PC-based automation

Control technology

System structure & configuration
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1 About this documentation

This system manual contains information about the system structure of the control technology. As a superior document, the system manual gives an overview of the system components of the control technology and their interconnection.

System commissioning is described as work flow. Detailed information about the individual components, target systems, and the software to be used can be found in the manuals for the related devices and components.

Depending on the software equipment purchased, some chapters of this manual may be irrelevant.

The present manual is part of the “PC-based automation” manual collection. It consists of the following components:

<table>
<thead>
<tr>
<th>Documentation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Manual</td>
<td>Control technology - system structure &amp; configuration</td>
</tr>
<tr>
<td>&quot;PC-based automation&quot;</td>
<td></td>
</tr>
<tr>
<td>(Software) manual</td>
<td>Industrial PC - parameter setting &amp; configuration</td>
</tr>
<tr>
<td>&quot;PC-based automation&quot;</td>
<td></td>
</tr>
<tr>
<td>Operating Instructions</td>
<td>EL x800 - panel PC with TFT display</td>
</tr>
<tr>
<td>&quot;Embedded Line Panel PC&quot;</td>
<td></td>
</tr>
<tr>
<td>Operating Instructions</td>
<td>CS x800 - stand-alone operator terminal</td>
</tr>
<tr>
<td>&quot;Command Station&quot;</td>
<td></td>
</tr>
<tr>
<td>Operating Instructions</td>
<td>CPC 2800 - control cabinet PC</td>
</tr>
<tr>
<td>&quot;Control Cabinet PC&quot;</td>
<td></td>
</tr>
<tr>
<td>Operating Instructions</td>
<td>EL 1xx - HMI with Windows® CE</td>
</tr>
<tr>
<td>&quot;HMI EL 100&quot;</td>
<td></td>
</tr>
<tr>
<td>Communication manuals</td>
<td>CANopen control technology - commissioning &amp; configuration</td>
</tr>
<tr>
<td>&quot;PC-based automation&quot;</td>
<td>EtherCat control technology - commissioning &amp; configuration</td>
</tr>
<tr>
<td></td>
<td>PROFIBUS control technology - Commissioning &amp; configuration</td>
</tr>
<tr>
<td>Software manuals</td>
<td>»IPC Backup &amp; Restore«</td>
</tr>
<tr>
<td>&quot;PC-based automation&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPC as gateway - parameter setting &amp; configuration</td>
</tr>
<tr>
<td>Further software manuals</td>
<td>»Global Drive Control« (»GDC«)</td>
</tr>
<tr>
<td></td>
<td>– IPC as gateway - parameter setting &amp; configuration</td>
</tr>
<tr>
<td></td>
<td>»Engineer«</td>
</tr>
<tr>
<td></td>
<td>»PLC Designer« / »PLC Designer - SoftMotion« / »PLC Designer - CANopen für Laufzeitsysteme«</td>
</tr>
<tr>
<td></td>
<td>»VisiWinNET® Smart«</td>
</tr>
</tbody>
</table>

Information on how to use the IPCs outside the control technology can be found in the system manuals created for the prevailing application case.
Further technical documentation for Lenze components

Further information on Lenze components which can be used in connection with "PC based Automation" can be found in the following documentation:

<table>
<thead>
<tr>
<th>Mounting &amp; wiring</th>
<th>Legend:</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA 8400 StateLine/HighLine</td>
<td>Printed documentation</td>
</tr>
<tr>
<td>MA 9400 StateLine/HighLine</td>
<td>Online help/PDF</td>
</tr>
<tr>
<td>MA EPM-Txxx (I/O system IP20)</td>
<td></td>
</tr>
<tr>
<td>MA EPM-Sxxx (I/O system 1000)</td>
<td></td>
</tr>
<tr>
<td>MA 8200 vector</td>
<td></td>
</tr>
<tr>
<td>EMC-compliant wiring 8200 vector</td>
<td></td>
</tr>
<tr>
<td>MA ECSxS/P/M/A axis modules</td>
<td></td>
</tr>
<tr>
<td>MA ECSxE power supply modules</td>
<td></td>
</tr>
<tr>
<td>Accordingly for built-in variants:</td>
<td></td>
</tr>
<tr>
<td>• Built-in unit</td>
<td></td>
</tr>
<tr>
<td>• Push-through technique</td>
<td></td>
</tr>
<tr>
<td>• Cold plate technique</td>
<td></td>
</tr>
<tr>
<td>MA communication card MC-CAN2</td>
<td></td>
</tr>
<tr>
<td>MA communication card MC-ETC</td>
<td></td>
</tr>
<tr>
<td>MA communication card MC-ETH</td>
<td></td>
</tr>
<tr>
<td>MA communication card MC-PBM</td>
<td></td>
</tr>
<tr>
<td>MAs for communication modules</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameterisation, configuration, commissioning</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ SW 8400 StateLine frequency inverter</td>
<td></td>
</tr>
<tr>
<td>☐ SW 9400 StateLine/HighLine/PLC controller</td>
<td></td>
</tr>
<tr>
<td>☐ 9400 HighLine commissioning guideline</td>
<td></td>
</tr>
<tr>
<td>☐ SHB I/O system IP20 (EPM-Txxx)</td>
<td></td>
</tr>
<tr>
<td>☐ SHB I/O system 1000 (EPM-Sxxx)</td>
<td></td>
</tr>
<tr>
<td>☐ SHB 8200 vector</td>
<td></td>
</tr>
<tr>
<td>☐ BA ECSxS “Speed and Torque” axis module</td>
<td></td>
</tr>
<tr>
<td>☐ BA ECSxP “Posi &amp; Shaft” axis module</td>
<td></td>
</tr>
<tr>
<td>☐ BA ECSxM “Motion” axis module</td>
<td></td>
</tr>
<tr>
<td>☐ BA ECSxa “Application” axis module</td>
<td></td>
</tr>
<tr>
<td>☐ BA ECSxE power supply module</td>
<td></td>
</tr>
<tr>
<td>☐ KHBs for communication modules</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programming</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ SW 9400 function library</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Establishing a network</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ KHBs for communication modules</td>
<td></td>
</tr>
</tbody>
</table>

**Target group**

This documentation is intended for qualified personnel in accordance with IEC 364.
1.1 Document history

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>TD11</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>05/2008</td>
<td></td>
<td>First edition</td>
</tr>
<tr>
<td>1.1</td>
<td>08/2008</td>
<td></td>
<td>ST 2.1, (in preparation!) removed for Release EtherCAT.</td>
</tr>
<tr>
<td>1.2</td>
<td>05/2009</td>
<td></td>
<td>• ID number added</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• PROFIBUS contents added</td>
</tr>
<tr>
<td>1.3</td>
<td>02/2011</td>
<td></td>
<td>• Control technology 2.5, update for the new software version</td>
</tr>
</tbody>
</table>

Tip!

