

# L-force Controls

*Control Technology*



A control system in just 4 steps

# Logic

## IEC 61131-3

## PLCopen

# Motion

# Logic

## IEC 61131-3

### L-force | your future is our drive

Demands are increasing all the time. In future, key challenges will lie in the areas of cost efficiency, time-saving and quality improvements. Faster project planning and commissioning, improved performance and increased flexibility in production are expected. New ideas are therefore needed for the machines of the future.

Lenze has risen to this challenge and, with L-force, we can now not only offer you an innovative family of drive and automation products, but also a new, comprehensive portfolio of solutions.

#### 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

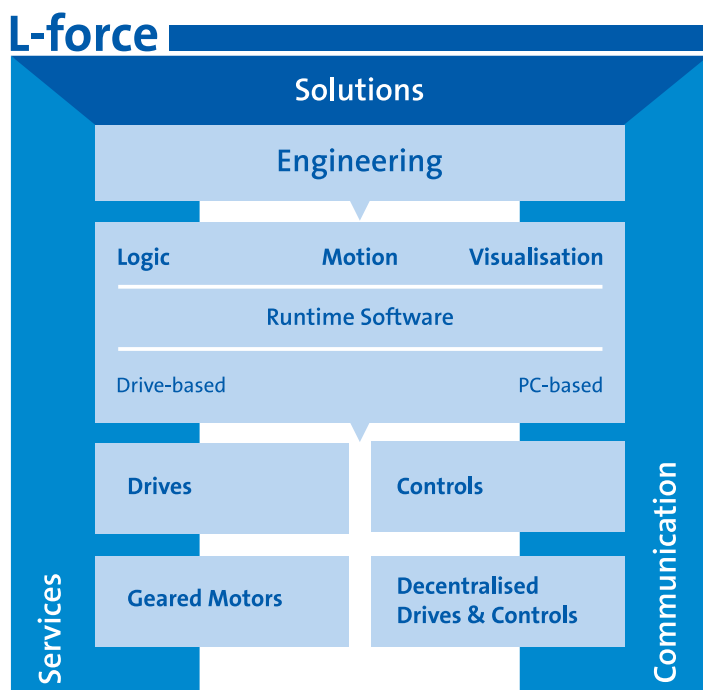
We always focus on the user. Therefore, when we developed L-force, we made sure that people with plenty of practical experience were involved, right from the start.

#### 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.

#### Customer-specific control

No matter which variety of motion control your application needs, or your preferred type of automation architecture, L-force can offer a solution that meets your specifications in any scenario.



[www.L-force.de](http://www.L-force.de)

# L-force automation | a winning combination

**Today's powerful industrial PCs and progressive software makes it possible to unite motion control, logic control, numerical control and visualisation on a single platform. Compared to traditional solutions with dedicated motion and sequential controllers, this approach, which is characterised by a range of functions from simplified engineering to remote maintenance, usually has advantages in terms of costs. It's a particularly efficient way of implementing control systems.**

PC-based automation systems are reaping the benefits of rapid progress made within the realm of PC technology. For example, more powerful processors, larger and cheaper memory chips are used, as well as graphics engines. These trends are forcing dedicated PLCs, motion control equipment and specialist displays into niche applications.

In addition to the advantages it offers in terms of performance, the appeal of PC-based automation lies in its openness and scalability.

Now you can reap the benefits of a whole range of sophisticated and future-orientated system solutions for drive and automation technology – and all from a single source. Working in collaboration with you, we will analyse and optimise your specifications – from the power supply right through to the motion function – using a state-of-the-art, scalable product portfolio.

Offering a competent service as part of a value-adding partnership enables us galvanise your company's competitive advantage for the long term. Why not get in touch – whatever your location, we can help you with drive dimensioning, systems engineering and commissioning, and even offer a 24-hour service!



# Step 1 | selecting a design

In most cases, when an automation project begins the main body of the engineering work on the machine will already have been carried out, and the preferred operating philosophy established. However, it is also possible for this to take place at an early stage in the project. A good place to start is by selecting the design.

