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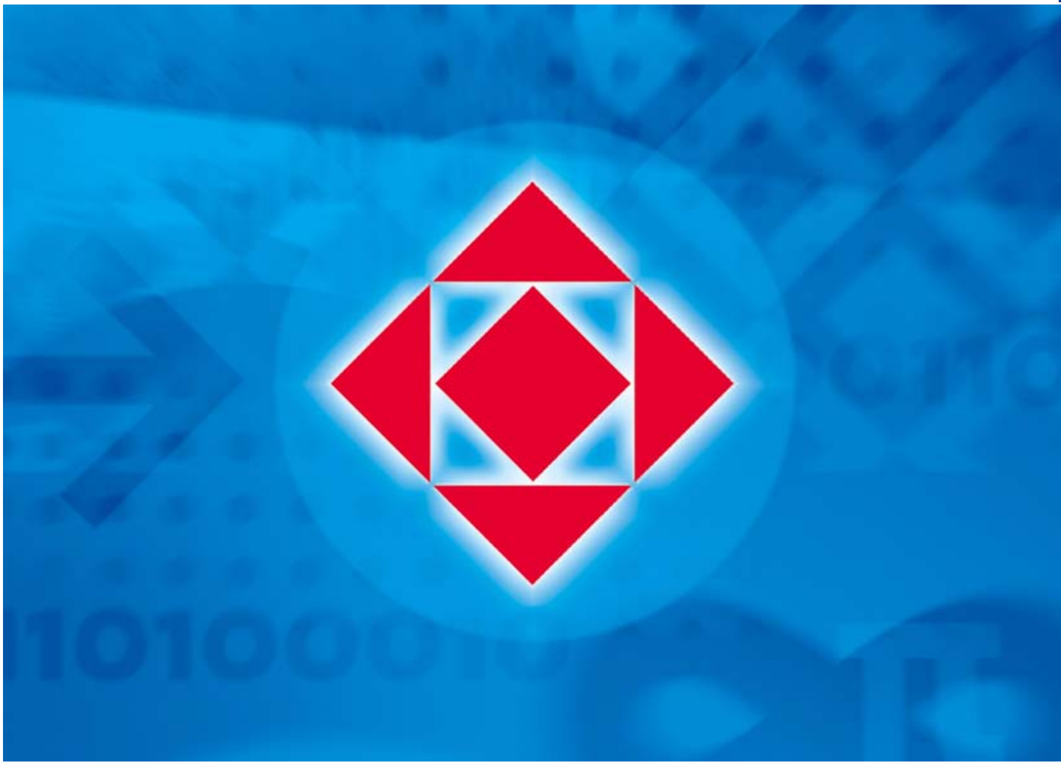
L-force *Engineering*

Software manual

L-force *Engineer*



HighLevel

Lenze

Validity information

This documentation is valid for the Lenze »Engineer« HighLevel as of version 2.13.0.0

Target group

This documentation addresses to all persons who want to use the engineering software L-force »Engineer« to parameterise, configure and diagnose field devices and control systems.

Document history

Version			Description
2.0	10/2007	TD16	First edition
2.1	07/2008	TD11	Extended by new functions: User motors, Cam Manager, Cam Editor
2.2	11/2008	TD11	Extended by new functions of »Engineer« V2.9: • L-force Loader Export, optimised menu control, device data update and establishing an online connection. New chapter "Handling catalogues".
2.3	04/2009	TD11	Optimised structures, update of dialog boxes & extension by new functions of »Engineer« V2.10: • Data logger • Compare and copy parameter sets
2.4	08/2009	TD11	Updated chapter: Managing cam data with the »Cam Manager« (📖 276)
2.5	10/2009	TD11	Updated contents for the software version »Engineer« V2.10 SP3
2.6	04/2010	TD11	Updated contents for the software version »Engineer« V2.12
2.7	11/2010	TD11	Updated contents for the »Engineer« V2.13 software version

Trademark

Contents

1 About this documentation

This documentation contains information about the Lenze »Engineer«.

»Engineer« is a Lenze engineering software program for different types of devices and is used for parameterising, configuring and diagnosing individual components (such as drive controllers, Industrial PCs, motors and I/O systems) as well as machine control systems.

»Engineer« is a tool which supports you throughout the whole machine life cycle - from planning to maintenance.

Structure of this documentation

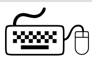
- In the chapter entitled "Safety instructions" safety instructions are listed that must be observed if you want to commission a drive controller or a plant with »Engineer«. (📖 15)
- In the chapter entitled "User interface" you can familiarise yourself with the user interface of »Engineer«. (📖 16)
- In the chapter entitled "Working with projects" you are told how to create a project in »Engineer«. (📖 36)
- In the chapter entitled "Establishing an online connection" you are told how to establish an online connection to one or several devices. (📖 88)
- The chapter "Device functions in the online mode" describes how to execute control functions in the device and how to transfer parameter sets and programs between the device and the »Engineer«. Moreover, this chapter describes different diagnostics options with an established online connection. (📖 105)
- The chapter "Defining the system functionality" describes how to define the functionality of your entire system in the »Engineer«. (📖 138)
- The chapter "Inserting & configuring a network" describes how to add and configure networks to the project so that information can be exchanged between the devices of the system. (📖 209)

1.1 Conventions used

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

Type of information	Writing	Examples/notes
Notation of numbers		
Decimal symbol	Point	The decimal point is generally used. For example: 1234.56
Text		
Program name	» «	The Lenze PC software »Engineer«...
Window area	*Italics*	The *Message window*... / The *Options* ... dialog box
Variable identifier		By setting *bEnable* to TRUE...
Control element	**Bold**	The **OK**... button / The **Copy**... command / The **Properties**... tab / The **Name** ... input field
Sequence of menu commands		If several commands in a row are required for a function to be performed, the single commands are separated by arrows: Select the **File→Open** command to ...
Shortcut	**<Bold>**	Use **<F1>** to open the online help.
		If a shortcut is required for a command to be executed, a "+" has been put between the key identifiers: With **<Shift>+<ESC>** ...

Program code	`Courier`	`IF var1 < var2 THEN`
		`a = a + 1`
		`END IF`

Keyword	**`Courier bold`**	
Hyperlink	underlined	Highlighted reference to another topic. In this online documentation activated with a mouse-click.
Symbols		
Page reference	(📖 13)	Highlighted reference to another page. In this online documentation activated with a mouse-click.
Step-by-step instructions		Step-by-step instructions are marked by a pictograph.

1.2 Definition of notes used

This documentation uses the following signal words and symbols to indicate dangers and important information:

Safety instructions

Structure of the safety instructions:

> **Danger!**
>
> (characterises the type and severity of danger)
>
> **Note**
>
> (explains the danger and how to avoid it)

Pictograph	Signal word	Meaning
	Danger!	**Danger of personal injury through dangerous electrical voltage** Reference to an imminent danger that may result in death or serious personal injury unless the corresponding measures are taken.
	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 unless the corresponding measures are taken.
STOP	**Stop!**	**Danger of material damage** Indicates a potential danger that may lead to material damage unless the corresponding measures are taken.

Application notes

Pictograph	Signal word	Meaning
	Note!	Important note to ensure trouble-free operation
	Tip!	Useful tip for simple handling
		Reference to another documentation

2 Safety instructions

Observe the following safety instructions if you want to commission a controller or a system by means of »Engineer«.

Carefully read the documentation supplied with the controller or the individual system components before you start commissioning the devices using »Engineer«!

The device documentation contains safety instructions which must be observed!

Danger!

According to today's scientific knowledge it is not possible to ensure absolute freedom from defects of a software.

If required, systems with integrated controllers have to be equipped with additional monitoring and protective equipment in accordance with the safety regulations valid in each case (e.g. law on technical equipment, regulations for the prevention of accidents), so that an impermissible operating status does not endanger persons or equipment.

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 the »Engineer« while the controller is connected online, the changes will be directly accepted by the controller!

An incorrect parameterisation can result in unpredictable motor movements. By an unintentional direction of rotation, too high speeds or jerky operation, powered machine parts can be damaged!

3 User interface

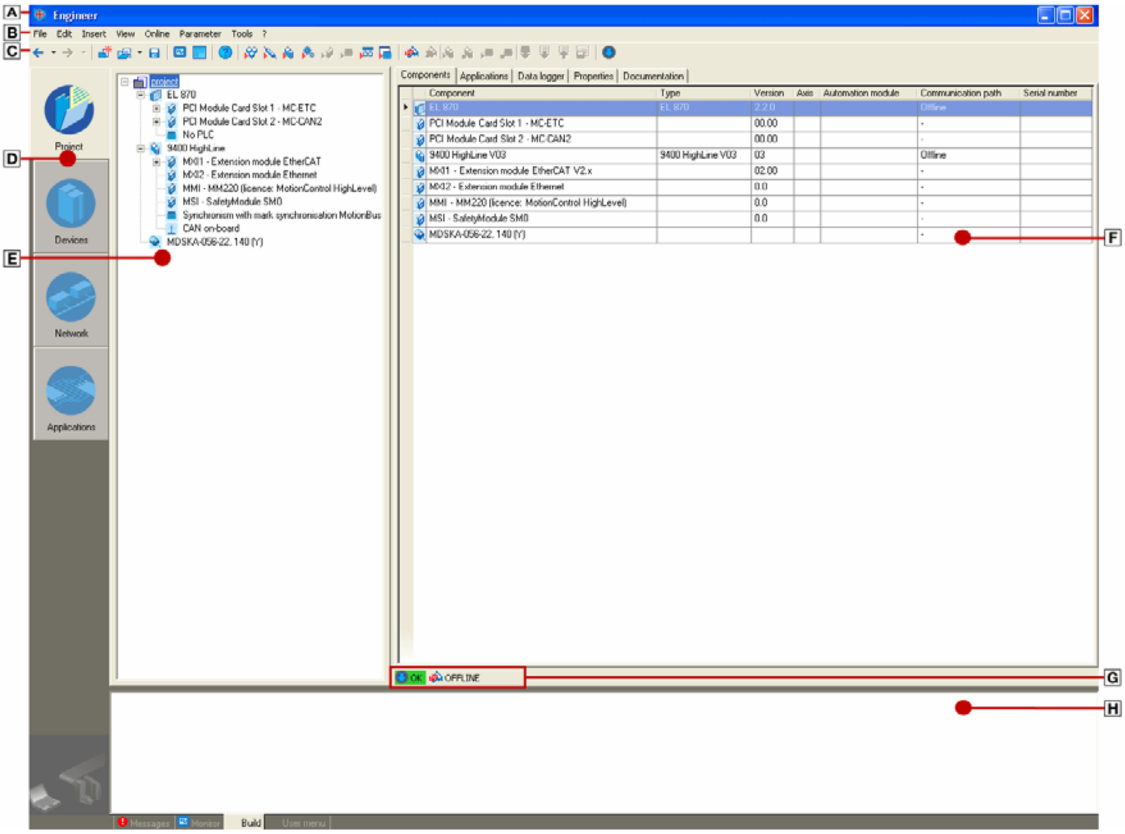
This chapter introduces the different control elements and function elements of the user interface and explains how you can exit the program again.

▸ Control & function elements (📖 16)

▸ Exiting the program (📖 35)

3.1 Control & function elements

The user interface contains the following control and function elements:



A Title bar	C Toolbar	E Project tree	G Status information
B Menu bar	D Project view bar	F Workspace	H Messages / Monitor / Create / User menu
			Without illustration: Wizards

Tip!

In order to increase the size of the workspace, you can use the context menu (right-hand mouse button) to reduce the size of the buttons in the Project *view bar* or **mask them out**.

- Alternatively the settings of the *Project view bar* can be executed via the menu command **Tools→Options** in the *Environment* tab. ▸ Options for the representation/project memory location (📖 34)

3.1.1 Title bar

In the *Title bar* in the upper position of the application window, the **Program symbol** and the **Program name** are shown in the left-most position, and the **Window symbols** are shown in the right-most position.

- You can use the **Window symbols** _ □ 🗗 to alter the way in which the application window is shown. Here, a distinction is made between
  - Icon in the *Task bar* (_)
  - Complete picture (□)
  - Window size (🗗)
- By clicking the **Program symbol**, you open the **System menu** that contains commands for positioning and altering the size of the application window.
- By clicking the **Window symbol** ✕ or double-clicking the **Program symbol** , you close »Engineer«.

3.1.2 Menu bar

You use the *Menu bar* to gain access to all menu commands.

- By clicking a main menu item, you open the corresponding menu, and the menu items it contains are then shown.
- By clicking a menu item, you trigger execution of the function associated with it.
  - Menu items displayed in light grey are deactivated in the current program status.

Further information on the commands that can be called in the *Menu bar* can be found in the following section: Short menu reference (266)

3.1.3 Toolbar

You can use the icons in the *Toolbar* to directly execute some of the most frequently used functions without having to call the commands in the *Menu bar*. If you are currently in the Project view, the "complete" toolbar is shown.