Current documentation and software updates on Lenze products can be found on the Internet in the "Services & Downloads" area under:

http://www.Lenze.com

1.2 Conventions used

This documentation uses the following conventions to distinguish between different types of information:

<table>
<thead>
<tr>
<th>Type of information</th>
<th>Writing</th>
<th>Examples/notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spelling of numbers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decimal separator</td>
<td>Point</td>
<td>Generally the decimal point is used. For example: 1234.56</td>
</tr>
<tr>
<td>Text</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Version information</td>
<td>Text colour blue</td>
<td>All pieces of information that only apply to or from a specific software version of the controller are indicated accordingly in this documentation. Example: This function extension is available from software version V3.0!</td>
</tr>
<tr>
<td>Program name</td>
<td>Italic</td>
<td>The Lenze PC software »Engineer«...</td>
</tr>
<tr>
<td>Window</td>
<td>Italic</td>
<td>The Message window... / The Options dialog box...</td>
</tr>
<tr>
<td>Variable identifier</td>
<td>Italic</td>
<td>By setting bEnable to TRUE...</td>
</tr>
<tr>
<td>Control element</td>
<td>Bold</td>
<td>The OK button... / The Copy command... / The Properties tab... / The Name input field...</td>
</tr>
<tr>
<td>Sequence of menu commands</td>
<td></td>
<td>If several commands must be used in sequence to carry out a function, then the individual commands are separated by an arrow. Select File→Open to...</td>
</tr>
<tr>
<td>Keyboard command</td>
<td>Bold</td>
<td>Press &lt;F1&gt; to open the online help. If a command requires a combination of keys, a &quot;+&quot; is placed between the key symbols: With &lt;Shift&gt;++&lt;ESC&gt; you can...</td>
</tr>
<tr>
<td>Program listings</td>
<td>Courier</td>
<td>IF var1 &lt; var2 THEN a = a + 1 END IF</td>
</tr>
<tr>
<td>Keyword</td>
<td>Courier bold</td>
<td></td>
</tr>
<tr>
<td>Hyperlink</td>
<td>Underlined</td>
<td>Optically highlighted reference to another topic. Is activated via mouse-click in this documentation.</td>
</tr>
</tbody>
</table>

Symbols
<table>
<thead>
<tr>
<th>Type of information</th>
<th>Writing</th>
<th>Examples/notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page reference</td>
<td>(8)</td>
<td>Optically highlighted reference to another page. Is activated via mouse-click in this documentation.</td>
</tr>
<tr>
<td>Step-by-step instructions</td>
<td><img src="image" alt="Step-by-step instructions" /></td>
<td>Step-by-step instructions are indicated by a pictograph.</td>
</tr>
</tbody>
</table>
### 1.3 Terminology used

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>»Engineer«</td>
<td>Lenze engineering tools which support you throughout the whole life cycle of a machine with an Industrial PC - from planning to maintenance.</td>
</tr>
<tr>
<td>»Global Drive Control« («GDC»)</td>
<td></td>
</tr>
<tr>
<td>»PLC Designer«</td>
<td></td>
</tr>
<tr>
<td>»EtherCAT Configurator«</td>
<td></td>
</tr>
<tr>
<td>IPC</td>
<td>The Industrial PC (IPC) is the central component of the PC-based automation.</td>
</tr>
</tbody>
</table>
1.4 Definition of notes used

The following signal words and symbols are used in this documentation to indicate dangers and important information:

**Safety instructions**

Structure of safety instructions:

- **Pictograph and signal word!**
  - (characterise the type and severity of danger)
  - **Note**
    - (describes the danger and gives information about how to prevent dangerous situations)

<table>
<thead>
<tr>
<th>Pictograph</th>
<th>Signal word</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![Danger!](Image) | Danger! | Danger of personal injury through dangerous electrical voltage  
Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken. |
| ![Danger!](Image) | Danger! | Danger of personal injury through a general source of danger  
Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken. |
| ![Stop!](Image) | Stop! | Danger of property damage  
Reference to a possible danger that may result in property damage if the corresponding measures are not taken. |

**Application notes**

<table>
<thead>
<tr>
<th>Pictograph</th>
<th>Signal word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Image" alt="Note!" /></td>
<td>Note!</td>
<td>Important note to ensure trouble-free operation</td>
</tr>
<tr>
<td><img src="Image" alt="Tip!" /></td>
<td>Tip!</td>
<td>Useful tip for simple handling</td>
</tr>
<tr>
<td><img src="Image" alt="Reference to another documentation" /></td>
<td></td>
<td>Reference to another documentation</td>
</tr>
</tbody>
</table>
2 **Safety instructions**

Please observe the following safety instructions when you want to commission a controller or system using the Industrial PC.

*Read the documentation supplied with the system components thoroughly before starting to commission the devices and the Industrial PC!*

*The system manual contains safety instructions which must be observed!*

**Danger!**

According to our present level of knowledge it is not possible to ensure the absolute freedom from errors of a software.

If necessary, systems with built-in controllers must be provided with additional monitoring and protective equipment according to relevant safety regulations (e.g. law on technical equipment, regulations for the prevention of accidents) so that an impermissible operating status does not endanger persons or facilities.

During commissioning, persons must keep a safe distance from the motor or the machine parts driven by the motor. Otherwise there would be a risk of injury by the moving machine parts.

**Stop!**

If you change parameters in an engineering tool during an existing online connection to a device, the changes are directly added to the device!

A wrong parameter setting can cause unpredictable motor movements. By unintentional direction of rotation, too high speed or jerky operation, the driven machine parts may be damaged!
The "PC-based Automation" system

Industrial PCs (IPCs) become more and more important in the field of automation technology. Due to their scaling options and various combinations of visualisation and control on one device, Industrial PCs provide clear advantages for many applications.

Lenze Industrial PCs are available with the following software equipment:

- Industrial PC as component, on request with operating system, without further software
- Industrial PC as visualisation system
- Industrial PC as control and visualisation system

The "PC-based Automation" system enables the central control of logic and motion systems.

For this purpose, Lenze provides coordinated system components:

- Industrial PCs as control and visualisation system
  - The IPC is the central component of the PC-based automation which controls the logic and motion functions by means of the runtime software.
  - The IPC communicates with the field devices via the fieldbus.
  - The IPCs are available in different designs.

**Note!**

Moreover, the "PC based automation" system comprises the HMI series EL 1xx PLC. These devices differ considerably from the Industrial PCs with regard to performance and various other details. However, the devices of the HMI series EL 1xx PLC are able to perform smaller control functions.
Engineering tools for the Engineering PC
- The Engineering PC communicates with the IPC via Ethernet.
- The different Engineering tools serve to configure and parameterise the system.

Fieldbuses

Field devices
4 System description

This chapter describes the basic structure of a control system based on an Industrial PC and the required components.

4.1 System components

4.1.1 The Industrial PC

4.1.1.1 IPC types

Thanks to a consequently implemented platform strategy, Industrial PCs can be assembled individually and are nearly optionally scalable with regard to power, display size, and function. This results in three different designs from which you can select the tailor-made platform for the prevailing automation solution.

This universal and scalable IPC platform is complemented by HMIs which are provided in fixed configurations and can also fulfil automation functions in a restricted way.

