L-force

9400 HighLine Servo Drives

Productive, economical, easy to use

Lenze

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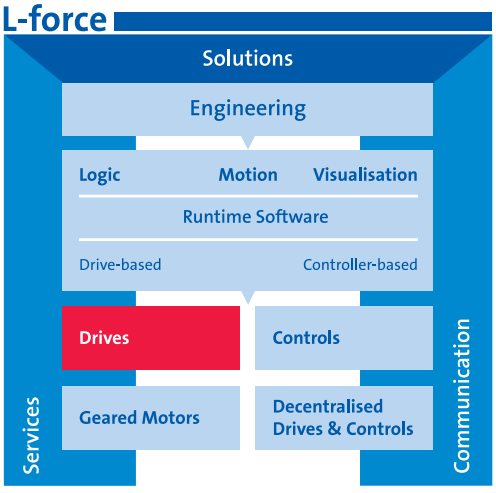
L-force | your future is our drive

Cost efficiency, saving time and improving quality are the challenges of the future. Lenze is meeting these challenges with L-force – the drive and automation family with wide-ranging solutions and compatible interfaces and components. L-force means faster project planning and commissioning, enhanced performance and flexibility in production.



Driven by innovation – New ideas for new possibilities

Always on the lookout: Our idea of innovation is working on even better solutions for our customers, every day.

Driven by flexibility – High degree of scalability for individual solutions

Scalability is an important aspect of the **L-force** philosophy. Performance, scope of functions, software, service provisions and aftersales care – Lenze will provide you with exactly the combination you require.

Driven by usability – Simple solutions, even for complex applications

We always focus on the user. Therefore, when we developed **L-force,** we made sure that people with plenty of practical experience were involved, right from the start.

Driven by compatibility – Universal products and solutions

Don't waste any more time searching for suitable components and the right interfaces. With **L-force,** everything is compatible.

Driven by completeness – Comprehensive and modular

Our drive electronics include the modules to meet your requirements.

9400 HighLine Servo Drives | intelligently simplified

Servo technology from Lenze - Hear the difference. The click of our servo technology revolutionises the way you handle your systems and processes. Experience the highlights of 9400 Servo Drives – modularity, assembly concept and integrable safety with simple clicks.

Click – The new assembly concept
It's the revolutionary electromechanical assembly concept of the 9400 Servo Drives that makes them so appealing. The installation backplane and drive electronics (up to max. 15 kW) are separate, which makes installation, mounting and application incredibly simple.

Click – The modular architecture
The modular drive system can be easily customised to your application. We are also happy to take on this task for you and supply a tested, complete system. All you then have to do is install and commission the system, making configuration child's play. You can even put together the optimum solution yourself with little effort.

Click – With integrated safety
The optional pluggable safety modules satisfy the requirements of IEC 61508 SIL3 and are tested by the German TÜV authority. The modular approach also gives you the reassurance that you can grow to meet future requirements.

Benefit from the levels of freedom the drive system offers you. A wide range of equipment features is available.

New assembly concept up to 11 kW

9400 HighLine Single Drives

Drive technology | that is sure to impress

The 9400 HighLine Servo Drives are available in two versions: Single Drive and Multi Drive.

Single Drives
Our single-axis drives combine mains supply, DC bus and inverter in a single unit. The filter elements and the brake chopper are integrated into the controller and permit self-sufficient application in distributed control cabinet installations. Single Drives are available in the 0.37 to 370 kW power range.

Multi Drives
Our multi-axis drives are particularly suitable for centralised, compact multi-axis installations. The energy exchange via the DC bus reduces the power requirement on the mains side. The axes share use of the mains supply, brake chopper and EMC filter. This significantly reduces material and installation costs. The integrated DC busbar system allows compact installations for controllers rated up to 15 kW.

Further benefits
- Can be used throughout the world
  - Wide operating voltage range
  - UL certified
  - CE compliant
- Integrable brake control
  - Small footprint
  - Minimal wiring
  - Intelligent brake logic as standard

9400 HighLine Multi Drives

High-tech | that makes your life easier

Right from the start – The versatile standard equipment offers you a comprehensive range of options for handling your tasks.

Onboard

- **CANopen system bus**
  Ready for communication right out the box thanks to the integrated CANopen system bus interface. This guarantees the interaction with other system elements.