▶ Click an icon to execute the corresponding function:

Icon/button	Menu command	Function
History of the operating steps (back/next)		
	-	One step forwards or backwards in the history of the previously selected elements. ▸ History of the preselected elements (📖 21)
	-	
Managing projects		
	File→New project...	▸ Creating a new project (📖 37)
	File→Open...	▸ Opening the project file (📖 45)
	File→Save	▸ Saving the project (📖 49)
Configuring the user interface		
	-	▸ Configuring the monitor window (📖 28)
	-	Maximise or minimise workspace ▸ Workspace (📖 25)
Calling the online help		
	?→Engineer help	Show online help
Inserting project elements		
	Insert→System module	▸ Inserting system modules (📖 57)
	Insert→Axis	▸ Inserting axes (📖 59)
	Insert→Component	▸ Inserting components (📖 62)
	Insert→Gearbox	▸ Inserting a gearbox (📖 81)
	Insert→Device module	▸ Inserting device modules into a device (📖 66)
	Insert→Application	▸ Assigning an application to a device (📖 65)
	Insert→Network	▸ Inserting a network (📖 214)

Icon/button	Menu command	Function
	Insert➞Machine application	‣ Inserting a machine application with a port interconnection (🕮 180)
Going online/offline		
	Online➞Go online	Establish a connection to a device ‣ Go online (🕮 90)
	Online➞Go offline	Break the connection to a device ‣ Going offline (🕮 103)
	Online➞Optical location	Device search function (signalling via device LEDs) ‣ Optical location - device identification (🕮 103)
Control functions for drive controllers		
	Online➞Enable controller ‣ Safety instructions (🕮 15)	Enable device (cancel controller inhibit) ‣ Enable controller (🕮 108)
	Online➞Inhibit controller	Inhibit device (set controller inhibit) ‣ Inhibit controller (🕮 108)
	Online➞Start application ‣ Safety instructions (🕮 15)	Start application in the device ‣ Start application (🕮 109)
	Online➞Stop application	Stop application in the device ‣ Stop application (🕮 109)
Application / parameter transfer		
	Online➞Download program	Download application to the device ‣ Download program (🕮 111)
	Online➞Download parameter set	Download parameter set to the device ‣ Download parameter set (🕮 114)
	Online➞Upload parameter set	Upload parameter set ‣ Upload parameter set (🕮 116)
	Online➞Save parameter set	Save parameter set in the device safe against mains failure ‣ Store parameter set (🕮 118)
Compiling the project		
	Tools➞Build project	Build project (individual project elements or whole project)

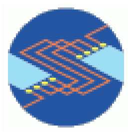
Note!

The icons which are available in the *Toolbar* depend on the project view selected and on the program context in which you are located at the moment.

- Some icons, for instance, are only available when a controller is selected.

3.1.4 Project view bar

Via the following buttons/icons in area D of the application window you can filter the project tree:

Button	Representation in the project tree
 Project	Show **Project tree in the** *Project view*. • This button serves to show all available project elements. • All project elements can be edited.
 Devices	Filter **Project tree in the** *Device view* • The project tree only shows the root element and the devices inserted. Details (like for example interfaces) are masked out.
 Network	Filter **project tree in the** *network view* • The project tree only shows the root element and the networks inserted.
 Applications	Filter **Project tree in the** *Application view* • The project tree only shows the root element and the applications that are inserted in the project.

Note!

In order to be able to completely edit the project, you have to be in the *Project view* (**Project** button in the *Project view bar*).

▶ Depending on the button selected in the *Project view bar*, the available icons in the *Toolbar*, the elements shown in the *Project view*, and the *Workspace* change.

Representing the project view bar in a reduced size/masking it out

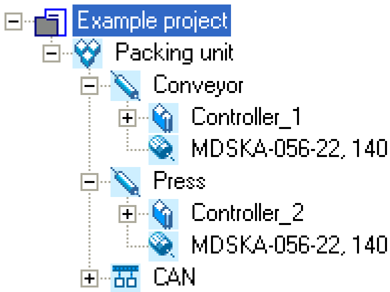
Tip!

In order to increase the size of the workspace, you can use the context menu (right-hand mouse button) to reduce the size of the buttons in the Project *view bar* or **mask them out**.

- Alternatively the settings of the *Project view bar* can be executed via the menu command **Tools→Options** in the *Environment* tab. ▶ Options (📖 106)

3.1.5 Project tree

Similar to the folder view in the *Windows Explorer*, the *Project tree* displays the project elements in the form of a hierarchical tree structure:



[3-1] Example for the hierarchical representation of the project structure in the »Engineer«

- If you select a project element and then change to the workspace, the project element is still shown on a grey background and is underlined at the same time.
  - Like this you can clearly see which project element the active workspace belongs to.
- If there is a plus sign ⊞ in front of a project element, further subelements are available.
  - A click on the plus sign ⊞ shows the subelements.
  - Another click on the minus sign ⊟ displayed will hide the subelements again.
- In the workspace, the properties and settings of the currently selected element are shown and can be edited there.

Tip!

You can alter the width and height of the *Project view* by using the mouse pointer to shift the screen divider between the *Project view* and the *Workspace* or between the *Project view* and the *Message window*.

By clicking with the **right-hand mouse button**, you can open a *Context menu* containing functions relevant to the elements.

By clicking the ← and → buttons in the *Toolbar*, you can quickly jump back to the element previously selected in the *Project view*.

3.1.5.1 History of the preselected elements

All elements selected in the *Project view* during project processing are stored in a "history".

Note!

The history is emptied automatically when the project is closed, i.e. the history is always empty when you open a project.

Via the buttons ← and → in the *Toolbar* you can move within this history to navigate backwards and forwards to the elements selected.

Tip!

If you are currently in the project tree with several drive controllers, you can return to the last edited element by clicking the ⇐ button.

- Clicking on the ⇐ button takes you back to the previously selected element.
- Clicking on the ⇒ button takes you forward to the next element in the history.
- If you click the arrow ▾ next to the ⇐ or ⇒ button, a list is shown that enables you to gain quick access to the element selected last.
  - Click on an entry in the list to jump to the corresponding element.
  - Each entry has the form "project: element name".

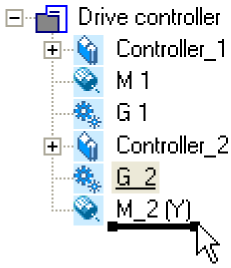
3.1.5.2 General editing functions in the project view

The following processing functions apply to all elements in the *Project view*.

- Drag element (cut & paste) (23)
- Duplicate element (copy & paste) (23)
- Delete element (24)
- Rename element (24)

Drag element (cut & paste)

1. Select the element to be shifted including all subelements.
2. Click and hold the element with your left mouse button and drag it to the desired position. The current position of the element is displayed in one of the following manners:
   - **Highlighting** of the respective element: The element to be shifted becomes the subelement of the highlighted element. This behaviour corresponds to the following command sequence: **Edit→Cut** followed by **Edit→Insert**.
   - Element shown as a horizontal bar: The element that has been shifted is placed in the desired position between the two adjacent elements. You can thus influence the sequence of elements on a level of the project tree:



or

1. Select the element to be shifted including all subelements.
2. Select menu command **Edit→Cut**.
3. Select the element into which the element cut before is to be pasted.
4. Select menu command **Edit→Insert**.

Duplicate element (copy & paste)

1. Select the element which is to be copied including all subelements.
2. Select menu command **Edit→Copy**.
3. Select the element into which the element copied before is to be pasted.
4. Select menu command **Edit→Insert**.

Delete element

1. Select the element to be deleted including all subelements.
2. Select menu command **Edit→Delete** or press the **<Del>** button in order to delete the element selected.

Rename element

1. Select the element to be renamed.
2. Select menu command **Edit→Rename** or press the **<F2>** function key.
3. Enter new name.
4. Press the **<input key>** to accept the new name.

3.1.5.3 Shortcuts in the project view

Tip!

As an alternative to directly selecting elements with the help of the mouse pointer, you can use keyboard shortcuts (for example, if you are running »Engineer« on a notebook). This enables faster movement within the *Project view* in order to select elements for editing.

You can use the following shortcuts for navigating within the *Project view* if an element is focused on in the *Project view*:

Shortcut	Function	
<PG UP>	Browsing upwards in the project tree.	
<PG DN>	Browsing downwards in the project tree.	
<UP ARROW>	Selection of the next element up.	
<DOWN ARROW>	Selection of the next element down.	
<LEFT ARROW>	Depending on the symbol shown in front of the element:	
	⊞	Selection of the superior element in the hierarchy.
	⊟	Hiding the subelements.
<RIGHT ARROW	Depending on the symbol shown in front of the element:	
	⊞	Showing the subelements.
	⊟	Selection of the first subelement.
<BACKSPACE>	Selection of the higher-level element in the hierarchy in each case.	
<POS1>	Selection of the first element (the project element).	
<END>	Selection of the last element (shown).	

Tip!

In order to focus on an element in the *Project view*, click on an element or press the **<Tab>** key until the focus has changed to the desired element.

3.1.6 Workspace

The *Workspace* (area F) has various tabs which show the properties and settings of the project elements currently slected in the *Project tree* (e.g. 9400 HighLine or CPC_2700). The tabs can be used to edit the parameters of the respective device.

[3-2] Tabs of a 9400 HighLine

▶ By clicking on the designation at the top of a tab, you cause the full tab to be shown in the foreground.

Tip!

Exactly which tabs are shown in the *Workspace* depends on the type of project element/device selected.

You can alter the width and height of the *Workspace* by using the mouse pointer to move the screen divider between the *Project view* and the *Workspace* or between the *Workspace* and the *Message window* as required.

3.1.6.1 Displaying parameter values

Device parameter settings shown in the workspace of the »Engineer« (e.g. in the **Parameters** tab for a device) are displayed with different background colours with the following meaning:

Colour	Example	Meaning
Offline representation		
White	1,2345	Offline parameter • The device is not connected "online" with the »Engineer«. The parameter value set in the project is displayed.
Light grey	1,2345	Offline display parameter • So-called "display parameters" are parameters which are only used to show status information and actual values and which feature a read-only access.
Online representation		
Yellow	1,2345	Online parameter (value can be changed) • The device is connected "online" with the »Engineer«. The current parameter value of the device is displayed. • The ≠ symbol in front of a parameter value indicates that the value in the device differs from the parameter value set in the project.
Pale yellow	1,2345	Online display parameter (read only) • The device is "online", i.e. connected to »Engineer«. The current parameter value of a display parameter of the device is shown.
Red	1,2345	Communication error (time-out) • Communication to a device is interrupted, the online parameter could not be read out of the device within a certain time.

If you edit a parameter value in an input field, you can see from the colour of the text whether the altered value has already been integrated into the project or the device and is within the valid range.

Colour	Example	Meaning
Black	1,2345	Parameter value that is within the valid range and that has already been integrated into the project or device.
Blue	1,2345	Altered parameter value that has not yet been integrated into the project or the device. • By pressing the **<input key>**, you accept the altered value. • You can reject the change by pressing the **<ESC>** key.
Red	1,2345	Changed parameter value which is outside the valid range. • You can reject the change by pressing the **<ESC>** key.

3.1.7 Status information

Information	Meaning
Project status	
OK	The project element has been updated.
Changed	The project element has been changed. • Build the project by pressing the button in the *Toolbar*. ▶ Control & function elements (📖 16)
Device status	
OFFLINE	The device is offline. • There is no online connection to the device.
ONLINE	The device is online. • The »Engineer« communicates with the device via bus connection.
ONLINE	The online connection is interrupted. • An established online connection between the device and the »Engineer« is interrupted (communication error).

3.1.8 Messages

In the *Message window*, status and error messages relating to an executed program operation or the current status of the program are displayed.

Each message has the following structure:

Icon	Time stamp	Text
	[hh.mm.ss]	Information text
		Note
		Error text
		Program error text

Context menu

In the *Message window* there is a context menu (right-hand mouse button) with the following commands:

Command	Function
Delete	Delete all messages in the message window.
Display	Submenu to select the elements to be displayed.
Copy list	Copy all messages to the clipboard.
Copy message	Copy the selected message to the clipboard.

Tip!

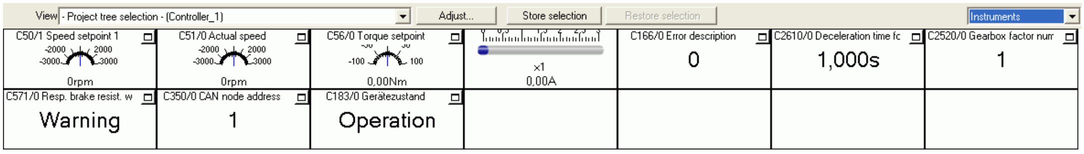
Using the mouse pointer, the height of the *Message window* can be changed by dragging the screen divider between *Workspace* and *Message window* up or down.

3.1.9 Monitor

A *Monitor window* can be displayed instead of the *Message window* below the *Project view* and the *Workspace*.

How to show the monitor window:

1. Select the **Monitor** tab at the lower edge of the application window in order to hide the *Message window* and show the *Monitor window*.
2. Select the *Monitor window* to be displayed in the **View** list field.



- In the *Monitor window*, the current values of up to 16 parameters of the devices in the project can be displayed if an online connection has been established.
- Select via the **View** list field whether the *Monitor window* is to be displayed for the whole machine or just for a specific device available in the project.
  - If the *Monitor window* for the machine has not yet been configured, the display area for this *Monitor window* is initially empty.
  - The *Monitor window* for a device is already preconfigured with display parameters which can be changed if required.
- The **Adapt** button makes it possible to customise the way in which the parameters are displayed. Configuring the monitor window (28)
- Using the **Store selection** and **Restore selection** buttons, an adapted monitor window can be used for another device in the same project.
  - After completion of a Monitor window, click the **Store selection** button.
  - Highlight the other device in the project tree and click the **Accept selection** button.
- The list field to the right switches the instrument display:
  - Single-column list display: list (single-column)
  - Two-column list display: list (two-column)
  - The graph is preset: *Instruments*.
- By clicking the ☐ window symbol of a display field, you cause the corresponding display to be shown in full in the *Monitor window*.
  - You can change back to showing all the configured display fields by clicking the 🗗 window symbol which is then shown.