The following designs are distinguished:

- Embedded Line (15)
- HMI series EL 100 (16)
- Command Station (17)
- Control cabinet PC (18)
Embedded Line

Embedded Line Industrial PCs are designed for installation into control cabinets, casing of machinery, or other mounting cutouts and are provided with bolts and clamping screws on the rear face to ensure simplicity of assembly and assured sealing (IP65) even in aggressive industrial environments.

Features of the supported device series EL 1800 ... EL 9800

► Display
  – Display size 8-19.0 inches
  – Different front/keyboard variants

► Interfaces:
  – Ethernet on-board
  – Option: 2 x CAN (example: one Logic bus line and one Motion bus line)
  – Option: 4 x CAN (example: one Logic bus line and three Motion bus lines)
  – Option: EtherCAT
  – Option: PROFIBUS
HMI series EL 100

- Display size 5.7-10.4 inches
- Integrated CAN interface
- Ethernet on-board
Command Station

Command Station (CS) is a stand-alone operator station (IP65) which is totally protected against dust and water spray incursion. The flat enclosure is fitted with a mounting frame at the rear edge which is intended for support arm mounting or direct fixing to the wall. To allow the flexible implementation of individual operator concepts, the system offers numerous options and add-on operator consoles as for example:

- Touch screens,
- functional and alphanumeric keyboards,,
- Operator consoles with switching elements.

Features of the supported device series CS 5800 ... CS 9800

► Display
  – Display size 15.0-19.0 inches
  – Different front/keyboard variants

► Mounting
  – Stand-alone, completely enclosed (IP65)
  – Flexible support arm mounting

► Interfaces:
  – Ethernet on-board
  – Option: 2 x CAN (example: one Logic bus line and one Motion bus line)
  – Option: EtherCAT
  – Option: PROFIBUS
Control cabinet PC

Industrial PCs of the CPC series are designed for the robust and continuous operation in industrial applications. In contrast to the Embedded Line and Command Station types, the CPC Industrial PCs are not provided with integrated displays. They are mounted into a control cabinet or a corresponding installation housing.

Features of the supported device series CPC 2800

- Optional monitor panel as screen
  - MP DVI (Embedded Line)
  - CS DVI (Command Station)

- Mounting
  - Installation in control cabinet (IP20)

- Interfaces:
  - Ethernet on-board
  - Option: 2 x CAN (example: one Logic bus line and one Motion bus line)
  - Option: 4 x CAN (example: one Logic bus line and three Motion bus lines)
  - Option: EtherCAT
  - Option: PROFIBUS
4.1.1.2 Runtime software

The Industrial PC is the core of the control system. To perform the task of the central control unit, the Industrial PC requires the runtime software.

The runtime software comprises the operating system. Moreover, further software components are required which, for example, execute the control program.

![Runtime software diagram]

The Industrial PCs are supplied completely with the runtime software. The different components of the runtime software are described in the following.

- **L-force Logic**

  The L-force Logic runtime software is a soft PLC. It serves to execute PLC programs which have been created with the »PLC Designer«. These programs describe logic operations. L-force Motion (20) serves to control drive-related processes.

  The programs are processed cyclically by a multitasking operating system. L-force Logic merely describes the function; the performance of the control system results from the interaction of the runtime software with the selected target system and thus directly depends on the selected processor and other factors.

  L-force Logic is available for the following target platforms:

  **Industrial PCs:**
  - Embedded Line EL 1800-9800
  - Command Station CS 5800-9800
  - Control Cabinet CPC 2800

  **HMIs:**
  - EL100 PLC
L-force Motion

In contrast to L-force Logic, L-force Motion serves to trigger controllers in addition to processing PLC programs. In addition to all functions of the L-force Logic, also Soft Motion functions are supported according to PLCopen part I and II.

L-force Motion is available for the following target platforms:

**Industrial PCs:**
- Embedded Line EL 1800-9800
- Command Station CS 5800-9800
- Control Cabinet CPC 2800

L-force Visu

The L-force Visu runtime software serves to extend your IPC to a visualisation device. The visualisation can be installed on a separate IPC but can also run on the same IPC in parallel to the control. There are different options for the communication interface connection.

The resulting four options and their advantages and disadvantages are described in the following.

L-force Visu is available for the following target platforms:

**Industrial PCs:**
- Embedded Line EL 1800-9800
- Command Station CS 5800-9800
- Control Cabinet CPC 2800

**HMIs:**
- EL 100
- EL 100 PLC
Integrated visualisation

Further information can be found in the documentation for »VisiWinNET®« Smart.

In this solution, the control and visualisation application are located on one PC. The PC in Embedded Line and Command Station design has an integrated display so that no further components are required.

Properties:
- Visualisation has access to variables of the control and parameters of the field devices
- No impact on the real-time capability of the bus by the visualisation
- No further components required
External monitor panel

This solution corresponds to the integrated solution with regard to its performance. The only difference is that the control and visualisation application are calculated on a PC without integrated display (control cabinet PC). It is displayed on an external monitor panel. This solution offers advantages with regard to cabling, operating conditions, and accessibility.

Properties:

- Visualisation has access to variables of the control and parameters of the field devices
- No impact on the real-time capability of the bus by the visualisation
- Use of any external monitor (for example: monitor panel in Command Station design) is possible.
Industrial PC as gateway

If it is required to separate control and visualisation, e.g. for performance reasons or due to different operating systems, the control IPC can be used as gateway. The visualisation IPC does not require any special fieldbus connection, only the Ethernet interface available as standard is required. The implementation from Ethernet to the fieldbus is executed by the Industrial PC.

Properties:
- Visualisation has access to variables of the control and parameters of the field devices
- No impact on the real-time capability of the bus by the visualisation
- Several visualisations can access the same control
- Optimal for graphically complex visualisations
- Not available for HMI series EL100
Independent control and visualisation

In this variant, the control and visualisation access the bus independently of each other. This ensures the most possible independence of both systems but is only very rarely sensible in practice.

Note!

The configuration with control and visualisation that are independent of each other is only recommended for systems without Lenze control!

Properties:

- Visualisation has access to parameters of the field devices
- Impact on the real-time capability of the bus by the visualisation is possible, thus it is only suitable in Motion systems in a restricted way (also depending on the bus system used)
- Depending on the prevailing bus system, several bus masters can be used which are independent of each other:
  - Use of CANopen
  - In connection with EtherCAT a configuration with two bus masters is not possible.
  - Available for HMI EL100
4.1.2 Field devices

The following field devices can be used within the scope of the PC based automation. Depending on the bus system used, a device series may be applicable in a restricted way. For details see ▶ Network topologies (p. 32)

4.1.2.1 Operation on the MotionBus

The MotionBus can drive controllers which support the standardised device profile DS402. These are the following devices:

▶ Controller
  – 9400 Servo Drives
  – ECS servo system (motion device version with CiA 402 )

4.1.2.2 Operation on the fieldbus (Logic)

The fieldbus (Logic) can drive all field devices which have a suitable device description file. The system is optimised for the following device series:

▶ Controller
  – 9400 Servo Drives Highline
  – ECS servo system, device versions Speed and Torque, Posi and Shaft, Application
  – 8400 Inverter Drives

▶ Further field devices
  – I/O system 1000
  – I/O system IP20 compact/modular
  – HMI series EL100
  – HMI series EPM-Hx
4.1.3 Engineering tools

4.1.3.1 Overview

Lenze provides various engineering tools to configure automation solutions according to individual requirements.