Aside from the desired or necessary operating philosophy, there are other criteria - such as the amount of space available or the operating conditions (e.g. minimum and maximum temperature, humidity, dust) – that play a role in selecting the most suitable design. In order to afford the designer maximum freedom in his/her selection, Lenze offers three designs that cover all possible configurations.

## Embedded Line

The Embedded Line (EL) for installation directly in the machine – at the point at which the operator is intended to have access to the machine functions.

### Industrial PCs for installation in control cabinets

- ▶ EL 870 -9700
- ▶ 8"-19.0"
- ▶ Different front side/keyboard versions

### HMI with Windows® CE

- ▶ EL 100 PLC
- ▶ 5.7"-10.4"

## Command Station

On account of its degree of protection, the Command Station (CS) is particularly suitable for setting up separate operating and monitoring stations.

- ▶ CS 5700 -9700
- ▶ 15.0"-19.0"
- ▶ Different front side/keyboard versions
  - Stand-alone, IP65 all around
  - Flexible support arm mounting

## Control cabinet PC

This design is intended for use in control cabinets, where it can be shielded from harsh operating conditions with particular ease.

- ▶ CPC 2700
- ▶ Option of using monitor panel as screen
  - MP DVI (Embedded Line design)
  - CS DVI (Command Station design)



Embedded Line



Command Station



Control cabinet PC

# Step 2 | selecting the functionality and capability

One of the biggest advantages of PC-based automation is the ability to combine logic, motion and visualisation on a single hardware platform. Since these software components are all executed on one system, it is essential to establish whether the industrial PC is to adopt the function of a motion controller or a visualisation device in addition to that of a PLC before the computer is actually dimensioned.

Depending on the function required, an L-force Logic or Motion runtime combination may be necessary. The efficiency of the system is determined by the processor that is used. Thanks to the scalable nature of the system, it is possible to decide which type of processor is required on the basis of the application program size, number of axes and size of the visualisation project.

## L-force Logic

### LPC 1000

- ▶ PLC functionality to IEC 61131-3
- ▶ Multitasking
- ▶ Based on the tried-and-tested CoDeSys system

## L-force Motion

### MPC 1200

- ▶ Motion according to PLCopen Parts 1 + 2
- ▶ NC functionality with 2 ½ interpolated axes (2.5 D)
- ▶ NC transformations: gantry, tripod and SCARA, via libraries
- ▶ G-Code interpreter module (DIN 66025)
- ▶ Electronic cam
- ▶ Electronic cam group

## L-force Visu

- ▶ VisiWinNET® visualisation system
- ▶ Straightforward operation and monitoring, right up to the SCADA system
- ▶ Scaling via a number of Power Tags

Text-based		
Instruction List (IL)	Structured Text (ST)	
LD VAR_1 Load value from Var_1 AND %IX1.0 AND input 1.0 OR %QX2.1 OR output 2.1 ST Var_4 Save result in	IF Bed1 THEN Z := -1; ELSE Z := 1 END_IF	
Graphics-based		
Ladder Diagram (LD)	Function Block Diagram (FBD)	Sequential Function Chart (SFC)