3.1.9.1 Configuring the monitor window

The *Monitor window* is freely configurable for the respective machine and the connected devices such as drive controllers or Industrial PCs. When the Monitor view is being adapted, a distinction is to be made between the "instruments" display and the "list" display of the parameters.

▸ Adapting the view of the instrument representation (📖 29)
▸ Adapting the view of the list representation (📖 31)

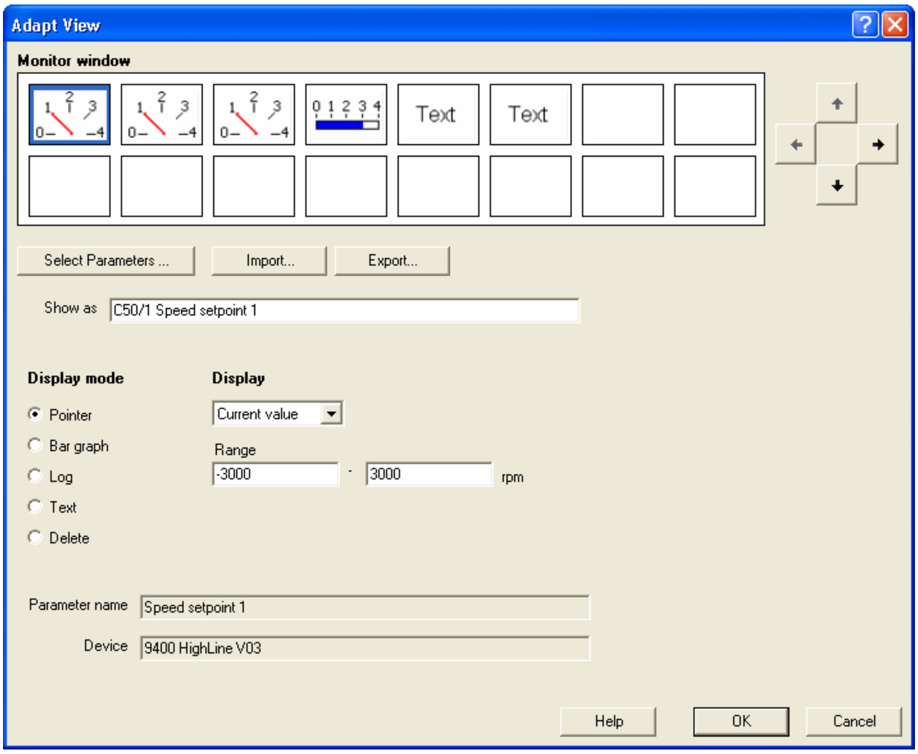
Tip!

With a right-click in the corresponding code, you can accept parameter values in the monitor window.

Adapting the view of the instrument representation

How to configure the monitor window:

1. In the **View** list field, select the *Monitor window* to be configured.
2. Click the **Adapt** button to open the *Adapt view* dialog box.



3. Click on the display field you want to configure in the **Monitor window** area.
   - The selected display field is highlighted with a blue frame.
4. Click the **Select parameters** button to open the *Parameter selection* dialog box.
5. In the tree structure on the left-hand side, select the target system that contains the parameters to be displayed.
6. Select the desired parameter from the list field on the right.
   - If you deactivate the control field **Only show read parameters**, all the parameters in the target system are shown in the list field.
   - By activating the control field **Activate in menu groups** you display the parameters in a manner divided into menu groups.

7. Click the **OK** button.
   - The *Parameter selection* dialog box is closed and the selection is accepted.
8. Configuring the way in which a parameter value is shown:
   - In the **Show as** input field, alter the name of the display field, if necessary, in order to ensure that the Monitor window for the machine indicates the relationship to the respective device.
   - In order to visualise the parameter value, select one of the following options: pointer, bar graph, log, text, delete.
   - When choosing an instrument of the type pointer, bar graph or log, you can also specify a minimum and maximum value for the display area.
   - In the **Display** list field, you can choose whether the current value, the maximum value or the minimum value of the parameter is to be shown.
   - The position of the display field in the monitor window can be changed afterwards by means of the arrow buttons.
   - With the **Import** and **Export** buttons, you can export the values of an adapted Monitor window as an *.epc file and import them into another »Engineer« project.
9. Click the **OK** button.
   - The *Configure monitor window* dialog box is closed and the configured display fields are shown in the *Monitor window*.

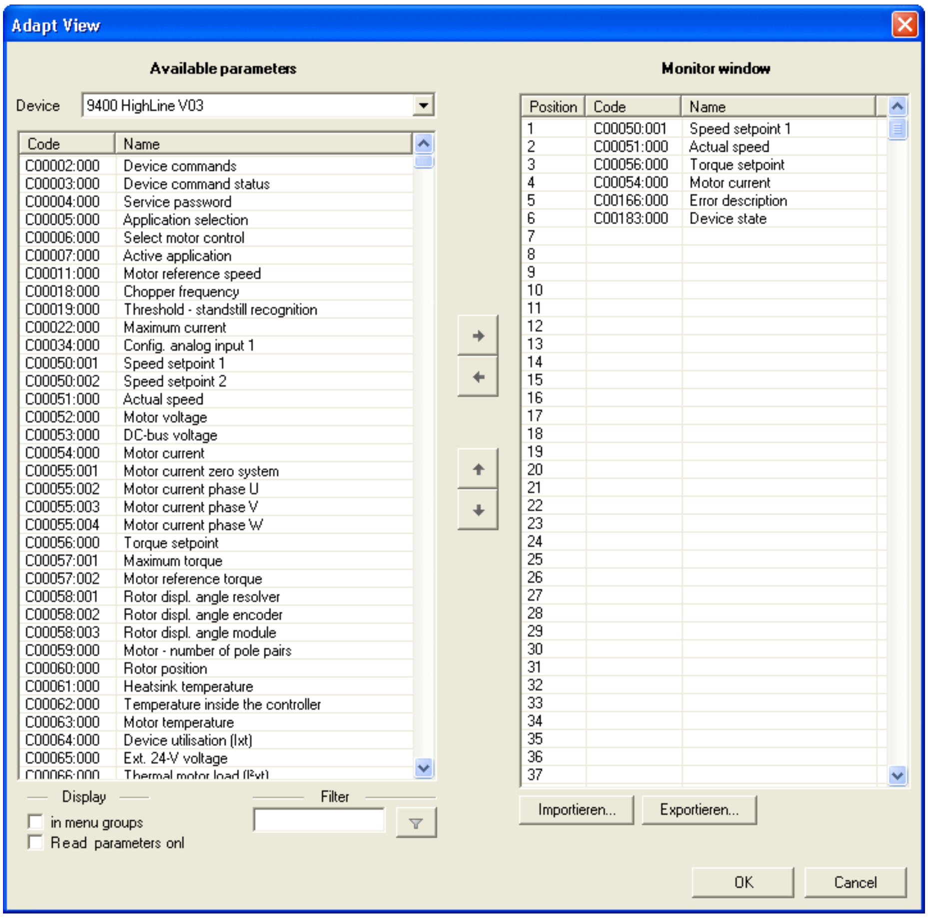
Tip!

By clicking with the right-hand mouse button, you can open a context menu with functions relevant to elements.

Adapting the view of the list representation

How to configure the monitor window:

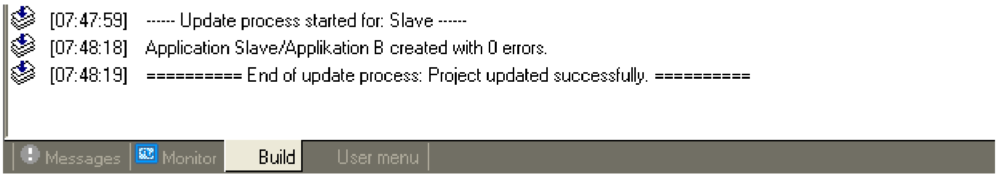
1. In the **View** list field, select the *Monitor window* to be configured.
2. Click the **Adapt** button to open the *Adapt view* dialog box.



3. Go to *Available parameters* and select the parameters you want to accept in the *Monitor window*.
   - Multi-selection of parameters shown one above the other: Hold down the **<CTRL>** key and highlight the parameters.
   - Multi-selection of individual parameters: Hold down the **<SHIFT>** key and highlight the desired parameters individually.
4. Use the arrow key to accept the selected parameters in the monitor window.
   - The arrow keys can be used to remove parameters from the monitor window and change the positions of the individual parameters.
   - Via the control fields **In menu groups** and **Read parameters only**, the parameters available can be displayed according to menu groups and read parameters,
   - By clicking the **Import** button, you can import the saved parameter lists.
   - By clicking the **Export** button you can export the adapted view in an .epc file in order to be able to use the view for other projects.

5. Click the **OK** button.
   - The *Configure monitor window* dialog box is closed and the configured display fields are shown in the *Monitor window*.

3.1.10 Create



In the *Create* section, the »Engineer« provides information on individual creation and updating processes.

▶ Error messages and notes are listed under *Messages*. Messages (📖 27)

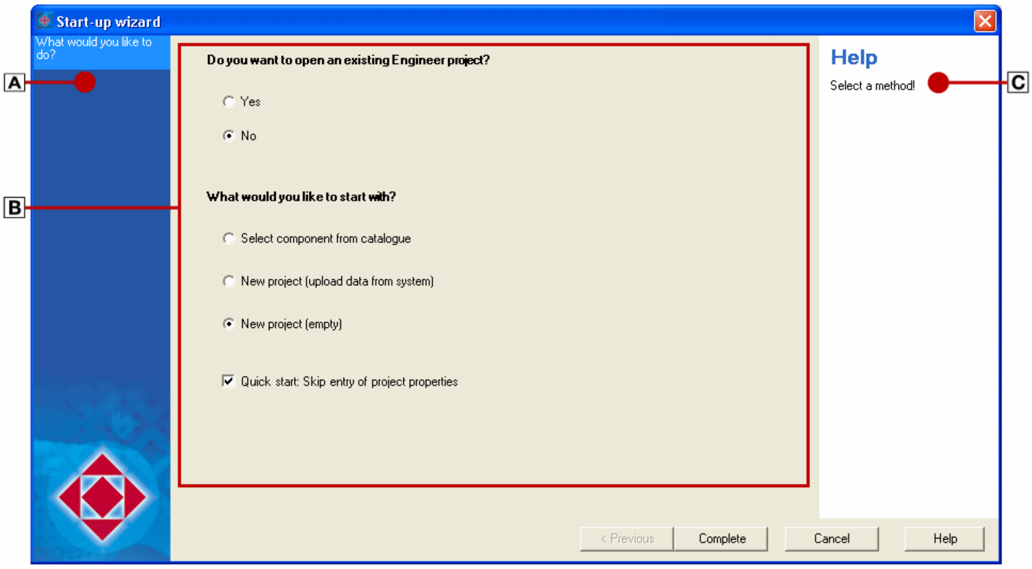
3.1.11 User menu

Via the *User menu* tab you can display the user-specific parameters. Further information on the configuration can be found in the following section: User menu (📖 176)

3.1.12 Wizards

The »Engineer« has various so-called "wizards" that help you , for instance, during the creation of a new project or during set-up and configuration of a network.

▶ What all wizards have in common is the underlying appearance of the dialog box by means of which the information needed is obtained from you step by step:



▶ Area A shows within which step of the wizard you are right now.

▶ Area B contains the main dialog box for entering the data and selecting the desired options.

▶ Area C displays further information and input requests for the respective step.

Standard buttons

Button	Function
Previous	Go back to the previous step.
Next	Go to the next step.
Complete	Closes the wizard and accepts the entered settings.
Cancel	Cancels the wizard and rejects the entered settings.
Help	Calls online help on the topic.

3.2 Options for the representation/project memory location

Via the **Tools→Options** menu command you open the *Options* dialog box. In this dialog box you can carry out general settings for the user interface in the **Environment** tab.

- In the **Environment** tab general optional settings can be edited.
- The settings are not a project property. Thus the settings are maintained for the following »Engineer« projects.

Option	Description
• Activate confirmation prompt when deleting components	Activate/deactivate confirmation prompt that is shown when components are deleted. • If this option is deactivated, the »Engineer« directly deletes the desired component without a confirmation prompt.
• Register external applications automatically	Specifies that the »Engineer« automatically writes the required entries into the Windows registry to start external programs. • Like this the external program is registered for use in the »Engineer« and can thus be called by the »Engineer«. Registration is effected in accordance with the general Windows operating system standards. • The option is activated by default. **Example:** When a device from the 9400 HighLine series is *Updated*, the »Engineer« calls the »PLC Designer« to compile the program code which was previously created from the function block interconnection. On the Engineering PC several versions of »Engineer« and/or the »PLC Designer« can be installed. When the option is activated, the »Engineer« automatically ensures that the "suitable" (expected) »PLC Designer« version is used for the compilation process. **Note:** **If unexpected malfunction on your system occurs by this procedure, you can deactivate this option.** For instance administrated access authorisation can prevent the »Engineer« from writing into the registry. In order to ensure that the external programs can be called by the »Engineer«, you then have to make sure that after installing the »Engineer« no other version of the program to be called by the »Engineer« has been installed on your Engineering PC. **Otherwise malfunction or an unexpected response of the controller may result!**
• Change representation of the *Project view bar*	Specify the form of representation of the Project view bar. • For instance, the *Project view bar* can be masked out to increase the size of the *Workspace*. ▶ User interface (📖 16)
• **Standard memory location** for »Engineer« projects	Specify the standard memory location for the creation of »Engineer« projects • The standard memory location can also be defined when a new project is created. ▶ Creating a new project (📖 37)
• Representation of descriptive texts	Specify the type of representation of the descriptive texts. • The standard setting is "simple and self-explanatory". By this the respective descriptive text is reduced to the essential. • "Formally more clearly" provides further information. By this the descriptive texts are accordingly written in greater detail. • The option for instance has a (device-independent) effect on all codes and selection texts in the »Engineer«, which contain further descriptive texts. • The option will become effective after an »Engineer« restart.