<table>
<thead>
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<th>Field device</th>
<th>Engineering tool</th>
<th>Task of the engineering tool</th>
</tr>
</thead>
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<tr>
<td>9400</td>
<td>»Engineer«</td>
<td>Parameter setting/configuring Online diagnostics with IPC as gateway</td>
</tr>
<tr>
<td>8400</td>
<td>»Engineer«</td>
<td>Parameter setting/configuring Online diagnostics with IPC as gateway</td>
</tr>
<tr>
<td>ECS</td>
<td>»GDC«</td>
<td>Parameter setting/configuring Online diagnostics with IPC as gateway</td>
</tr>
<tr>
<td>I/O system 1000</td>
<td>»Engineer«</td>
<td>Parameter setting/configuring Online diagnostics with IPC as gateway</td>
</tr>
<tr>
<td>I/O system IP20</td>
<td>»Engineer«</td>
<td>Parameter setting/configuring Online diagnostics with IPC as gateway</td>
</tr>
<tr>
<td></td>
<td>»GDC«</td>
<td>Parameter setting/configuring Online diagnostics with IPC as gateway</td>
</tr>
<tr>
<td>Industrial PC</td>
<td>»Engineer«</td>
<td>Parameter setting/configuring Online diagnostics</td>
</tr>
<tr>
<td></td>
<td>»WebConfig«</td>
<td>Parameter setting/configuring Online diagnostics</td>
</tr>
<tr>
<td></td>
<td>»IPC Backup &amp; Restore«</td>
<td>Restore after device exchange</td>
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<td></td>
<td>»PLC Designer«</td>
<td>Programming Bus configuration</td>
</tr>
<tr>
<td></td>
<td>»VisiWinNET®«</td>
<td>Creating a visualisation</td>
</tr>
</tbody>
</table>
4.1.3.2 »PLC Designer«

You need the »PLC Designer« for

► creating the control program for the IPC,
► transferring the PLC projects to the IPC.

Basic functions of the »PLC Designer«:

► Programming of Logic & Motion according to IEC 61131-3:
  – Instruction list (IL),
  – Ladder diagram (LD),
  – Function plan (FP),
  – Structured text (ST),
  – Sequential function chart (SFC),
  – Function block diagram (FBD).
► Certified function blocks according to PLCopen Part 1 + 2,
► NC module library,
► Graphic DIN 66025 Editor (G code) with DXF import,
► cam editor.

4.1.3.3 Web-based parameterisation

The »WebConfig« is an engineering tool for web-based parameter setting of Industrial PCs.

Functions of the »WebConfig«:

► Configuration and diagnostics of the Industrial PCs in the web browser by integrated web server,
► access to all IPC parameters,
► access to an integrated IPC logbook.
4.1.3.4 L-force »Engineer«

The L-force »Engineer« is used for parameter setting, configuration, and diagnostics of controllers, I/O systems, and Industrial PCs.

- Functions in the »Engineer«:
  - Hardware configurator,
  - configuration editor,
  - function block editor,
  - graphical parameter setting interfaces.

The »Engineer« is used for:

- Parameter setting and diagnostics of:
  - 9400 Servo Drives,
  - 8400 Inverter Drives,
  - I/O system 1000,
  - I/O system IP20.

- Access to the supported field devices via the IPC gateway function.

4.1.3.5 »Global Drive Control« (»GDC«)

The »GDC« provides support for further field devices as the 8200 vector frequency inverter, 9300 servo inverter, and ECS servo system.

- The basic function of the »GDC« is the parameterisation and diagnostics of controllers which are not supported by the »Engineer«.

- Access to the supported field devices via the IPC gateway function.
4.1.4 Backup

Industrial PCs do not have hard disks as data memories. The operating system is saved on memory chips. Depending on the series, this memory chip can either be permanently integrated or implemented using a memory card.

The following Industrial PC series use a Compact Flash card (CF card) as storage medium:

- EL 1800 - EL 9800,
- CS 5800 - CS 9800,
- CPC 2800.

The Compact Flash card is the "memory" of the IPC. Without this CF card, the IPC cannot run.

»IPC Backup & Restore« serves to copy, duplicate, and archive these cards. To transfer user-specific data from the Industrial PC to an Engineering PC and vice versa, USB flash drives can be used.

The HMI series EL100 PLC uses an SD card for data exchange.

Further information can be found in the following documentation:

- Industrial PC - Parameter setting & configuration
- »IPC Backup & Restore«
- HMI EL 100

4.1.4.1 »IPC Backup & Restore«

»IPC Backup & Restore« saves the data bases of the Industrial PCs:

- Compact Flash cards at the Engineering-PC:
  - Duplicating,
  - archiving,
  - restoring.
- USB flash drive:
  - Prepare for backup and restore at the IPC,
  - for creating backups
  - use for restoring backups,
  - use for updating the runtime software.
4.1.4.2 UPS

IPC can be equipped with a capacitor package. The capacitor package serves to buffer the current supply of the IPC. This compensates current fluctuations and in case of a complete power failure, these capacitors ensure the current supply. To bridge a longer power failure, rechargeable battery packs are available.

Within this protected time, the control can save especially marked variable contents (retain variables). The retain variables will continue to be available in case of a restart of the system. Depending on the series, the capacitors are already integrated or can be connected externally.

Further information can be found in the following documentation:

- Industrial PC - parameter setting & configuration
- HMI EL 100
4.1.5 Visualisation with »VisiWinNET®«

To visualise the machine and systems engineering, »VisiWinNET®« is available as a modular and scalable visualisation system. Here, we distinguish between the engineering system and the runtime software.

The L-force Visu runtime software comes installed in the Industrial PC. In combination with the control technology, it is the »VisiWinNET®« compact CE variant. It runs in parallel to the other runtime software as for example L-force Logic on the Industrial PC.

4.1.5.1 Development system »VisiWinNET®«

The creation of the visualisation interface requires the »VisiWinNET®« engineering system which has to be installed on an Engineering PC. This is available in two versions:

► »VisiWinNET®« Smart

To create a simple interface, the »VisiWinNET®« Smart is available free of charge as a user-friendly visualisation system. It can be used as a flexible tool for creating simple applications or as service tool. »VisiWinNET®« Smart is provided with its own full-graphics integrated development environment and supports the user by ready-made templates. The special strength of the system is the option to combine it with »VisiWinNET®« Professional.

- Features »VisiWinNET®« Smart
  - For simple B&B applications
  - For applications in the machine-oriented field

► »VisiWinNET®« Professional

The »VisiWinNET®« Professional system is completely implemented in the Microsoft® Visual Studio .NET integrated development environment and is the basis for creating visualisation and SCADA applications with high functionality. Ready-made templates and modules serve to create applications fluently per "drag and drop".

