy during braking. The energy cannot be stored.
» Due to the cylinder diameter, the stroke and the cycle time the annual air requirement equals 150.000 Nm^3 per year.
» Pneumatic manufacturers list production costs for compressed air at 0.025 EUR/Nm^3.

Energy costs

» At a current price of 0.12 € / kWh and 8000 hours of operation, **the annual energy cost is € 96.**

» With production costs of 0.025 EUR / Nm^3 and an air consumption of 150.000 Nm^3.
» **The annual compressed air costs are 3.750.- €.**

Total cost comparison and CO$_2$ emissions

Costs after 24 months:

Pneumatics: 7'540.- EUR
Linear Motor: 1'640.- EUR

Costs after 12 months:

Pneumatics: 3'840.- EUR
Linear Motor: 1'540.- EUR

5'900.- EUR
Savings

Costs after 5 months:

Pneumatics: 1'480.- EUR
Linear Motor: 1'480.- EUR

2'300.- EUR
Savings

START   **5 months**   **12 months**   **24 months**

The initial costs of a linear direct drive system including all components (cables, converters, etc.) required for the operation are higher than the initial costs for a pneumatic actuator system (incl. valves, hoses, etc.). But by accounting for the significantly lower energy costs of linear motors, these initial costs are recovered in less than half a year. After this time, the cost savings are realized as lower operating costs and increased profit margins. The operating energy costs of pneumatics exceed their initial investment costs after only three months.

CO$_2$ emissions can be drastically reduced by switching to an electric linear drive providing another huge benefit. The energy of 24,000 kWh, which is additionally required by the pneumatic cylinder in this sample calculation, results in an annual output of 12,000 kg CO$_2$. This calculation takes into account the German energy mix of 500g CO$_2$ / kWh.

Thus, the CO$_2$ record speaks clearly: A change to electric direct drives!

LinMot®

Competence

Everything from one source

Support

As the world`s leading manufacturer of industrial linear motors, NTI AG uses its knowledge and innovation to provide customized solutions. Seeking the optimal solution of specific drive tasks our application engineers offer exceptional support to the customer. Our customers can rely on years of production experience for the implementation and production for customer specific drive solutions.

Innovation

Through continuous development and investment and with the input of our worldwide sales consultants, engineers and partners NTI AG is able to offer its customers commercially viable new products at attractive prices.

Production

The standardized LinMot and MagSpring products are manufactured via self-designed production facilities. This guarantees rapid product availability even in larger quantities while simultaneously allowing for maximum flexibility and customizations. The highly automated production facilities ensure constant high quality products.

«

Seeking optimal solutions for specific drive tasks LinMot application engineers provide exceptional customer support.

Logistics

LinMot and MagSpring products are standardized products, which are typically supplied from stock and available worldwide. Currently more than 1000 different drive and motor combinations are in stock and available within 48 hours worldwide.

Quality

Quality control starts with the checking of incoming material and continues into production all the way through the final burn-in testing before delivery. All LinMot linear motors are subjected to a 24-hour burn-in before delivery. For long-term quality assurance, LinMot products are labeled with a unique serial number on the Stator, on its electronic nameplate and in the Servo Drive.