3.3 Exiting the program

Select the **File→Exit** command or click the Window icon ✕ in the Title bar in order to exit »Engineer«.

Note!

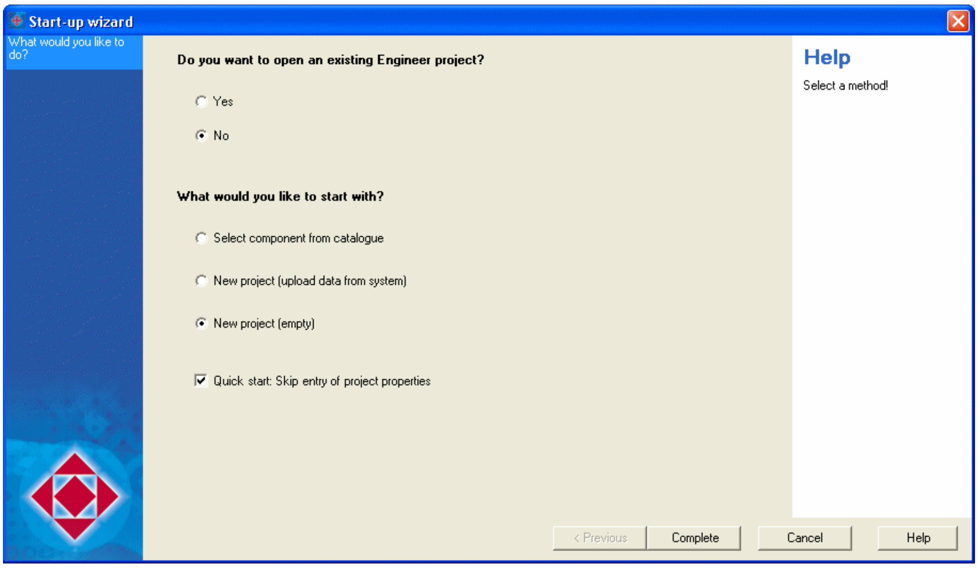
If a project is open with changes that have not yet been saved, the *Save project* dialog box is shown before the program is terminated.

▸ Working with projects: Closing the project (📖 51)

4 Working with projects

This chapter presents the work with projects in the »Engineer« to you. In the »Engineer« you create projects to map (plan) your desired machine/system concept in the »Engineer«.

When you start the »Engineer« no project is loaded at first, and the *Start-up wizard* appears. You can open an already existing project or create a new project:



Starting options

- Creating a new project (37)
- Opening the project file (45)

4.1 Creating a new project

The creation of a new project is carried out by means of the *Start-up wizard* and includes the definition of options for the procedure of inserting components and project properties.

How would you like to start?

Step	Option	Function
What would you like to do?	• Select a component from the catalogue	Create projects with components fom selection lists. ▸ Creating a new project (selecting a component from the catalogue) (📖 38)
	• Start the search for devices connected	Search for devices that accessible online. All devices identified are inserted in the project tree. ▸ Creating a new project (starting the search for devices connected) (📖 40)
	• Empty project	▸ Creating an empty project (📖 43)
	• Quick start guide: Skip entry of the project properties (optionally)	• Skip project properties (properties/memory location). For the time being the project is named *My project* and is stored at the standard memory location. • The quick start guide for instance is helpful when you need projects temporarily for testing purposes.
Project properties		
Properties	• Project name • Project data • Descriptive text	Define desired properties in order to be able to clearly identify the project.
Memory location	• Name of the project folder • Memory location for projects	Define desired memory location. • Optionally a standard memory location can be defined.

Project properties

You can alter the project properties entered in the *Start-up wizard* at any time later on. ▸ Project properties (📖 48)

Memory location

In addition to the project file with the ending ".afs" a project includes further directories and files which are stored in a project directory.

▶ The name and path for the project directory can be selected in the *Start-up wizard*.

▶ The memory location can be changed later. ▸ Options for the representation/project memory location (📖 34)

4.1.1 Creating a new project (selecting a component from the catalogue)

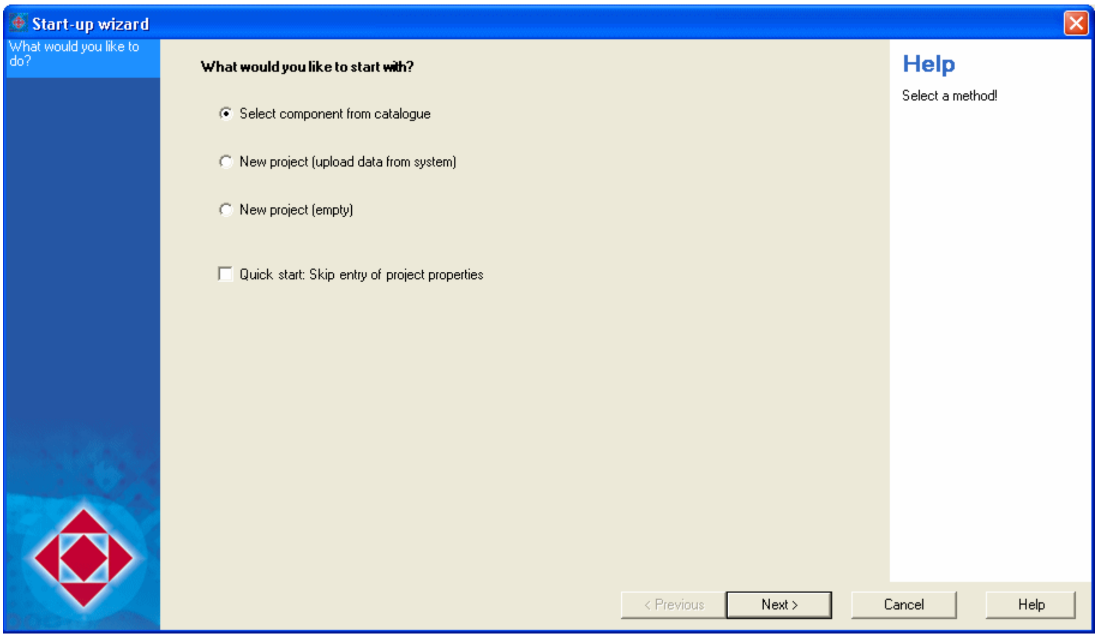
By this procedure you create a project with components (for example controller, I/O system, etc.). The components are chosen from the selection lists in the »Engineer«.

▶ By means of this option you can go online with the inserted controller directly after having created the project, in order to transfer parameters.

How to directly create a new project with components:

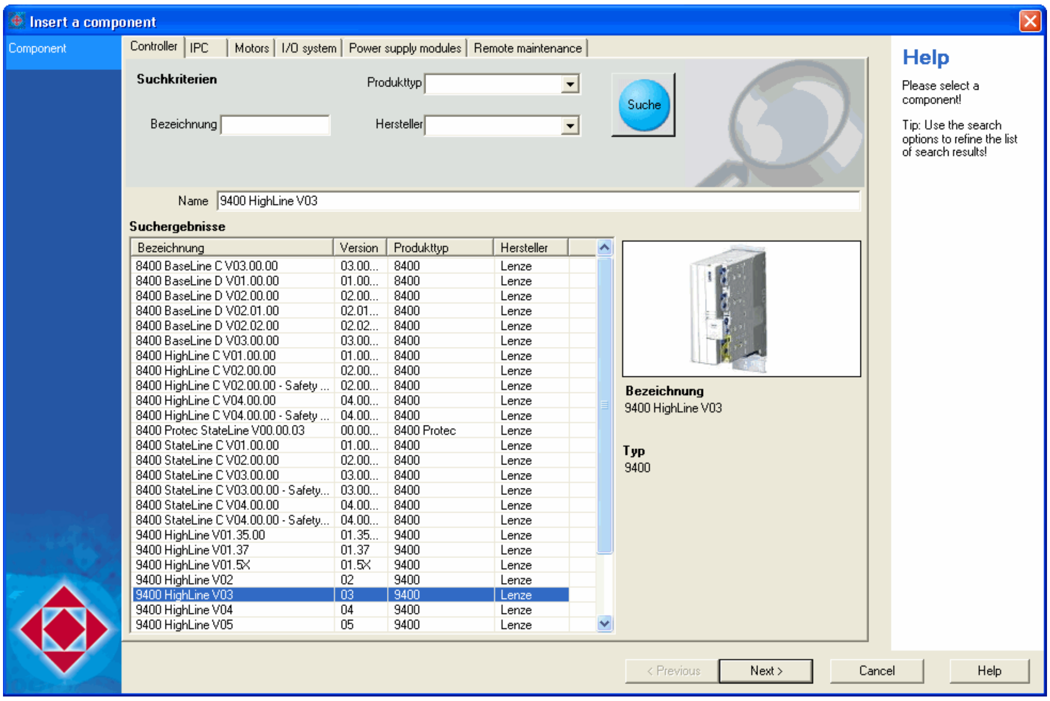
1. If the *Start-up wizard* has not yet appeared, click the icon or select the menu command **File→New** to call the *Start-up wizard*.

   Step 1 - What would you like to do?



2. Select the **Select component from catalogue** option.
3. Click the **Next** button.
4. **Step 2 - properties**
   Enter the corresponding properties of the project (name, order number etc.) in the input fields.
   - Enter desired **Properties**.
   - The **Name** can be found later in the *Project view* as the name of the project element.
5. Click the **Next** button.

6. **Step 3 - memory location**
   As **Project name** the previously entered **Project designation** is suggested. If required, correct the suggestion accordingly.
   - The **Project name** at the same time is the name for the project directory to be created.
   - Specify the storage location for the project directory in the **Directory** input field.
   - If the folder specified is not available, it will be created.
   - As an alternative you can select an existing directory in your workspace environment via the **Browse...** button.
   - The *Always save projects here* option determines the folder specified to be the standard storage location for future »Engineer« projects. Activate this option for the central management of all projects within the same folder.
7. Specify the storage location for the project directory in the **Directory** input field.
   - If the specified directory does not exist, it will be created.
   - As an alternative you can select an existing directory in your workspace environment via the **Browse...** button.
8. Click the **Next** button.
   - The **Start-up wizard: insert component** dialog box appears.



9. Select the required component.
   - The search results show the components available.
10. Click the **Next** button.
    - Further proceeding is described in the chapter entitled "Project structure". ▶ Inserting components (📖 62)

4.1.2 Creating a new project (starting the search for devices connected)

Instead of beginning with an empty project, you can ask »Engineer« to look for devices that can be reached *online*.

- After the search has been carried out, you can open the *Start-up wizard* and select the identified devices that are to be included in the project.

Note!

A communication link to the system via CAN or via the X6 diagnostic interface (in the case of the Inverter Drives 8400 and Servo Drives 9400 device series) is needed in order to read out the data.

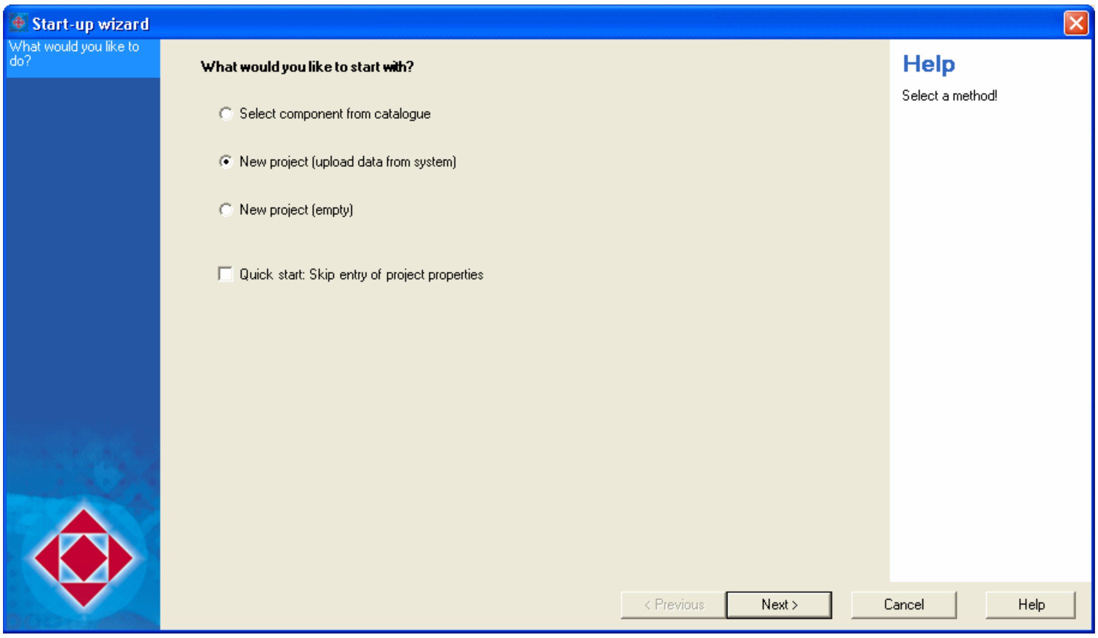
Stop!