If required, the system permits individual program-related changes on the basis of Visual Basic .NET and C#. This serves to solve company-specific and complex tasks when the standard visualisation functions are not sufficient.

- Features »VisiWinNET®« Professional
  - For complex B&B applications
  - For client/server-based SCADA systems
  - For individual and company-related programming
  - For connection to databases or other Office programs
  - For use of complex report functions
4.2 Network topologies

The Lenze control technology provides master interface connections for the following communication systems:

- CANopen: Tried-and-tested system for smaller plants
- EtherCAT: Ethernet-based system for every application
- PROFIBUS: For the greatest selection of different field devices

Lenze's control technology is based on CANopen profiles. The communication system supported by the respective application is used for data transfer.

💡 Tip!

The Lenze support assists you in selecting the fieldbus system tailored for your application and the suitable Industrial PC components.

Depending on the bus system used, the basic structure of the network varies. The bus system also influences the usability of the different device families. This is described in the following:
4.2.1 Control technology with CANopen

CANopen as the basis for the Lenze control technology

- The control technology based on CANopen serves to implement the classical Lenze device series that have the system bus (CAN) on board. Thus, solutions at optimal cost are possible.
- In order to extend the existing limits of the CAN bus, up to four CAN lines can be used which are synchronised among each other.
- The highest possible number of nodes on a CAN line depends on the baud rate and the set cycle time.
  - Example: Three nodes can be connected to the CAN bus with a setpoint PDO and an actual value PDO each at a cycle time of 1 [ms] and a baud rate of 1[MBit/s].

Physical structure

Due to the real time requirements of the bus system and the limited transmission capacity, it is vital with CANopen to separate the bus line with Motion from the one with components that are controlled via PLC functionalities only (Logic). Moreover it is required, depending on the number of Motion nodes and the bus cycle time, to create several Motion bus lines.

CANopen uses separate CAN interfaces to operate Logic and Motion nodes:

- The IPCs support up to four CAN interfaces.
  - Interface 1 is CANOpen(Logic).
  - Interface 2-4 is CANOpen(Motion).
  - If no Logic is required, the interface 1 can additionally be Motion. Thus, up to four synchronised Motion buses are possible.

Note!

- When the IPC type "Command Station" is used, only two bus lines are possible!
- Depending on the required number of Motion nodes and bus cycle time, up to four Motion bus lines can be created.
- When the IPC series "Command Station" CS x8xx is used, only two bus lines are possible.

Convention for "PC based Automation"

- Bus line 1 (CAN1): CANopen (Logic) or CANopen (Motion)
- Bus line 2 - 4 (CAN2 - 4): CANopen (Motion)
4.2.1.1 CANopen Logic

The Logic bus line is used to operate controllers which
▶ execute simple movements.
▶ do not have a Motion functionality,
▶ are controlled via PLC functionalities only.

4.2.1.2 CANopen (Motion)

The Motion bus line is used to control controllers which, for instance, execute complex movements in several dimensions.

The "L-force Motion" runtime software contains the PLCopen libraries and supports the soft motion control for driving the "9400 StateLine" series and the "ECS servo system".

Further information and performance features about CANopen can be found in the following documentation:
- CANopen communication manual
4.2.2 EtherCAT

EtherCAT is a very powerful bus system which is based on Ethernet.

- EtherCAT is suitable for greater applications
- The highest possible number of nodes at an EtherCAT line mainly depends on the performance of the Industrial PC due to the great bandwidth of this bus system.
  - Depending on the Industrial PC used and the required computing time of the applications which run on the IPC (PLC and optional visualisation), a high number of nodes at a low cycle time is possible.

Physical structure

Thanks to the integrated synchronisation mechanisms via "distributed clocks", EtherCAT offers excellent real-time features. Thus, Motion and PLC applications can be operated via the same bus and the number of the nodes to be controlled and the maximum bus length is much higher compared to a CANopen system.

- EtherCAT can control all field devices at one common interface. Thus, no division into Logic fieldbus and Motionbus is required.
- The Industrial PC provides the interface for connecting EtherCAT.

Note!

EtherCAT is not available for Industrial PCs of the device series EL 1xx, EL x8xx, CS x8xx and CPC x8xx in combination with the Control technology release 2.5.
Further information and performance features about EtherCAT can be found in the following documentation:

- EtherCAT communication manual
4.2.3 PROFIBUS master

Today, PROFIBUS is the most commonly used fieldbus system. Because it comes with the widest range of various field devices, the PROFIBUS is occasionally prioritised over more modern bus systems. Due to the low bandwidth and synchronisation mechanisms, the PROFIBUS is only provided as logic bus within the "PC-based Automation".

We recommend to use the PROFIBUS for the following applications:

- Control of system parts that have already been automated with PROFIBUS and another control system.
- Use of field devices that are not available for e.g. EtherCAT or CANopen.
- Combination of PROFIBUS as logic bus with a second bus system as motion bus.

Further information and performance features about EtherCAT can be found in the following documentation:
- PROFIBUS communication manual

General information about the PROFIBUS can be found on the Internet website of the PROFIBUS Nutzerorganisation e.V.: [http://www.profibus.com](http://www.profibus.com)
## Physical structure

- The Industrial PC (IPC) is the PROFIBUS master. It can communicate with one or several stations (slaves).
- The PROFIBUS has an internal line topology (without repeater) or a tree topology (with repeater).
- The PROFIBUS network must be terminated at the first and last station.
- The bus terminating resistor is integrated in the bus connector and activated by a switch.

### 4.2.4 Mixed operation

#### Note!

Mixed operation is only possible with Industrial PCs provided with two extension slots for communication cards.
- Thus, the “Command Station” is not suitable for mixed operation!

#### 4.2.4.1 Combination of CANopen and EtherCAT

It is possible to combine both bus systems CANopen and EtherCAT in a control system.

This combination of CANopen and EtherCAT may be sensible if controllers with EtherCAT are available but further peripheral devices have to be controlled which are only available with CANopen. Both bus systems are synchronised via the control system, the IPC (controller).
4.2.4.2 PROFIBUS with CANopen or EtherCAT

Note!

A mixed operation is only possible with Industrial PCs which have two extension slots for communication cards.
- When the Command Station is used, a mixed operation is not possible!

The PROFIBUS bus system can be combined with CANopen or EtherCAT.
- This makes sense if not all field devices are available for the same bus system or a motion bus is required in parallel to the PROFIBUS.
- The bus systems are synchronised in the control, the IPC (controller).

The following combinations are allowed:

PROFIBUS (as logic bus) and up to two CAN interfaces (as motion bus)
PROFIBUS (as logic bus) and EtherCAT (as motion bus)

"Control technology CANopen" communication manual
• Here you can find detailed information on how to commission CANopen components.

"Control technology EtherCAT" communication manual
• Here you can find detailed information on how to commission EtherCAT components.
5  Commissioning of the system

5.1  General commissioning steps

This chapter informs you about the basic steps to commission a control system. The overview in table form shows the order of commissioning steps.