- **Conventional I/O**
  A wide range of analogue and digital inputs and outputs makes drive expansion superfluous in many application cases.

- **Diagnostic LEDs**
  The six built-in diagnostic LEDs reveal the drive's status at a glance.

- **Local diagnostics**
  More in-depth diagnostics on a PC connected by USB adapter or a keypad with plain text display are possible at any time via the local diagnostic interface.

- **Feedback systems**
  The resolver input, standard on Lenze drives, is supplemented by a versatile multi-encoder interface. This creates scope for the simultaneous use of a direct position encoder or an alternative motor feedback.

Communication | for harmonious interaction

Communication without limits
Thanks to the drive's modularity, communication is not restricted in any way. Pluggable modules guarantee adjustment to the drive's environment in all situations (e.g. fieldbus systems) and allow future standards to be integrated.

PROFIBUS *Ethernet* *EtherCAT*

Ethernet in the drive
Ethernet gives you a platform for uniform horizontal and vertical communication. Other modules are available for Motion Control applications with strict real-time capability requirements.

Extension modules available
- Digital frequency
- CANopen
- DeviceNet
- Ethernet
- ETHERNET Powerlink (MN/CN)
- ETHERNET Powerlink (CN)
- EtherCAT
- PROFIBUS
- PROFINET

Remote maintenance
You can access the process data, parameters and application programs in the 9400 Servo Drives at any time and from any location. All you need is an Ethernet network or a phone line. Thanks to the latest OPC technology, software integration is not a problem.

Modem CAN *Ethernet CAN* *OPC-DriveServer*

Memory module | Scalable functionality

Simple and cost-effective
All drive settings and application data are stored on a pluggable memory module, the MM□□□. In the event of a hardware replacement, for example, all you then have to do is plug the memory module into the new device. Since the module also contains all the information regarding the functional scope required and configures the drive accordingly, only one type of drive needs to be held in stock. This drastically reduces the costs of maintenance and spare parts stock to a minimum.

Scalable functionality
Different memory module versions allow for tailoring to the individual functional range.

Speichermodul MM220

HighLine with . . .

MM220 memory module	MM330 memory module	MM430 memory module
The intelligent drive for modular engineering	The high-tech drive for demanding motion control	The high-tech drive for demanding motion control with a real-time clock function
The modules feature ► Parameterisable technology applications for simple entry level applications	► Individual solutions thanks to tried-and-tested function block libraries	

Safety | integrated in the drive

The challenge: Personal safety in the workplace. According to the European Machinery Directive, the manufacturer of a machine must ensure that operation, set-up and maintenance of the machine may be carried out without endangering the health and safety of workers (provided the machinery is used appropriately and for the intended purpose). In the case of drive systems, this means safe and reliable protection against uncontrolled movements.

SM100 *SM301*

The benefits of Lenze safety technology at a glance

- Cost and time savings thanks to the reduced number of components and reduced wiring requirements
- Faster response times mean shorter cycle times for the machine
- Simple understanding of a complex subject – the functions are integrated into the controller
- May be expanded to accommodate future safety concepts

Certified safety

All functions have been developed in accordance with IEC 61508, SIL 3 and, depending on the module, satisfy the requirements of EN 954-1 up to Cat. 4. The SM100 and SM301 safety modules are already certified with the highest performance level “e” in accordance with EN ISO 13849-1. Acceptance by the TÜV testing authority confirms this.

TÜV Rheinland Group

TÜV Industrie Service GmbH
Automation, Software und Informationstechnologie

→ **Further information may be found in the L-force Drive-based Safety product information flyer.**

SM□□□

- **SM0**
  Without safety function / required to operate the controller
- **SM100**
  “Safe Torque Off” (STO) safety function
- **SM301**
  Advanced safety functions include:
  "Safe Torque Off" (STO), Safe Stop 1 & 2 (SS1 & SS2), Safely Limited Speed (SLS), Operation Mode Selector with Enable Switch (OMS & ES) safe two-channel inputs/output, optional PROFIsafe via PROFIBUS or PROFINET, other...

Systematic software | architecture

Flexible and yet uncomplicated to use. The 9400 HighLine Servo Drives simply and consistently solve motion and process tasks as well as complex machine functions. The basis for this is a multi-layered software architecture which ensures scalability, flexibility and expansion capability in a unique way.