In the step "Reading online data", the *Start-up wizard* (after the **Start search** button has been clicked) automatically establishes an online connection via the selected interface in order to enable the read-out of data from the connected devices.

How to create a new project with connected devices:

1. If the *Start-up wizard* has not yet appeared, click the icon or select the menu command **File→New** to call the *Start-up wizard*.

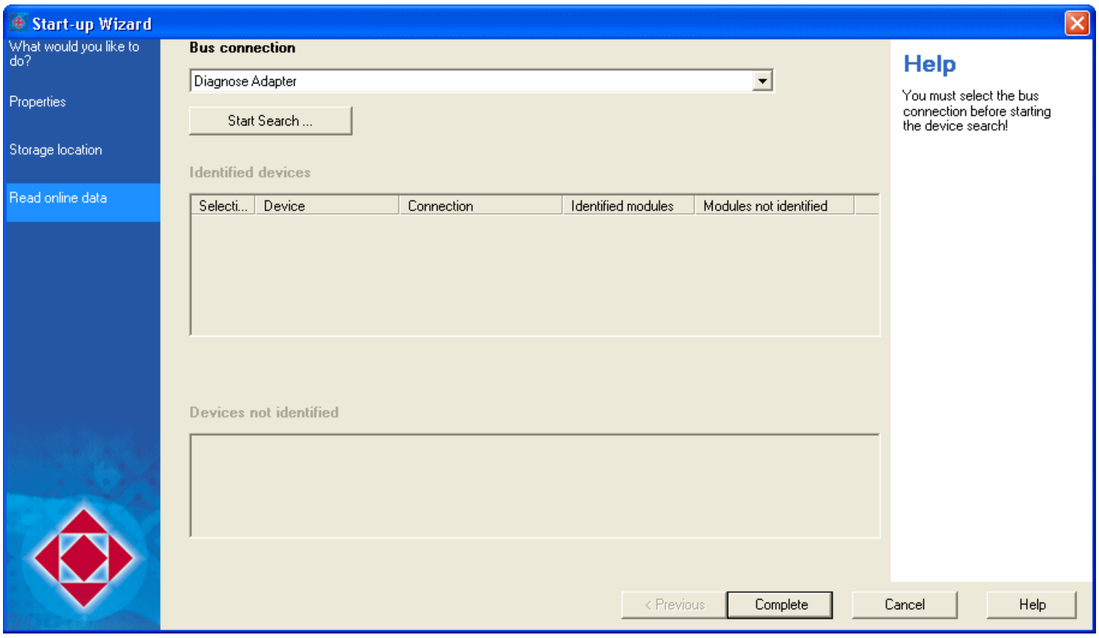
   Step 1 - What would you like to do?



2. Select the option **Search for connected devices**.
3. Click the **Next** button.

4. **Step 2 - properties**
   Enter the corresponding properties of the project (name, order number etc.) in the input fields.
   - Enter desired **Properties**.
   - The **Name** can be found later in the *Project view* as the name of the project element.
5. Click the **Next** button.
6. **Step 3 - memory location**
   As **Project name** the previously entered **Project designation** is suggested. If required, correct the suggestion accordingly.
   - The **Project name** at the same time is the name for the project directory to be created.
   - Specify the storage location for the project directory in the **Directory** input field.
   - If the folder specified is not available, it will be created.
   - As an alternative you can select an existing directory in your workspace environment via the **Browse...** button.
   - The *Always save projects here* option determines the folder specified to be the standard storage location for future »Engineer« projects. Activate this option for the central management of all projects within the same folder.
7. Click the **Next** button.

   Step 4 - Reading online data



8. Select the interface to be used in the **Bus connection** list field.

9. Click the **Search for devices** button to start the search for devices connected to the selected interface.
   - The dialog box entitled *Search for online devices* is displayed with status messages regarding the search.
   - The *Start-up wizard* automatically establishes an online connection via the selected interface in order to enable the read-out of data from the connected devices.
10. After the search has been completed, click the **Close** button to close the *Search for online devices* dialog box.
11. In the **Identified devices** list field, select the devices that are to be included in the new project to be created.
12. Click the **Complete** button.
   - The project is created with the defined settings.
   - **There is now an online connection to the selected devices!**

In the *Project view*, the Project element together with the name assigned to the project is displayed and, below the project element, all the previously selected devices are shown in a flat system structure.

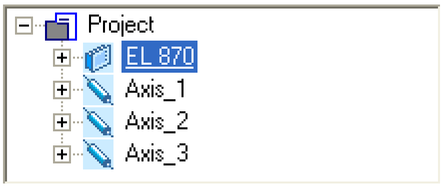
Stop!

There is now an online connection to the devices. This is signalled by the yellow-highlighted device symbol in the *Project view*.

If you change parameters in the »Engineer« while the controller is connected online, the changes will be directly accepted by the controller!

Example 1: Project with 9400 HighLine, to which an online connection already exists

Example 2: Project with an Industrial PC and three axes



Next steps

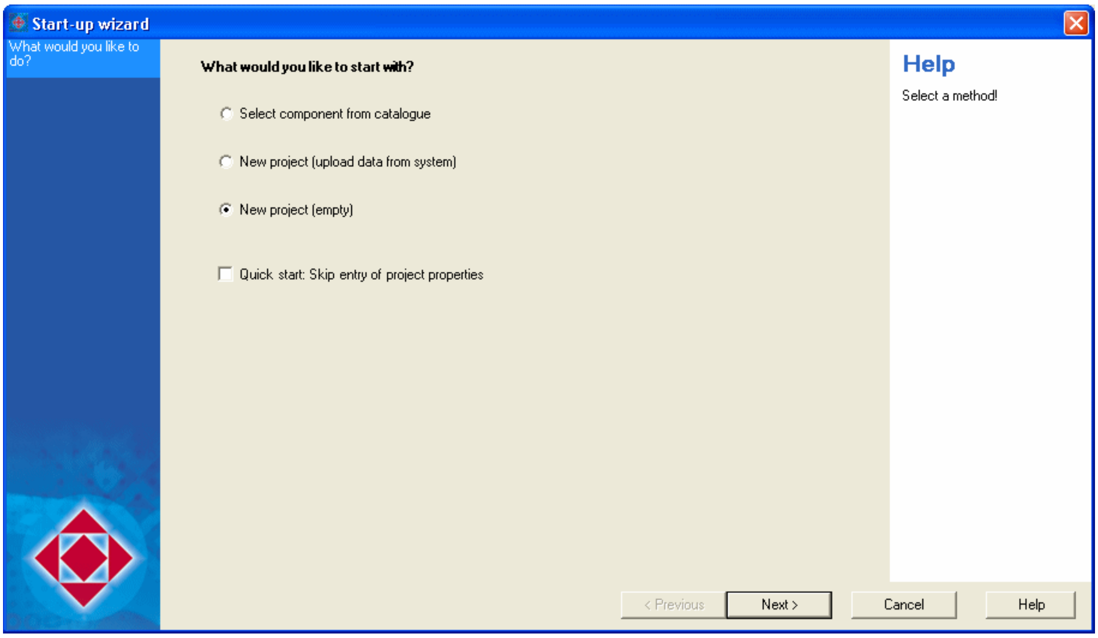
Next, you can continue to add items to the system structure and, for example, convert the flat system structure into a hierarchical system structure by adding system modules and/ or axes to the project.

4.1.3 Creating an empty project

How to create a new (empty) project:

1. If the *Start-up wizard* has not yet appeared, click the icon or select the menu command **File→New** to call the *Start-up wizard*.

   Step 1 - What would you like to do?



2. Select the **Empty project** option.
3. Click the **Next** button.
4. **Step 2 - properties**
   Enter the corresponding properties of the project (name, order number etc.) in the input fields.
   - Enter desired **Properties**.
   - The **Name** can be found later in the *Project view* as the name of the project element.
5. Click the **Next** button.
6. **Step 3 - memory location**
   As **Project name** the previously entered **Project designation** is suggested. If required, correct the suggestion accordingly.
   - The **Project name** at the same time is the name for the project directory to be created.
   - Specify the storage location for the project directory in the **Directory** input field.
   - If the folder specified is not available, it will be created.
   - As an alternative you can select an existing directory in your workspace environment via the **Browse...** button.
   - The *Always save projects here* loption determines the folder specified to be the standard storage location for future »Engineer« projects. Activate this option for the central management of all projects within the same folder.

7. Click the **Next** button.
8. Click the **Complete** button to create the project with the specified settings.

Tip!

- The individual elements in the *Project view* can be edited anytime.
- The standard memory location for »Engineer« projects can be defined anytime via the menu command **Tools→Options** in the **Environment** tab. ▶ Options for the representation/project memory location (📖 34)

Next steps

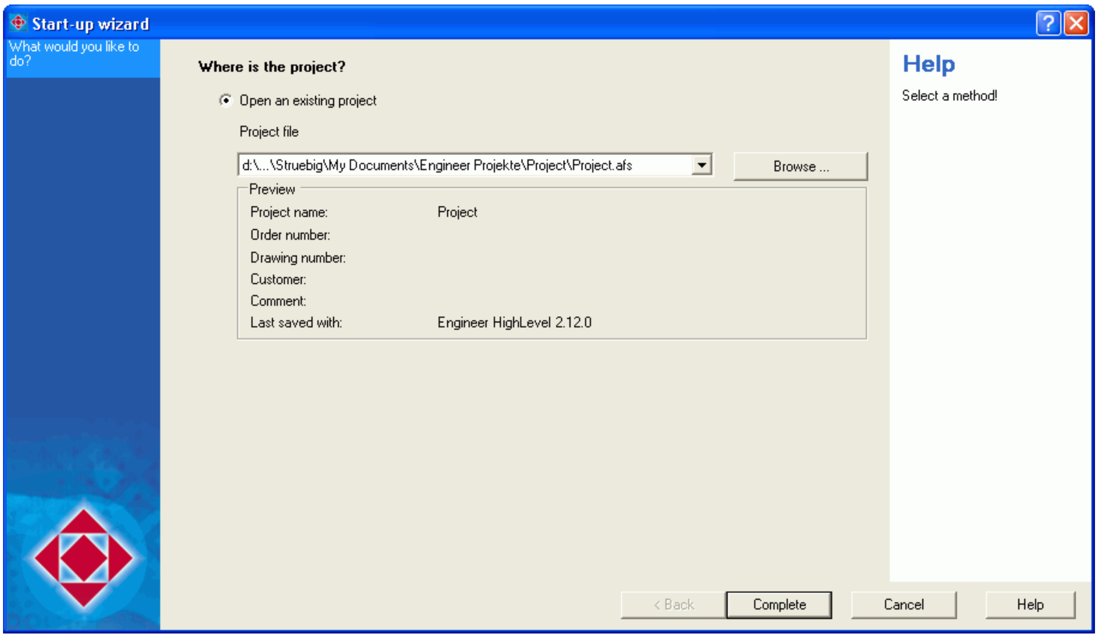
The next step is to create a system structure.
▶ Inserting system modules (📖 57)

4.2 Opening the project file

How to open an existing project:

1. If the *Start-up wizard* has not yet appeared, click the icon or select the menu command **File→Open** to call the *Start-up wizard*.

   Step 1 - What would you like to do?



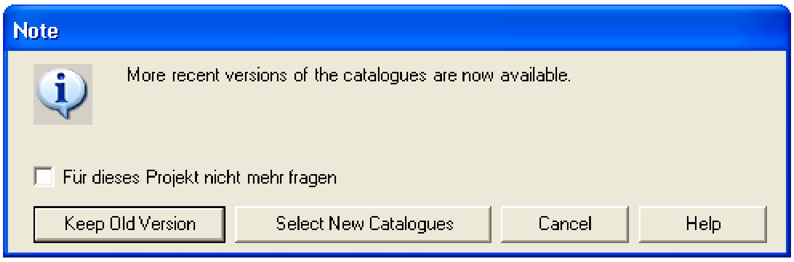
2. In the **Project file** list field, select one of the recently processed project files or click the **Browse...** button to select an existing project file (*.afs format) within the workspace environment.
   - The *Preview* area shows additional details for the project selected, which you can add during saving the project. Like this the respective project can be better identified.
3. Click the **Complete** button to open the selected project file.

▶ If a project to be opened contains out-of-date catalogues, you can update the catalogue versions for this project.
▸ Building projects while opening them (📖 46)

4.3 Building projects while opening them

This function is available from »Engineer« HighLevel V2.9!

When a project is opened with out-of-date catalogue versions, the following note dialog box appears:



Tip!

If you do not want to update the catalogues of a project continuously to newer catalogue versions, the query can be switched off. For this purpose, activate the checkbox *Do not ask any more for this project*. Afterwards save the project in order to activate the setting.

Note!

If the **Keep old version** button is inactive, the catalogue versions of the elements used are not available in the »Engineer«. Therefore, unchanged opening of the project is not possible.