Detailed information about the single commissioning steps...

• ... with CANopen can be found in the "CANopen control technology" communication manual.
• ... with EtherCAT can be found in the "EtherCAT control technology" communication manual.

<table>
<thead>
<tr>
<th>Commissioning step</th>
<th>Description</th>
<th>Engineering tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commissioning of the Industrial PC.</td>
<td>• Establishing the general readiness for operation of the IPC.</td>
<td>Optional »Engineer« or »WebConfig«</td>
</tr>
<tr>
<td></td>
<td>• The general readiness for operation enables the usability of the gateway in the IPC so that the communication with field devices is possible via the integrated gateway.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Industrial PC as gateway (23)</td>
<td></td>
</tr>
<tr>
<td>Planning/installation of the network</td>
<td>• This serves to prepare the field devices for communication with the IPC and the engineering tool which communicates via the gateway of the IPC.</td>
<td>None</td>
</tr>
<tr>
<td>(as for example electrical wiring, setting of DIP switches)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project planning and commissioning of the field devices</td>
<td>• Using the gateway in the IPC, the &quot;Engineer&quot; and &quot;GDC&quot; programs can communicate with the corresponding field devices and carry out the required parameter setting steps.</td>
<td>»Engineer«</td>
</tr>
<tr>
<td></td>
<td>• »GDC«</td>
<td></td>
</tr>
<tr>
<td>Project planning of the control</td>
<td>• Creating:</td>
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</tr>
<tr>
<td></td>
<td>– the control configuration,</td>
<td>»EtherCAT Configurator«</td>
</tr>
<tr>
<td></td>
<td>– bus configuration,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– control program</td>
<td></td>
</tr>
<tr>
<td>Creating a visualisation</td>
<td>• If the IPC is provided with a monitor, a visualisation can take place there in parallel to the control.</td>
<td>»VisiWinNET®«</td>
</tr>
<tr>
<td></td>
<td>• To create the visualisation and to download it to the IPC, use the program</td>
<td></td>
</tr>
<tr>
<td></td>
<td>»VisiWinNET®«</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Integrated visualisation (21)</td>
<td></td>
</tr>
</tbody>
</table>
### Commissioning step | Description | Engineering tools
--- | --- | ---
**Safe data** | • By means of the »IPC Backup&Restore« program, a copy of the Compact Flash card can be made and saved on any Engineering PC for backup.  
  - Backup (평 29)  
  • Further information can be found in the following documentation:  
    - Industrial PC parameter setting & configuration.  
    - Software Manual »IPC Backup&Restore« | »IPC Backup&Restore«

**Diagnostics** | • The control system can be diagnosed by means of the “Engineer” or “Webconfig”  
  - This, for instance, enables you to have a look into the logbook of the Industrial PC.  
  • If further diagnostics is required up to the level of the field device, also use the “Engineer” or “GDC”, depending on the field device type, using the gateway function of the IPC. | »WebConfig«  
»Engineer«  
»GDC«

Further information about the use of the single engineering tools can be found in the corresponding software documentation.
6 System architecture

To commission the control system, an Engineering PC is required. This can be a standard laptop. Here, the programs are installed which are required for configuration, parameter setting, and commissioning of the control system. The programs are listed in chapter 3.2.3.

The Engineering PC which is connected with the Industrial PC via Ethernet, serves to install the control system. For the operation of the control and visualisation system, the Engineering PC is not required anymore.

An Engineering PC can be used for the configuration of any number of Industrial PCs.
6.1 IPC as gateway

The Engineering PC is not only required for commissioning the Industrial PC but also for commissioning the subordinated field devices. To establish an online connection between an Engineering PC and a field device, e.g. a controller, two ways are possible:

- **Direct coupling** (p. 44)
- **IPC as gateway** (p. 45)

6.1.1 Direct coupling

In case of direct coupling, the Engineering PC has a special interface module for the corresponding fieldbus, e.g. a USB system bus adapter for coupling to the CANopen bus system.

**Advantage:**

The connection of the Engineering PC to the drive is totally independent from the control. Thus, it is irrelevant whether the control is already available in the system, or already commissioned, etc.

The speed at data transmission is optimal with direct coupling. The IPCs are used as gateway, this optimal speed cannot be achieved.

**Disadvantage:**

A special interface connection is required for the Engineering PC

The communication of the Engineering PC with the field device may interfere with the bus. It is, for instance, possible that the real-time capability of the control is disturbed by the Engineering PC since the Engineering PC overloads the bus or transmits telegrams at times the control needs for transmission of synchronisation protocols.
6.1.2 IPC as gateway

In the second case, the Engineering PC is not provided with a special fieldbus coupling. Only the Ethernet interface available as standard is required. The implementation from Ethernet to the fieldbus is made via the Industrial PC.

**Note!**

- The "IPC as gateway" function is not available in combination with PROFIBUS.
- Thus, "Going online" with the »Engineer« or the »GDC« via the IPC as gateway is not possible.

**Advantage:**

The Engineering PC does not require a special interface connection

The Engineering PC is the only master for the bus and can thus guarantee the real-time capability of the bus since it controls the access to the bus itself. Thus, it is ensured that the bus is always free for the control if required.

**Disadvantage:**

The gateway can only be used if the basic configuration of the IPC and the bus has been carried out.

The communication speed for a download to a field device using the Engineering PC is slower than with direct coupling. The extent of delay depends on whether the control is active itself at this moment or only the gateway of the IPC is used.

**Conclusion**

Direct coupling is an appropriate means to commission field devices for the first time (download). The download times are optimal and it is not required that the control has to run.
As soon as the control has been commissioned, no direct coupling should be used anymore since, depending on the bus system, the real-time capacity of the bus may be disturbed.

6.2 Function blocks

A number of available function blocks offers the opportunity to access parameters of the Industrial PC from the PLC program. These are the following:

- Device parameters of the Industrial PC,
- Device parameters of the field devices,
- Logbook entries of the Industrial PC.

Further information about the function blocks can be found in the following documentation:

- **Industrial PC - Parameter setting & configuration**
Remote maintenance and diagnostics

In the PC technology, there are various standard mechanisms for remote connections between the nodes.

► The standard mechanisms
  – are based on the Ethernet bus system or the protocols used for Ethernet.
  – can be used between Engineering/remote maintenance PC and IPC.

It is irrelevant whether a local connection or a remote connection exists between Engineering/remote maintenance PC and IPC.

► All access mechanisms described in the following can be used
  – with direct coupling between the PCs within a local network,
  – with a remote connection.

To establish a remote connection, a router is required. A router can be a separate device or the IPC itself. A router establishes a remote connection between two network segments.

Typically, routers are used for the following connection types:

► Analog phone (modem),
► ISDN,
► DSL

The client/server connection between the Engineering PC and Industrial PC is characteristic for a remote maintenance.

A server runs on the device to be accessed from afar. The server waits for a client to give a signal from afar and want to access the PC. Depending on the action you want to carry out from afar, different server types are available.