Scalable functionality
Pre-prepared technology applications, which need only their parameters setting, reduce engineering efforts and meet targets quickly. The drives can be commissioned using the keypad or custom PC dialogs in the L-force Engineer.

CiA 402 device profile
For centrally controlled motion control architectures, the device profile is widely available according to CiA 402 / IEC 61800-7-2. The communication paths CAN and EtherCAT as well as the following operating modes are supported:

- Homing mode
- Interpolated position mode
- Cyclic synchronous position
- Cyclic synchronous velocity

Graphical support
The sequence chains act as graphically assisted input options for positioning programs and lead to simple operation and a clear representation of complex processes.

Technology level

- **MotionControl TopLevel**
  (MM330 or MM430 required)
  – Positioning sequence control
  – Function blocks for electronic cams
- **MotionControl HighLevel**
  (MM220 required)
  – Electronic gearbox and synchronisation with mark synchronisation
  – Actuating drive (speed, torque)
  – Table positioning
  – Comprehensive function block library

Operating system

- Basic functions, e.g. referencing, manual jog, brake control
- Motor control, drive monitoring and diagnostics, communication

Engineer | to increase productivity

The L-force Engineer is the engineering tool for the commissioning and diagnostics of the 9400 Servo Drives. The user interface is intuitive and easy to use. The clearly structured dialogs of the L-force Engineer are specially adapted to user needs and thereby result in an increase in productivity throughout the entire engineering phase.

The L-force Engineer is available in two versions:

► **StateLevel Engineer**
As a free of charge engineering tool for service staff members and commissioners, it contains all important functions for parameter setting and diagnostics.

► **HighLevel Engineer**
As a powerful project planning tool, even for large systems, this tool combines the engineering of function block interconnection, network communication and cam technology.

Simple start-up thanks to integrated wizards.
The start-up wizard of the Engineer guides beginners through the first steps of project planning. You'll receive support for integrating the controller, application, motor and gearbox, without needing spending valuable time studying handbooks.

Start-up wizard
- ► Select controller
- ► Configure hardware
- ► Add technology application

Configuration options
- ► Hardware
- ► Network
- ► Function blocks
- ► Wiring/interconnections editor

Network configurator
You can carry out network configurations at a later date. You can quickly and easily configure the network for the integrated CAN in the 9400 HighLine Servo Drives.

Wiring/interconnections editor
In the wiring/interconnections editor, graphics show you which inputs and outputs (ports, usually called PDO in the context of a CAN) are to be transmitted via the CAN bus. The Engineer can then assign the identifiers automatically.

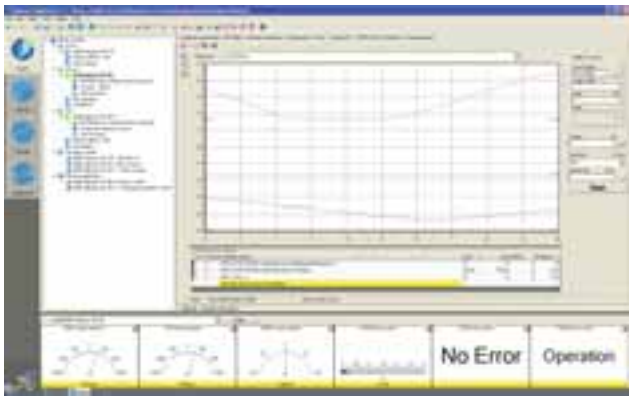
Parameter setting interfaces
New graphics-based parameter setting interfaces have been created. You will find it easy to locate the most important parameters for your application.

Function block editor
Lenze's tried-and-tested function block editor has also been significantly improved. The entire plan now appears on a single user-friendly screen. Once you have defined your settings, you can print the function block overview.

Diagnostics
Any faults can be found immediately in the easy-to-use diagnostics interfaces and the monitor window. An oscilloscope is even provided without the need for you to connect up external measuring equipment.

Document archiving
Other documents that are important for your project, such as CAD drawings, sketches, Word files, PDFs, etc. can also be stored in the Engineer project – so you always have all the information to hand.

Parameter setting/configuration
- Parameter setting interfaces
- Function block editor



Diagnostics
- Diagnostic interfaces
- Oscilloscope
- Monitor window

A perfect couple

9400 HighLine Servo Drives and Lenze motors

The MCS, MCA, MQA and MDFQA series of servo motors are a perfect complement to the 9400 Servo Drives. The motors in these series are all characterised by low moments of inertia, compact designs with high power density and robust construction. Furthermore, MDXMA series standard asynchronous motors with or without encoders can also be operated on the 9400 Servo Drive.