Button	Function
Keep old version	The project maintains its previously used versions of multiple existing catalogue packages. For single existing catalogue packages, a selection is not possible. In this case, the »Engineer« always uses the present version. If you open an unchanged project, you can nevertheless update the catalogue versions subsequently.
Select new catalogues	Opens the *Update catalogues* dialog box for selecting the new catalogues. Updating catalogues (47)

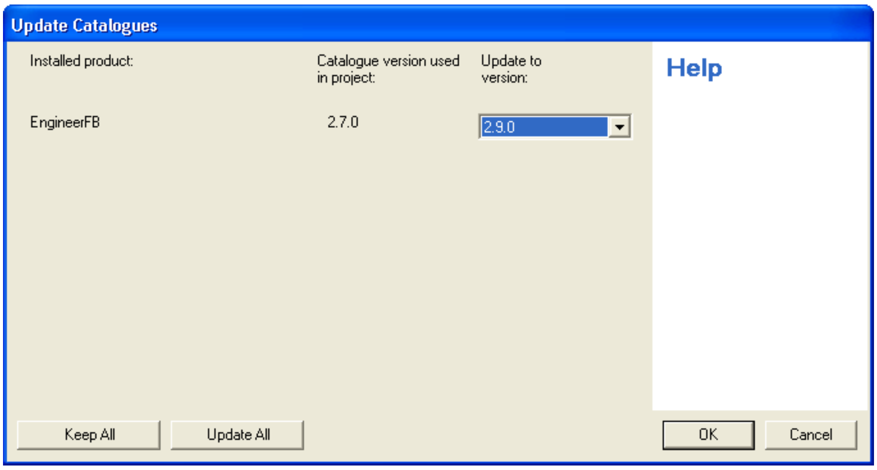
4.4 Updating catalogues

This function is available from »Engineer« HighLevel V2.9!

The *Update catalogues* dialog box can be called by...

- clicking the **Select New Catalogues** button in the note dialog box when opening a project with previous catalogue versions.
- selecting the **Tools→Catalogues** menu command and clicking the **Select New Catalogues** button in the *Catalogues* dialog box. If the button is grayed out, no new catalogues are available.

The catalogues used so far in the project can be updated in the *Update catalogues* dialog box:



The *Installed product* is the multiple existing catalogue package (example: *EngineerFB*). The project uses a certain version of the catalogue package. The previous and higher versions available are provided for an update.

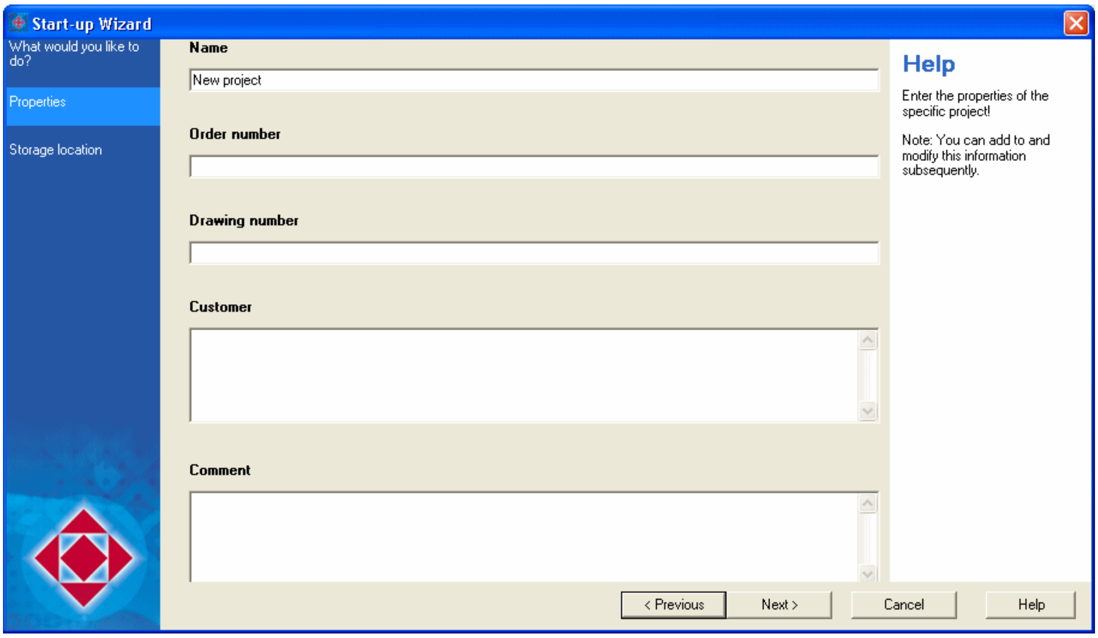
Button	Function
Keep all	Keep the catalogue versions used in the project so far.
Update all	Select the highest available catalogue version for all catalogue packages displayed in the dialog box.
OK	Open the project with the selected catalogues.
Cancel	Do not open the project.

Note!

- If the **Keep all** button is inactive, the catalogue versions used so far are not available in »Engineer«. »Engineer« marks the missing versions in red.
- For a permanent update of the catalogues, the project has to be saved. If the project is closed without being saved, the dialog box will appear again when the project is reopened.
- Independently of whether you use new catalogues when opening the project or not, the project cannot be opened again with an older »Engineer« version after being saved. The saved project can only be opened with the respective »Engineer« version used.

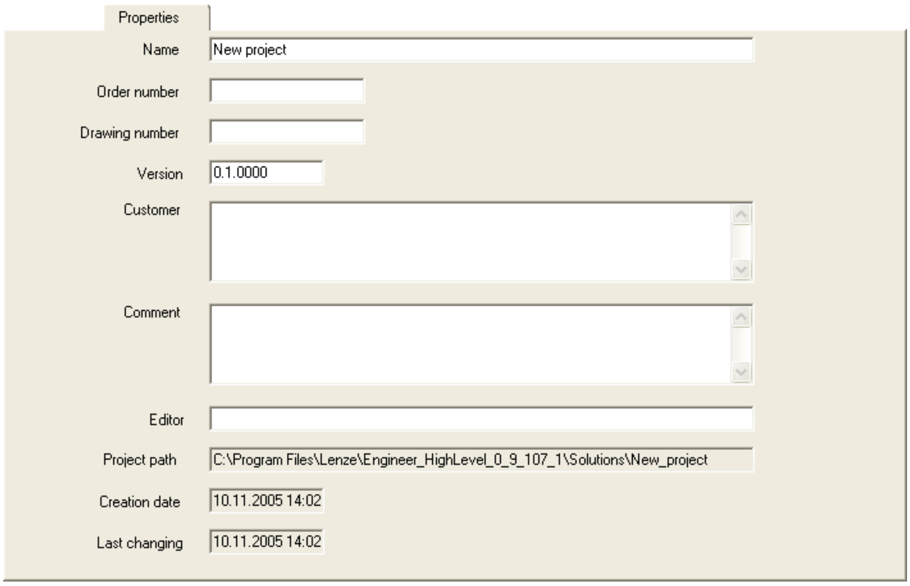
4.5 Project properties

The properties of a project can be defined initially during creation in the start-up wizard:



You can alter the project properties entered in the *Start-up wizard* at any time later on.

- If you go to the *Project view* and select Project element, the *Workspace* displays the **Properties** tab for the project:



- In the *Properties* tab you can enter global information regarding the project in order to be able to clearly identify the project when you use it later.
  – For each project you can save additional properties such as the order number, drawing number, version, customer and editor of the project.

Tip!

The data entered when saving a project will be available as a preview when the project is opened.

Memory location

In addition to the project file with the ending ".afs" a project includes further directories and files which are stored in a project directory.

- The name and path for the project directory can be selected in the *Start-up wizard*.
- The **Standard memory location** for »Engineer« projects can be changed later:
  Options for the representation/project memory location (📖 34)

4.6 Saving the project

Click the symbol or select the **File→Save** menu command in order to save the project.

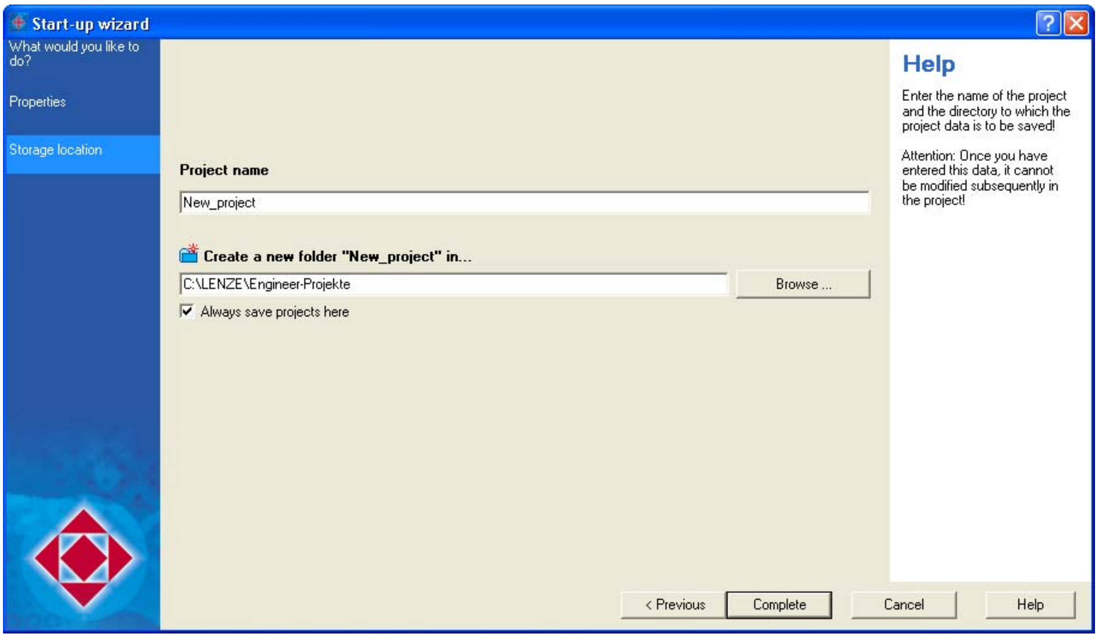
You can also use the **File→Save as** menu command to save your project. In this case, the *Save as...* dialog box will appear. In this dialog box you can change the project data or save the project under a different name. The length of the designation will also be checked.

Tip!

Save the project from time to time to protect your work from power failure or system problems.

Defining the memory location

The **Standard memory location** for projects can be defined initially in the start-up wizard. For this, activate the option *Always save projects here* to specify the indicated directory as standard memory location.



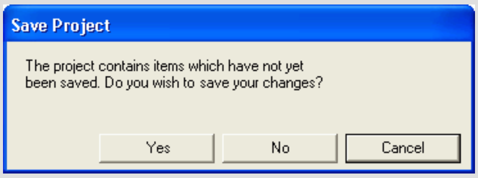
- During the work with the project the standard memory location can be altered via the menu command **Tools→Options**. ▸ Options for the representation/project memory location (📖 34)

4.7 Closing the project

Select the menu command **File→Close** to close the currently opened project.

Note!

If changes have been made but have not yet been saved, the *Save project* dialog box is displayed:



- Click the **Yes** button to save/close the project or click the **Cancel** button to cancel the procedure.
- If you click the **No** button, the project is closed without the changes being saved.

4.8 Managing projects in a packed archive

This function is available from »Engineer« HighLevel V2.9 upwards.

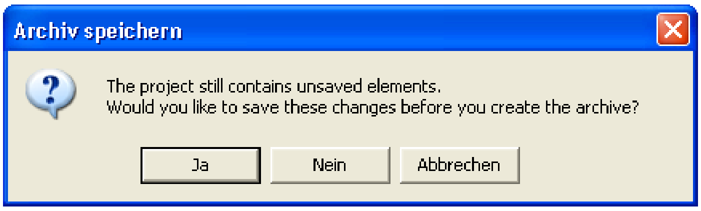
In addition to the regular saving of the project you can also save the project to an archive. The »Engineer« will save the project to a packed archive file (ZIP format) which for instance is suitable for the transfer via e-mail or which can be used as a backup copy. Saved archives can be opened in the »Engineer«.

- Saving an archive (📖 52)
- Opening an archive (📖 53)

4.8.1 Saving an archive

How to save a project to an archive:

1. Execute the menu command **File→Save archive**,
   - If the project has not been saved yet, a dialog box will pop up:

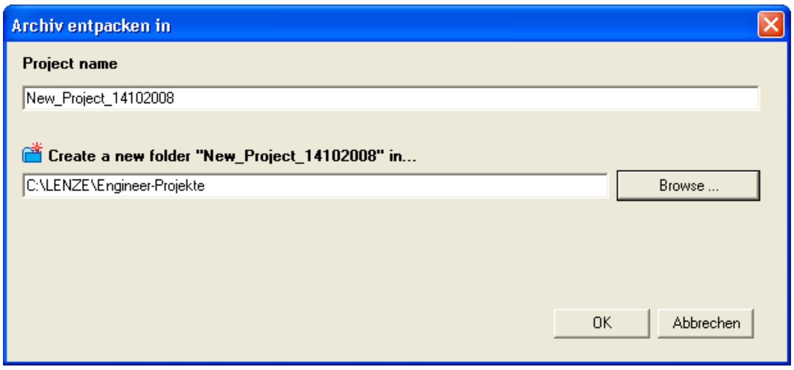


2. Assign an optional password.
3. Select a storage location for the archive.
   - By activating the *Divide into files* checkbox, you can split up the archive into several files. Specify the respective file size in the associated input field. This function extension is available from »Engineer« HighLevel V2.10 upwards.
4. Save the archive under the file name specified.

4.8.2 Opening an archive

How to open an archive saved using the »Engineer«:

1. Execute the menu command **File→Open archive**,
2. Open »Engineer«-project archive
   - Select the project archive saved in ZIP format.
3. Select the destination folder for unpacking the archive:



4. Assign a project name.
5. Select a storage location.
6. Click the **OK** button to unpack the archive in the destination folder specified and to open it afterwards.