When a remote connection has been established once, you can work with the same programs that are used for the local connection via Ethernet, as for example L-force «Engineer» or web server. Moreover, programs exist which are especially suitable for accessing parts of the IPC. You can even redirect the complete screen content of the IPC so that you can remote control it. The different programs available are described briefly in the following.
Note!
Setting a remote maintenance is a potential safety risk! This is particularly relevant if the computer to be remote-controlled is connected to an Ethernet network. Always contact your IT administrator to take the necessary safety measures.

7.1 Dial-in on the IPC
An RAS server runs on the IPC. A user can log-in via modem/ISDN card on this RAS server. If someone dials-in from a remote maintenance PC via this medium, the IPC executes a password check and then activates the connection.

Further information about the function and configuration of RAS servers can be found in the following documentations:
- Industrial PC - parameter setting & configuration
- HMI EL 100 with Windows® CE

7.2 Computer access via Telnet

Note!
Telnet is a standard mechanism reserved for experienced users to change system settings.

The Telnet protocol serves to access the data of a PC. Telnet requires an existing local connection or remote connection. Telnet is a command line-oriented protocol.

7.3 File transfer via FTP
To transfer files from one PC to another, FTP is frequently used. FTP is the abbreviation for File Transfer Protocol.

- FTP requires an existing local connection or remote connection.
- FTP can be used via the command line, similar to Telnet.

Many programs have an integrated FTP support as for example the Internet Explorer.

Further information about the function and configuration of FTP can be found in the following documentations:
- Industrial PC - parameter setting & configuration
- HMI EL 100 with Windows® CE
7.4 Web server

If the PC has a web server, the user is provided with ready-made views which can be displayed via a browser as the Internet Explorer. Depending on the structure of these web pages, they may allow the change of parameters. Calling a web server requires an existing local connection or remote connection.

All Lenze IPCs which support the control technology have an integrated web server. The web server allows for a web-based parameter setting.

Further information about the function and configuration of FTP can be found in the following documentations:

- Industrial PC - parameter setting & configuration
- HMI EL 100 with Windows® CE
7.5 Redirecting screen contents/entries

Comfortable programs for remote maintenance allow for a complete redirection of the entire screen contents. Moreover, all keyboard entries or mouse movements are transmitted from the local PC to the remote PC. Thus you can operate the remote PC as if you would be directly in front of it. However, the quality of the remote connection is decisive as the speed of the presentation of the screen contents depends strongly on it. A bad connection may render the operation of a program using the mouse impossible since you cannot track the movements of the mouse pointer. In such cases, you can use the command line-based protocols as FTP and Telnet, depending on the function to be executed.

The use of a screen redirection requires an existing local connection or remote connection. For redirecting the screen contents, the following programs are available, depending on the device type:

- **EL100:**
  - VNC (see manual EL100)
- **EL 1800-9800, CS 5800-9800, CPC 2800:**
  - Cerdisp/Cerhost

7.5.1 Virtual Network Computing (VNC)

Virtual Network Computing (VNC) is a software developed by Olivetti & Oracle Research Laboratory (from 1999 AT&T), which shows the screen content of a remote computer (with the VNC server software running) on a local computer (with the VNC viewer software running) and transmits the keyboard and mouse movements from the local computer to the remote computer. Alternatively, an “only read” mode is possible, where local entries have no impact on the remote computer.

VNC has an open source licence which means that the source code is free of charge for interested developers so that further developments are allowed. Thus, various VNC versions are available in the internet.

The VNC server is already installed in the devices of the HMI series EL100 by default. The Engineering PC requires the VNC viewer software. It can be downloaded from the download area of the Lenze homepage AKB and is enclosed to the CD which is supplied with the devices.

7.5.2 Cerdisp/Cerhost

Microsoft provides the software combination Cerdisp/Cerhost for redirecting screen contents and keyboard and mouse entries.

- The Cerdisp is installed on the Industrial PC. The IPCs of the EL 1800 series are supplied completely installed.
8 Appendix

This chapter informs you about the basics of the OPC communication standard and gives you an overview of where OPC is used in the Lenze control technology.

8.1 Basics of the OPC standard

The industrial operation in the automation technology can be divided into three levels:

1. The master level manages and visualises information.
2. The control level manages information and serves as process control.
3. The field level manages data and provides measured values.

The control and master level mostly use PC components. The field level consists of hardware in the form of sensors and actors. PC-based automation solutions are used to implement a suitable process connection to enable the access to the data of the field level. To exchange data with PC applications, a special driver is required with a conventional automation solution. Each hardware requires its own driver. Thus, the corresponding software application should be adapted to each hardware. The OPC standard simplifies the communication between Engineering PC and Industrial PC and the access to the data of the field level.

8.1.1 Communication by means of OPC

OPC is a standardised software interface for manufacturer-independent communication in the automation technology. OPC stands for Openness, Productivity, Collaboration, formerly OLE for Process Control. The target is to exchange data between different software applications.
8.1.2 OPC as universal driver

The OPC-Data Access specification provides a universal driver for the automation technology. The universal driver encapsulates the original driver and provides the generally understandable services via a universal interface. The application of the automation technology comes across a uniform interface when accessing the data on the field level.

8.1.3 OPC items

The process variables are represented by items when an OPC server is used. Thus, an item is the transport medium of a variable. Since in the most cases, only a part of the items provided by the OPC server is of interest for the client, they can be summarised in groups.

In addition to the contents of the variables, an item contains various additional information for the data. This additional information is called metadata.

An item is assigned to the following metadata:

- **Item definition**: Unambiguous string of digits to identify an item
- **Access rights**: Access authorisation to the item (reading, writing, or both)
- **Canonical data type**: Original data type as in the field device
- **Time stamp**: Time of the last change of an item
- **OPC quality**: State of an item, references to communication errors

An OPC client either receives the values of the items from the PLC or from the item cache of the OPC server.
8.1.4 OPC tunnel

If an OPC server and an OPC client are located on different computers, OPC tunnels are used. This is a software which is installed on both computers and acts as client and server itself. The data is transferred between the OPC server and OPC client by the OPC tunnel via the TCP/IP protocol. Thus, OPC tunnels provide a platform and network-spanning communication of OPC-based applications. This serves to avoid the "conventional" communication of distributed client/server applications via DCOM.

OPC tunnels are mainly used to connect the Engineering PC with the Industrial PC. However they can also be used in connections between the Industrial PC and other computers.
9 Glossary

A

AIF | Abbreviation for "Automation Interface". Lenze-specific interface at the controller on which a communication module can be plugged.

Communications module

Application | Implementation of a precise function (e.g. speed control) on an individual device.

Application variable | Structure of element variables which is communicated via network(s) using a specific transfer mode. The definition of an application variable is completely independent of a specific type of network.

Element variable

Axis | An axis is a special variant of a system module and basically contains at least one controller and one motor, but depending on the application it may contain further devices, such as gearboxes and encoders.

B

Bus server | Fieldbus-specific OPC server according to DRIVECOM specification.