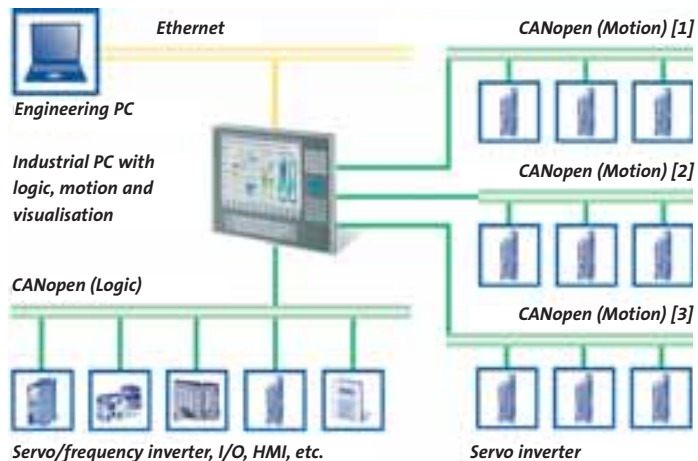




## Step 3 | selecting the bus system (CANopen or EtherCAT)

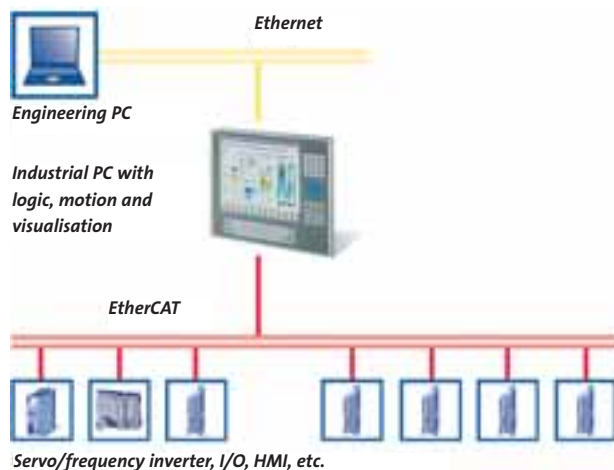
### CANopen

Where smaller systems are concerned, CANopen has proven itself to be a cost-effective and reliable solution for networking axes. Due to the limited transmission capacity, in the case of CANopen it is absolutely essential to separate the bus line into a logic bus and a motion bus. Up to four CAN lines that are synchronised with one another may be used to widen the existing scope of the CAN bus. By doing so, it also becomes possible to synchronise up to twelve drive controllers in one millisecond in a CANopen system.

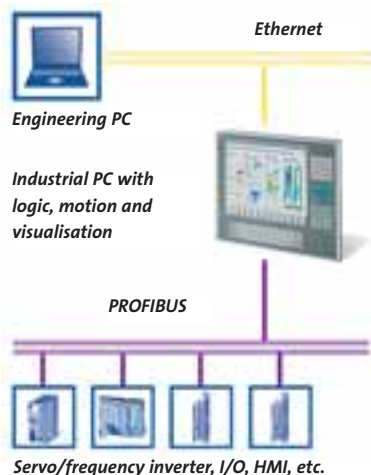


### EtherCAT

For larger machines and systems with more than twelve axes and/or line lengths longer than 25 m, modern Ethernet-based buses have been available for some years. EtherCAT in particular is the system of choice for PC-based control systems and especially for coordinated movements in space as well. Lenze therefore not only offers a CAN-based control system but also makes it possible to change over to EtherCAT in cases where the requirements are more demanding.



In the area of automation today, PROFIBUS is the most widely used fieldbus with the largest selection of field devices. The L-force Logic runtime software supports PROFIBUS as well as CANopen and EtherCAT. This means that any of the usual PROFIBUS nodes can be controlled by means of a soft PLC – and this can be done in parallel with the CANopen or EtherCAT motion buses with the optimally matching drive controllers from Lenze.



## Step 4 | selecting a drive (controller, motor, gearbox)

Selecting the right drives, motors and gearboxes, as well as programming or setting parameters for the inverter and communication modules, is the final step before specifying the PC-based control and motion control system. Lenze offers a closely stepped, scalable and highly comprehensive product portfolio for this purpose.

An entirely new electromechanics concept is what makes the **9400 servo system** stand out from the crowd. The separation of the installation backplane from the drive electronics has resulted in a simplified approach to installation, mounting and utilisation which can only be described as groundbreaking. As standard, the StateLine 9400 Servo Drive is equipped with the DSP402 device

profile defined by the CiA (CAN in Automation). For requirements over and above this, however, there is the option of parameterising and configuring the HighLine 9400 Servo Drives, designed for complex drive tasks and technology.

The **ECS servo system** operates with a central supply and axis modules able to withstand overloads several times over for peak output currents of up to 64 A. It is optimised for highly dynamic multi-axis applications, such as loading or unloading equipment involved in handling technology, gantry systems, machine tools and packaging industry applications. ECS is available with “control cabinet installation”, “push-through technology” and “cold plate” methods of assembly.