5 Creating a project structure

The »Engineer« provides for a cross-device parameterisation, configuration, and diagnostics of individual components such as machine controls. For this, map the desired machine structure in the project structure of the »Engineer«.

In the *Project view*, you create the hierarchical project structure that usually results from...

- ...the functional division of the whole system into different partial systems (e.g. conveyor and press) as well as from
- ...the existing or selected devices (e.g. drive controllers, control systems, motors).

Tip!

On the basis of your system you can represent these structures 1:1 in the »Engineer« project.

You can describe a hierarchical system structure with several system modules/ axes or alternatively select a "flat" modular design. The "flat" modular design is advantageous for projects with few individual components.

Modularisation by means of system modules and axes

In the *Project view* you can display a subsystem in a structured manner by means of a **System module** or an **Axis**.

- The task of a system module is the realisation of a specific system function (e. g. winding, positioning, pressing).
- A **system module** can contain devices, communication networks, applications, and documentation.
- For representing hierarchical system structures a system module can additionally contain further system modules and **Axes**.
- **Axes** serve to structure the »Engineer« project. An **Axis** is a special variant of a system module and usually contains at least one controller and a motor, but, depending on the application, can also contain further devices such as gearboxes.

Structure of the system structure

If you create a new (empty) project, only the Project element together with the name of the project is initially shown in the Project view:

Extending the system structure according to the top-down method

On the basis of this state, you can complete the system structure step by step in accordance with the Top-down method by inserting further system modules and/or axes:

In the example project the planned system consists of a system module *Packing module*. The packing module is divided into two axes: *Conveyor* and *Press*

Tip!

Name the individual subsystems uniquely in the *Project view* and orient yourself on your machine structure in order to be able to clearly identify the individual elements.

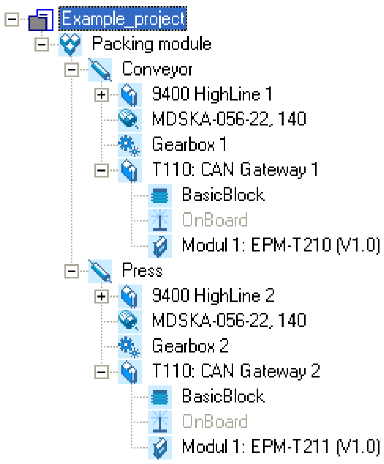
▶ Inserting system modules (📖 57)

▶ Inserting axes (📖 59)

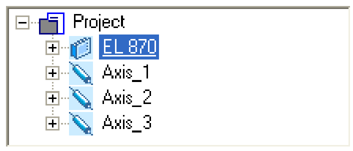
Inserting components

Once you have described the system structure with the help of system modules, you add the corresponding components (drive controllers, control systems, motors, I/O systems, gearboxes, etc.) to these elements unless this was already done when the axis or axes were inserted:

Example 1: Two 9400 HighLine drive controllers



Example 2: Industrial PC



[5-1] Examples of projects with different components

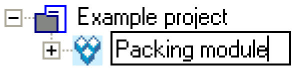
▶ Inserting components (📖 62)

Tip!

For purposes of documentation, you can add notes like documents available in electronic form (pictures, circuit diagrams, CAD data, etc.) to every element in the *Project view* Documentation concerning the system as a whole can for instance be added to the Project element.

▶ Inserting a documentation (📖 86)

If you select an element in the *Project view* and press the **<F2>** function key, you can change the name of the element:



- Press the **<Input key>** to accept the change, or the **<ESC>** key to discard the change.

Ambiguous designation

If, during inserting a component, the designation is already available in the project, this is signalised by a dialog window with the  icon.

▶ By specifying the **Current designation** and the **Designations already assigned** you can define a **New designation** in order to be able to clearly identify the corresponding component in the project.

Next steps

Network

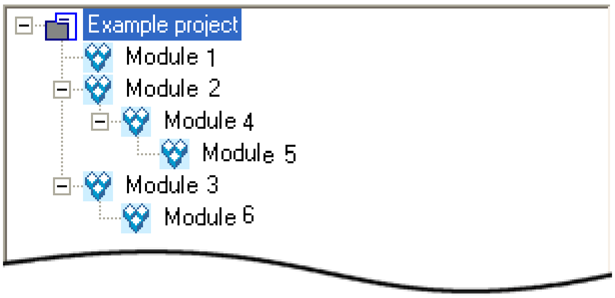
If you have added all devices to your project, the structure of the project has been created.

▶ Then you can extend the system structure by a logical view to networks available in the system.

▶ Inserting & configuring a network (📖 209)

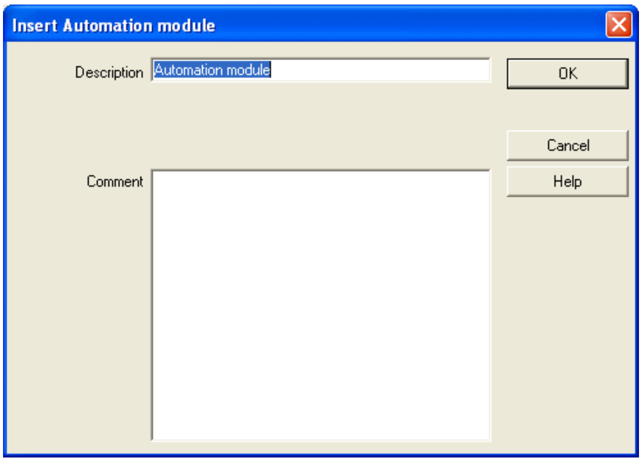
5.1 Inserting system modules

You can insert system modules into the Project element and also into already existing system modules in order to create a hierarchical structure with several levels, for example:



How to insert a system module:

1. In the *Project view*, either select
   - the project element , or
   - select an already existing system module into which a further system module is to be inserted.
2. Click the icon.
   - The *Insert system module* dialog box appears:



3. Enter a name for the system module in the **Name** text field.
   - Optionally you can enter a comment on the system module in the **Comment** text field.
4. Click the **OK** button.
   - The dialog box closes and the system module is inserted into the highlighted element.

Components, properties & documentation

If you select a system module in the *Project view*, the *Workspace* contains the **Components**, **Properties** and **Documentation** tabs.

- In the **Components** tab all components of the system module are listed.
- General information on the system module, e. g. the version and the editor, can be entered in the **Properties** tab.
- In the **Documentation** tab you can add notes and documents in electronic form to the system module.
  Inserting a documentation (86)

5.2 Inserting axes

In order to represent hierarchical system structures, you can insert one or more axes into the project element or into a lower-level system module, whereby these axes are also used for structuring purposes.

▶ An axis is a special type of system module and generally contains at least one drive controller and a motor but, depending on the application, can also contain further devices such as gearboxes and encoders.

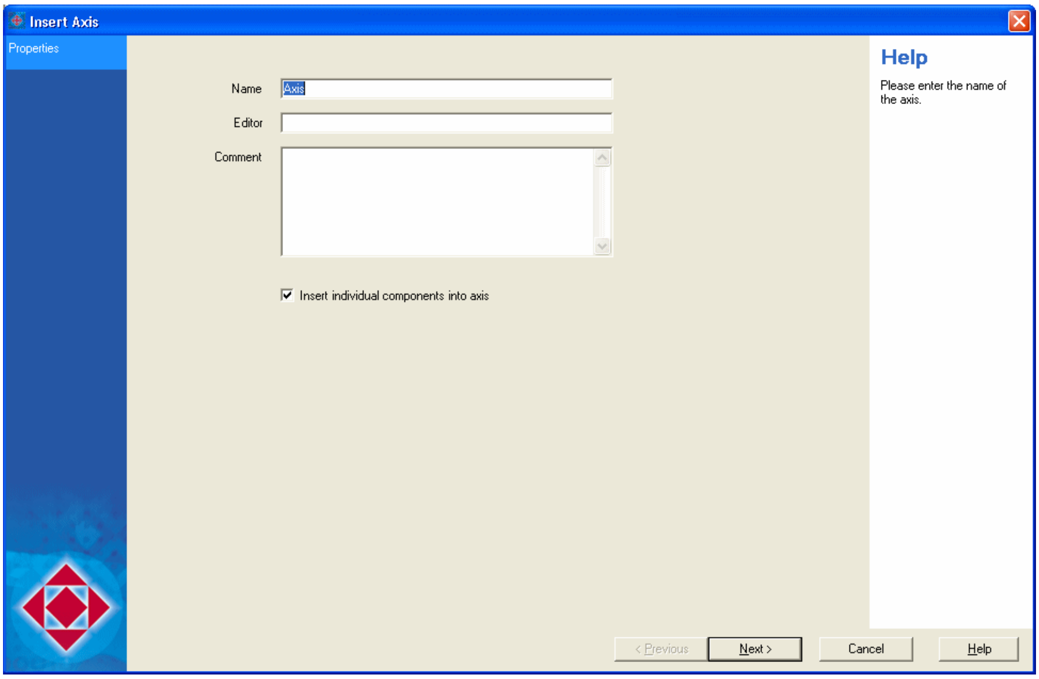
Tip!

If you have inserted an axis, you can also select the further components of the axis (drive controller, motor, gearbox, etc.). This saves you from having to call the **Add component** function again.

How to insert an axis:

1. Open the *Project view* and select the system module into which the axis is to be inserted.
    - An axis can also be inserted directly into the project element but, in order to modularise the system, we recommend using system modules.
2. Click the icon to open the wizard for adding an axis.

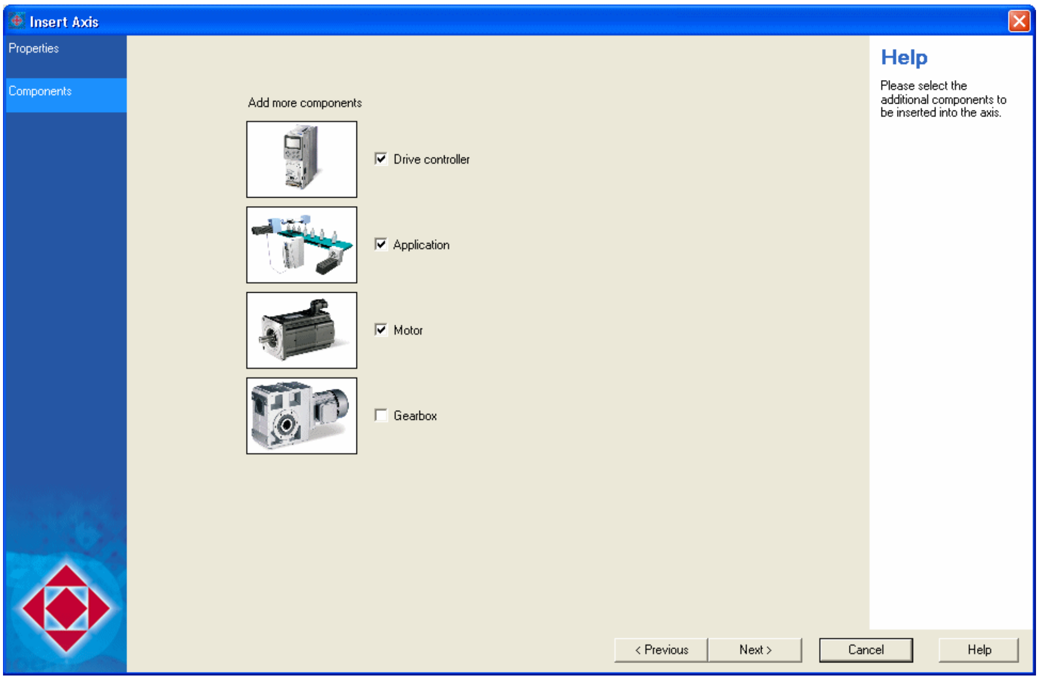
    Step 1 - Properties



3. Enter a name for the axis in the **Name** text field.
    - Optionally you can enter a comment on the axis in the **Comment** text field.
    - If the control field **Insert individual components into the axis** has been activated, you must click the **Next** button to select the components (drive controller, motor, etc.) that the axis is to contain.

4. Click the **Next** or **Complete** button.
   - If the control field **Insert individual components into the axis** has been deactivated, the dialog box is closed and the axis is inserted into the highlighted element without any additional components. You can of course retrospectively add further components to the axis or remove them at any time.

Step 2 - Components



5. Select the components the axis is to contain.
6. Click the **Next** button.
   - In the following dialog steps, you can now select the components for the axis from the corresponding catalogues.
   - If you click the **Complete** button in the final step, the dialog box is closed and the axis together with the selected components is inserted into the highlighted element.

Components, properties & documentation

If you select an axis in the *Project view*, the *workspace* contains the **Components**, **Properties** and **Documentation** tabs.

- All the components of the axis are shown in the **Components** tab.
- General information on the axis, e. g. the version and the editor, can be entered in the **Properties** tab.
- In the **Documentation** tab you can add notes and documents in electronic form to the axis.
  Inserting a documentation (86)

5.3 Inserting components

If you have divided the entire system into functional system parts by means of system modules and axes, you can afterwards add the corresponding components to these structuring elements:

- Inserting a controller (📖 63)
- Inserting an L-force Controller (📖 68)
- Inserting a motor (📖 71)
- Inserting an I/O system (📖 73)
- Inserting the remote maintenance (📖 80)
- Inserting a gearbox (📖 81)
- Inserting external components (📖 83)

Applications & device modules

When you add a drive controller, you can simultaneously assign an application to this device. You can also assign any existing device modules to the device if the device allows such expansion.

- Assigning an application to a device (📖 65)
- Inserting device modules into a device (📖 66)

Tip!