MCS and MCA servo motors

Does your application require optimum dynamics and precision in a compact package? Then synchronous MCS servo motors are the right choice for you.

With a power range from 0.25 kW to 15.8 kW, a rated torque range of 0.5 Nm to 72 Nm and peak torque values of up to 190 Nm, these motors will meet all your needs for compact and dynamic drive technology.

The innovative Single Element Pole Technology, high-quality magnetic materials and special pole forms create a sound basis for excellent drive characteristics.

The minimum detent torque levels offer excellent smooth running characteristics and thereby ensure exemplary control behaviour. The robust mechanical design with reinforced bearings, a high degree of protection and full stator encapsulation increase operational reliability, even in harsh ambient conditions.

The compact design of the MCA asynchronous servo motors and their low moment of inertia make the motors suitable for use in dynamic applications. In the event of a wide speed setting range and requirements for a rugged construction, there's no better choice than Lenze MCA asynchronous servo motors.

Whether naturally ventilated or with forced ventilation – in a power range from 0.8 to 53.8 kW, MCA asynchronous servo motors provide rated torques of up to 280 Nm. In comparison to standard three-phase AC motors, the motors in this product family are characterised by their low moment of inertia, low weight and high maximum speeds.

The benefits of MCS and MCA series motors at a glance

- High dynamic performance thanks to low moments of inertia
- Compact design with high power density
- Robust regenerative resolver system, or sin/cos encoder (MCA: additional incremental encoder) for the highest precision
- Plug-in connections offer user-friendly installation and servicing (terminal box optional)
- IP54 protection (IP65 optional)
- UR certified (MCS: additionally certified in accordance with CSA), CE compliant
- Electronic nameplate
- May be used in field weakening operation

MQA and MDFQA servo motors

Designed for the harsh conditions of continuous operation at high torques, the enclosed-ventilated motors in the MQA and MDFQA ranges offer long service life and optimum operational performance in all drive situations.

The motors have a power range of between 10 kW and 95 kW and a compact design with IP23 protection. They have been designed specifically for operation with Lenze frequency and servo inverters. A wide range of feedback systems, brakes and blowers ensures that the perfect system configuration is available for virtually all operating conditions.

The benefits of the MQA and MDFQA series motors at a glance

- High power density
- Exceptionally smooth running characteristics
- IP23 protection
- Terminal box for power, brake, encoder
- Temperature class F
- KTY temperature monitoring
- Radial blower
- Blower on non-drive end, may be fitted either end
- B 5 or B 35 design
- Wide speed control range
- May be used in field weakening operation

→ **Further information may be found in the product information relating to our motor and geared motor ranges.**

Technical data | 9400 HighLine Servo Drives

The technical data applies to operation with 3/PE 400 V AC or 565 V DC at the stated switching frequency.

Single Drive axis modules

Mains voltage range		3/PE AC 180 V -0 % ... 550 V +0 %; 45 Hz -0 % ... 65 Hz +0 %										
Rated output current	**[A]**	1.5	2.5	4	7	13	16.5	23.5	32	47	59	86	104
Rated switching frequency	**[kHz]**	8	8	8	8	8	8	8	8	4	4	4	4
Max. output current [1)]	**[A]**	6	10	16	21	39	49.5	58.8	76,8	94	118	172	208
Typical motor power	**[kW]**	0.37	0.75	1.5	3	5.5	7.5	11	15	22	30	45	55
Electronics supply		Internal; alternatively DC 24 V external											
Brake chopper		Integrated											
Brake resistor		External											
Dimensions (H x W x D)	**[mm]**	481 x 60 x 288		481 x 90 x 288		481 x 120 x 288			602 x 206 x 294			702 x 266 x 370	

[1)] The switching frequency is adjusted automatically depending on utilisation.
0.5 s with max. output current, then 4.5 s with reduced output current.