## Step 4 | Selecting a drive (controller, motor, gearbox)

### 8400 Inverter Drives

The 8400 StateLine Inverter Drives has been designed specifically for drive controllers with or without speed feedback, and can be used wherever networking via bus systems is required. The integrated S-ramp function facilitates virtually wear-free acceleration and deceleration, and the adjustable operation modes enable individual tailoring of the drive behaviour to your process. Furthermore, the integrated brake handling provides for a notably lower rate of wear as far as the service brakes are concerned. The StateLine is ideally suited for applications such as travelling and variable speed drives, or conveyor drives with more demanding requirements. In addition to the functions supported by the StateLine, the HighLine's features include integrated point-to-point positioning, which makes this version suitable for applications such as rotary feeders, filling systems, rolling and sliding doors, or positioning tasks in storage systems.



### I/O-System 1000 – Compact and clever

The new product range impresses at the very first glance with its slimline design. I/O modules that offer space for 8 connection points are squeezed into just 12.5 mm of space on the conventional DIN rail. The I/O-System 1000 offers a very clearly structured labelling and diagnostics concept with easily identifiable status LEDs, whereby a single labelling field is uniquely assigned to each LED.



Diagnostic ability, readability and labelling are thereby brought together in an optimum configuration in the smallest of spaces. Due to the pluggable electronics, modules can be changed at the blink of an eye whenever service or maintenance work is performed. The station can be assembled completely without tools, and up to 64 modules can be configured at will to form a station using the integrated backplane bus.

### Motors

Lenze servo motors satisfy the highest quality requirements for drive technology. They feature a modular design and, as a key component in the drive train, are easy to install and have a long service life without the need for maintenance. The motors can be universally combined with Lenze's gearbox ranges.



**MCS synchronous servo motors:** Capable of meeting demanding requirements in terms of dynamics, while offering excellent smooth running characteristics and a highly compact design.

**MCA asynchronous servo motors:** Low moments of inertia, a compact design and high operational reliability from a structural point of view are features of these motors.

### **MDxMA three-phase asynchronous AC motors**

Three-phase asynchronous motors have made their mark in practically all areas of industry. Our three-phase AC motors have been specially designed for inverter operation. Safe, continuous operation is ensured thanks to the special design of the windings and insulation system. The motors feature thermal sensors as standard to enable temperature monitoring. Superb smooth running characteristics are maintained throughout the entire speed range during frequency inverter operation and as a result, a large setting range is possible.

### **Gearboxes**

If you are looking for a partner with the right expertise, Lenze, with its range of high-performance gearboxes and geared motors with scalable functions, is the perfect choice. Whether you are interested in individual components or complete

drive systems, we will be happy to answer any queries you may have about project planning and commissioning, and our after sales service staff are always there to help.

Combined with synchronous or asynchronous servo motors, geared motors with overload capability satisfy the highest requirements in terms of dynamics, positioning accuracy and robustness.

### **We offer:**

- ▶ Helical geared motors (GST):  
Single or two-stage helical gearbox with coaxial design
- ▶ Shaft-mounted helical geared motors (GFL):  
Two-stage helical gearbox with flat design
- ▶ Planetary geared motors (GPA):  
Planetary gearbox with coaxial input and output shaft
- ▶ Bevel geared motors (GKR):  
Two-stage right-angle gearbox with helical stage and bevel stage
- ▶ Helical-bevel geared motors (GKS):  
Three-stage right-angle gearbox with helical stage and bevel stage
- ▶ Helical-worm geared motors (GSS):  
Two-stage right-angle gearbox with helical stage and worm stage
- ▶ Bevel geared motors (GKK):  
Bevel gearbox with integrated disconnect clutch



# Engineering | tailored software portfolio

The engineering PC communicates via Ethernet with the central component of the control system – the industrial PC (IPC). Various engineering tools for system configuration and parameterisation are run on the engineering PC.

## Gateway

The gateway function of PC-based automation enables access to field devices that are located on a bus underneath the industrial PC.