OPC

DRIVECOM

C

CAL | Abbreviation for "CAN Application Layer". Communication standard (CiA DS 201-207) which provides the objects, protocols and services for the event or polling-controlled transfer of CAN messages and the transfer of greater data areas between CAN nodes. Furthermore, CAL offers powerful processes for an automatic assignment of message identifiers, the initialisation of network nodes and the assignment of an individual identification to network nodes.

CAN | Abbreviation for "Controller Area Network". Serial, message-oriented (not node-oriented) bus system for max. 63 nodes.

CANopen | Communication profile (CiADS301, version 4.01), which has been created under the umbrella association of the CiA ("CAN in Automation") in conformance with the CAL ("CAN Application Layer").

Catalogue | A catalogue contains descriptive information on all element types that form an »Engineer« project. The »Engineer« uses various catalogue types, e.g. for devices, device modules, technology applications, function blocks, and motors. Each catalogue is labelled by versioning.

Catalogue package | A catalogue package consists of several related catalogues and is named and versioned. Multiple versions of a catalogue package can be added to an »Engineer« installation. Every »Engineer« project can use an optional number of catalogue packages. Each catalogue package can be used in exactly one version.

CiA | Abbreviation for "CAN in Automation (e. V.)": International manufacturer and user organisation with the target to worldwide distribute the knowledge of the internationally standardised CAN bus system (ISO 11898) and promote its technical further development.

Internet: http://www.can-cia.org/

Code | Parameters for Lenze devices for setting the device functions.

COM | Abbreviation for "Component Object Model": Architecture developed by Microsoft® for the co-operation of individual executable software components (objects) which communicate with each other in a similar manner and are not connected until the program is running.

Communication module | Generic term for Lenze function modules and communication modules.

Function module

Communication module
### Glossary

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<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td>Communication module</td>
<td>Device extension which can neither fulfil a function nor is able to communicate without a device.</td>
</tr>
<tr>
<td>Controller</td>
<td>Generic term for Lenze frequency inverters, servo inverters, and PLCs.</td>
</tr>
<tr>
<td>DCOM</td>
<td>Abbreviation for &quot;Distributed Component Object Model&quot;: COM where the executable objects are distributed to different computers within one local area network.</td>
</tr>
<tr>
<td>DRIVECOM</td>
<td>&quot;DRIVECOM User Group e.V.&quot;: International organisation of manufacturers of drive technology, universities and institutes with the target to develop an easy integration of drives into open automation structures.</td>
</tr>
<tr>
<td>Drive</td>
<td>Mechatronic unit which serves a certain purpose and can be provided with mechanical, electrical and logical interfaces with regard to its environment. A device is called a &quot;communication-capable device&quot; if it is able to communicate as a node in a network. Unlike the mechatronic unit &quot;system module&quot;, a device already is created by the manufacturer and not only when a system of a concrete project is created. Examples of devices: drive controllers, PLCs, motors, gearboxes, sensors, encoders</td>
</tr>
<tr>
<td>DriveServer</td>
<td>Lenze software which provides an easy integration of drives into open automation structures based on OPC (&quot;OLE for Process Control&quot;).</td>
</tr>
<tr>
<td>Element variable</td>
<td>Variable which is used in an application to implement a specific function of the respective device.</td>
</tr>
<tr>
<td>FIF</td>
<td>Abbreviation for &quot;Function Interface&quot;. Lenze-specific interface at the controller which can be plugged onto a function module.</td>
</tr>
<tr>
<td>Function module</td>
<td>Device extension for the FIF interface which can neither fulfil a function nor is able to communicate without a device.</td>
</tr>
<tr>
<td>Hyperlink</td>
<td>Optically highlighted reference which is activated by means of a mouse-click.</td>
</tr>
<tr>
<td>IPC</td>
<td>Abbreviation for &quot;Industrial PC&quot;. The IPC is a central system for controlling and/or visualising machines.</td>
</tr>
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</table>
M

Machine application
Implementation of a function which is generated by the interaction of several communication-capable devices. A machine application is defined by the (device) applications involved and the exchange of application variables between them.

Menu bar
Bar in the upper position of the application window below the title bar which shows the names of menus that open with a mouse-click.

N

NMT
Abbreviation for "Network Management": Services and protocols for initialisation, configuration, management and network monitoring within one CAN network according to the master/slave principle.
- CAN

O

OLE
Abbreviation for "Object Linking and Embedding": Insertion of functional objects into other applications, e.g. a Microsoft® Excel table into a Microsoft® Word document.

OPC
Abbreviation for "OLE for Process Control": Defines an interface based on the Microsoft® Windows® technologies OLE, COM and DCOM which is enabled via a data exchange between different automation devices and PC programs without considering driver and interface problems.
- COM
- DCOM

P

PDF
Abbr. for "Portable Document Format", a universal file format developed by Adobe for the exchange of electronic documents. With this free software Adobe® Reader® PDF files can be displayed and printed, independent of the application and platform used for the creation.
- Internet: http://www.adobe.com/

PLC
Abbreviation for "Programmable Logic Controller".

PLC Designer
Integrated development environment for the creation of IEC 61131 programs for Lenze PLCs.

Port
Connection point or interface of an application or machine application. Input ports serve to transfer e.g. setpoints and control commands to an application, output ports serve to, for instance, provide actual values and status messages.
- Application
- Machine application

Project element
The topmost element (root element) in the project view with the global properties of the project.

R

Reset node
Function for Lenze devices with a system bus (CAN) interface, by which the device can be reinitialised if a change with regard to the data transfer rate, node address, or identifiers is effected. Ein Reset-Node kann bei Lenze-Geräten durch erneutes Netzschalten, einem Reset-Node-Befehl per NMT-Kommando oder über die entsprechende Codestelle erfolgen.
- CAN
- NMT
### S

**ST**
Abbreviation for "Structured Text": Standardised programming language (IEC 61131-3) for programmable logic controllers (PLC).

**System bus (CAN)**
Lenze bus system based on the communication profile CANopen (CiADS301, version 4.01).
- CAN

**System module**
Generic term for a mechatronic unit which can generally include several devices, one or several networks, information on parameter values, program logic and documentation.

A system module provides a specific technological function. It interacts with its environment and can be generally reused in another environment or system. The interfaces of a system module are provided by the interfaces of its components.

### T

**Title bar**
Bar in the upper position of the application window which contains the program symbol in the left-most position and the window symbols in the right-most position.
- Window symbol

**Top-down method**
Design and implementation method which provides a step-by-step transition from the general comprehensive structure to more and more special details until the entire project structure has been created.

### V

**Variable**
Name of a data memory which can adopt values defined by the data type and information on the variable declaration.

### W

**Window symbol**
Button in the right-most position of the title bar to change the window presentation or close the window.

### X

**XML**
Abbreviation for "EXtensible Markup Language", a meta language which describes the structure of documents.
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Your opinion is important to us

These instructions were created to the best of our knowledge and belief to give you the best possible support for handling our product.

If you have suggestions for improvement, please e-mail us to:
feedback-docu@Lenze.de

Thank you for your support.

Your Lenze documentation team