Mains voltage range		3/PE AC 342 V -0 % ... 550 V +0 %; 48 Hz -0 % ... 65 Hz +0 %								
Rated output current	**[A]**	145	172	202	245	292	366	460	572	635	695
Rated switching frequency	**[kHz]**	4	4	4	2	2	2	2	2	2	2
Max. output current [1)]	**[A]**	261	310	364	441	526	659	828	1030	1143	1251
Typical motor power	**[kW]**	75	90	105	130	150	190	240	300	335	370
Electronics supply		Internal; alternatively DC 24 V external									
Brake chopper		Integrated									
Brake resistor		External									
Dimensions (H x W x D)	**[mm]**	930 x 407 x 427	1199 x 407 x 427		1580 x 407 x 427			1559 x 568 x 541			

[1)] The switching frequency is adjusted automatically depending on utilisation.
10 s with max. output current, then 50 s with reduced output current.

Multi Drive axis modules

DC supply		DC 260 V -0 % ... 775 V +0 %							
Rated output current	**[A]**	1.5	2.5	4	7	9.3	13	16.5	23.5	32
Rated switching frequency	**[kHz]**	8	8	8	8	8	8	8	8	8
Max. output current [1)]	**[A]**	6	10	16	21	28	39	49.5	70.5	76.8
Typical motor power	**[kW]**	0.37	0.75	1.5	3	4	5.5	7.5	11	15
Electronics supply		DC 24 V external								
Brake chopper		By power supply module								
Brake resistor		By power supply module								
Dimensions (H x W x D)	**[mm]**	481 x 60 x 288			481 x 90 x 288		481 x 120 x 288			

[1)] The switching frequency is adjusted automatically depending on utilisation.
0.5 s with max. output current, then 4.5 s with reduced output current.

Technical data | 9400 HighLine Servo Drives

Supply modules

Mains voltage range		3/PE AC 180 V -0 % ... 550 V +0 %; 45 Hz -0 % ... 65 Hz +0 %			
DC rated output current	[A]	10	36	100	245
DC max. output current [1]	[A]	40	108	200	368
Rated mains current	[A]	8	29	82	200
Electronics supply		DC 24 V external			
Brake chopper		Integrated			
Brake resistor		External			
Dimensions (H x W x D)	[mm]	461,5 x 60 x 288	461,5 x 120 x 288	510 x 210 x 288	510 x 390 x 288

[1] 0.5 s with max. output current, then 4.5 s with reduced output current.

Regenerative power supply modules
Information on the regenerative power supply modules can be found in the “L-force Energy Recovery” product information.

Performance characteristics | Overview

Control types	Servo control, sensorless vector control for devices up to 104 A, V/f control	✓
Basic functions	e.g. referencing, manual jog, speed, torque and position follower, brake logic, electronic nameplate, oscilloscope function	✓
Interfaces	Analogue inputs / outputs	2/2
	Digital inputs / outputs	8/4
	CANopen	✓
	Resolver input	✓
	Multi-encoder interface for one of the following feedback systems: – TTL incremental encoder – SinCos incremental encoder – SinCos absolute value encoder with Hiperface® interface – SinCos absolute value encoder with Endat V2.1 interface – SSI encoder with Stegmann SSI protocol as position or master encoder with a minimum cycle time of 1 ms	✓
Extension modules	Number of slots	2
	Ethernet, ETHERNET Powerlink, PROFIBUS, CANopen, TTL digital frequency, PROFINET, EtherCAT, DeviceNet	○
Memory modules – functionality	MM220 – Motion Control HighLevel	●
	MM330 – Motion Control TopLevel	○
	MM430 – Motion Control TopLevel with real-time clock function	○
Safety modules	SM0 – no safety functions	●
	SM100 – Safe Torque Off, EN954-1-Cat. 4, EN ISO 13849-1 PLe	○
	SM301 – Extensive safety functions, e.g. Safe Torque Off, safe stop 1, safe stop 2, safely limited speed, Safe inputs and outputs, PFROFIsafe ◑[1], EN954-1-Cat. 3, EN ISO 13849-1 PLe	○
Motor brake module	DC 24 V – 2.5 A, may be integrated into installation backplane up to 11 kW	○
	DC 24 V – 5 A, may be integrated into drive from 15 kW	○
	DC 180 V – 0.61 A, may be integrated into drive from 15 kW	○
	DC 205 V – 0.75 A, may be integrated into drive from 15 kW	○

✓ Included
● Standard
○ Option
◑[1] In conjunction with PROFIBUS-/PROFINET communication module

→ **Further information may be found in the L-force Drive-based Safety product information flyer**