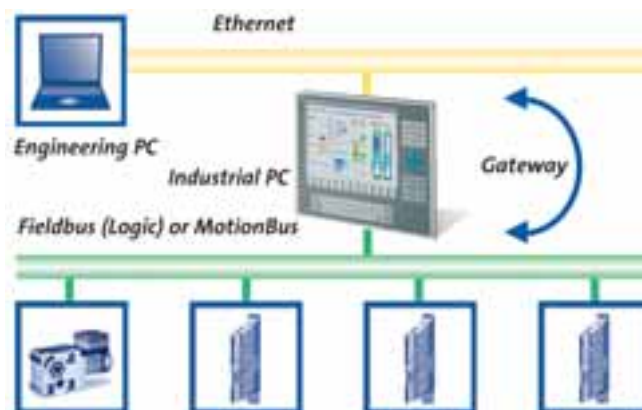
- ▶ Access to CANopen or EtherCAT field devices
- ▶ Use of available communication paths
- ▶ No separate parameterisation interfaces required

Absolutely no software needs to be installed if you are carrying out straightforward commissioning and maintenance tasks on an industrial PC – all you need is the engineering PC's web browser (such as Internet Explorer). The L-force Engineer may be used as an alternative.

## Web-based parameter setting

- ▶ Configuration and diagnostics for industrial PCs in the Internet browser by means of an integrated Web server
- ▶ Access to all IPC parameters
- ▶ Access to integrated IPC logbook

Drive controllers can be accessed using Lenze's familiar tried-and-tested standard software, such as L-force Engineer or Global Drive Control. Thanks to the gateway function featured on industrial PCs, it is possible to access field devices without any special adapters – all you need is Ethernet!



### PLC Designer

The free programming software PLC Designer enables programming of industrial PC in the six programming languages covered in IEC 61131-3. The motion functions are provided in the form of library functions in accordance with PLCopen Parts I and II. Additionally, NC libraries that can be used to create NC programs in G-Code (as per DIN 66025) are available.

- ▶ Can be supplied on CD or downloaded free of charge
- ▶ Logic & motion programming in accordance with IEC 61131-3 (IL, LAD, FBD, ST, AS and CFC editor)
- ▶ Certified function blocks to PLCopen Parts 1 + 2
- ▶ NC block library
- ▶ Graphic DIN 66025 editor (G-Code) with DXF import
- ▶ Cam editor

### Engineer und Global Drive Control (GDC)

- ▶ Engineer: Parameter setting, configuration and diagnostics for drive controllers and industrial PCs
- ▶ GDC: Parameter setting and diagnostics for older-generation drive controllers
- ▶ When used in conjunction with the gateway function of PC-based automation, it is also possible to access field devices located on a bus underneath the industrial PC.

### VisiWinNET®

The visualisation system VisiWinNET® is used for visualisation tasks. Available in Smart and Professional versions, it covers the entire spectrum of application scenarios – from simple operator control and monitoring applications right up to complex SCADA systems.

- ▶ Uniform, integrated visualisation software platform for mechanical and systems engineering
- ▶ Scalable combination of runtime and developer system
- ▶ Full-graphics parameterisation or programming with Visual Studio.NET



# It's good to know | why we are there for you



*"Our customers come first. Customer satisfaction is what motivates us. By thinking in terms of how we can add value for our customers we can increase productivity through reliability."*



**Vitamin L:**  
*Ideas and added value for your drive and automation solutions.*



*"We will provide you with exactly what you need – perfectly co-ordinated products and solutions with the right functions for your machines and installations. That is what we mean by 'quality'."*



*"Take advantage of our wealth of expertise. For more than 60 years now we have been gathering experience in various fields and implementing it consistently and rigorously in our products, motion functions and pre-configured solutions for industry."*



*"We identify with your targets and strive towards a long-term partnership which benefits both sides. Our competent support and consultation process means that we can provide you with tailor-made solutions. We are there for you and can offer assistance in all of the key processes."*

**You can rely on our service. Expert advice is available 24 hours a day, 365 days a year, in more than 30 countries via our international helpline: 008000 24 Hours (008000 2446877).**

**[www.Lenze.com](http://www.Lenze.com)**

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