- You can select the components of an axis at the same time as you insert the axis if, in the first step, you activate the control field **Select individual components of the axis** and, in the second step, select the corresponding components. ▸ Inserting axes (📖 59)
- By means of the control field **Only show newest version**, you can limit the display of the search results to the most recent versions of the device series in each case.

Tabs of the different components

If you select a component in the *Project view*, the *Workspace* contains different tabs that you can use.

- In the **Properties** tab the designation and identification of the component is displayed.
- In the **All parameters** tab all parameters of the component are listed.
- In the **Documentation** tab you can add notes and documents in electronic form to the component.
  ▸ Inserting a documentation (📖 86)

5.3.1 Inserting a controller

Tip!

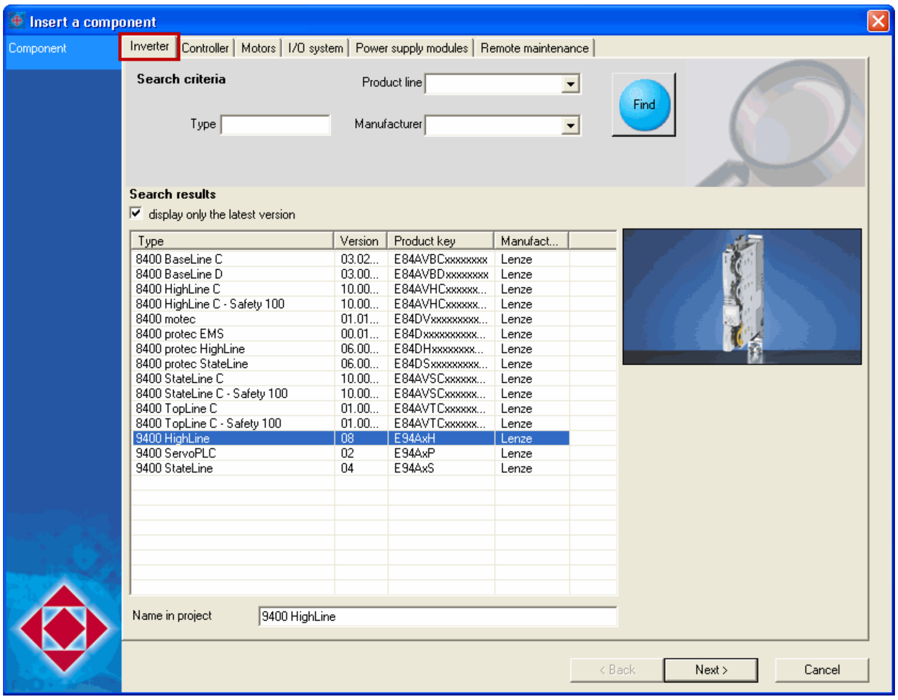
You can select the drive controller and other components at the same time as you insert an axis if, in the first step, you activate the control field **Select individual components of the axis** and, in the second step, select the corresponding components. ▶ Inserting axes (📖 59)

Even if you add a controller to an already existing axis or system module later on, you can select the further components (application, motor, gearbox) which are to be inserted at the same time.

How to insert a drive controller:

1. Open the *Project view* and select the system module or the axis into which the drive controller is to be inserted.
2. Click the icon to open the wizard for adding a component.

   Step 1 - component (example: 9400 HighLine)

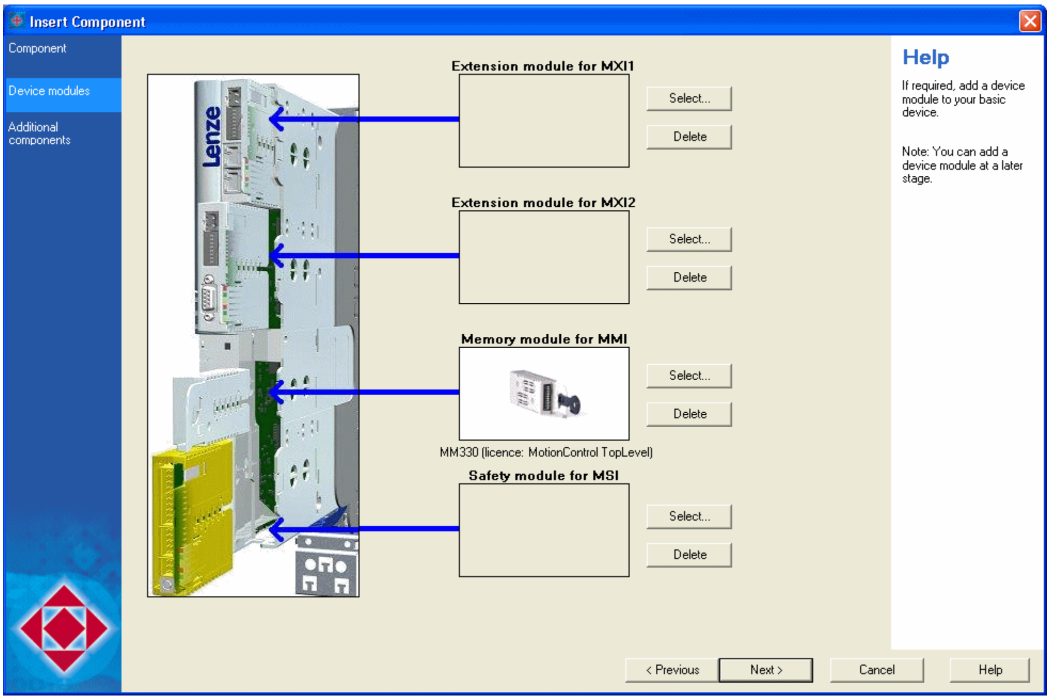


3. Unless it is already displayed, select the **Controller** tab.
   - All controllers available are displayed in the **Search results** list field.
4. If necessary, specify **Search options** in order to restrict the drive controllers that can be selected:
   - **Name**:
     String that must be contained in the name of the drive controller.
   - **Product type/manufacturer**:
     Limitation of the selection to a specific type or manufacturer.

5. After a change with regard to the search options, click the **Find** button to update the selection.
   - Then only the controllers complying with the features set in the **search options** are itemised in the **Search results** list field.
   - If no **search options** are set, all controllers available are shown.
6. Select the controller to be inserted in the **Search results** list field.
   - On the right further details and technical data on the controller selected are displayed.
7. Click the **Next** button.

   Step 2 - device modules (example: 9400 HighLine)

   If the controller selected supports device modules, you can select the device modules available in this step.
   - This step is not shown in the case of drive controllers without support for device modules.



8. Click the **Select** button to carry out the selection of the corresponding device module.
   - Select the desired device modules.
   - Accept selection with **OK**.
   - A device module already selected can be deleted via the **Delete** button.
9. Click the **Next** button.
10. **Step 3 - other components**
    Select the other components which are to be added to the controller.
    - If you do not select a device application in this step, a so-called "empty" device application, which you can replace with another device application at any time, is assigned to the drive controller. ▶ Assigning an application to a device (📖 65)

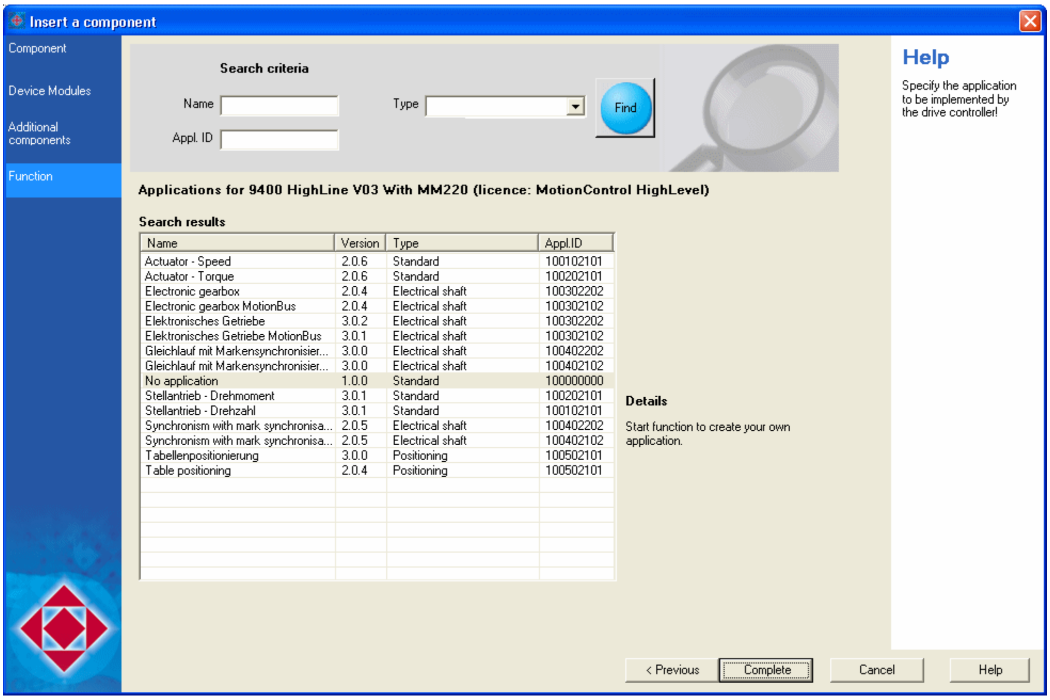
11. Click the **Next** or **Complete** button.
    - If no additional components have been selected, the dialog box is closed and the drive controller, without any additional components, is inserted into the highlighted axis or system module.
    - For the highlighted components, you can carry out the necessary selection in the corresponding catalogues in the next steps.
    - When you click the **Complete** button in the last step, the dialog box is closed and the drive controller, together with the additional components, is inserted into the highlighted element.

5.3.2 Assigning an application to a device

If you add a drive controller and activate the **Application** control field in the step "Other components", you can select an application for the drive controller in the following step.

Tip!

By means of the control field **Only show newest version**, you can limit the display of the search results to the most recent versions of the applications in each case.



Note!

If you select **No application**, a so-called "empty" application is assigned to the drive controller, which you can replace with another application anytime.

5.3.3 Inserting device modules into a device

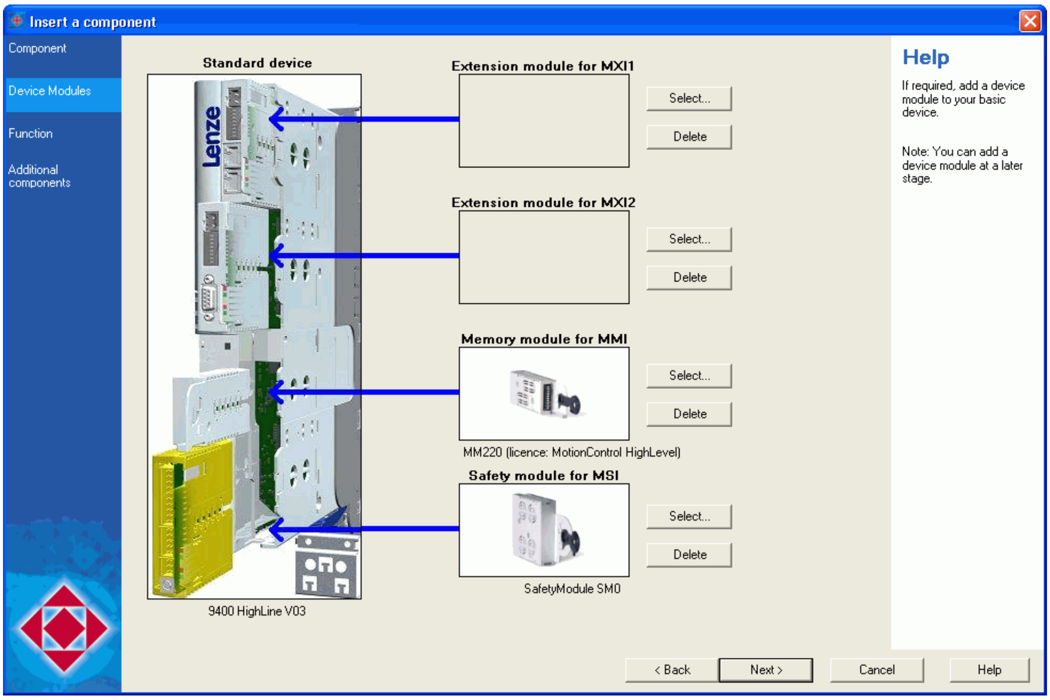
If the drive controller is equipped with device modules (e.g. memory module, safety module, function and/or communication module), you can assign them to the drive controller at the same time as you select the drive controller or you can assign them to the drive controller anytime later on.

Tip!

- The steps described in the following can also be carried out to replace a device module already assigned to a device by another device module.
- By means of the control field **Only show newest version**, you can limit the display of the search results to the most recent versions of the device modules in each case.

How to insert device modules into a device:

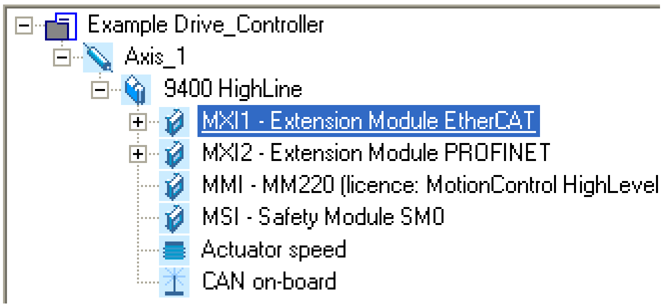
1. Open the *Project view* and select the device to which the device modules are to be assigned.
2. Click the icon.
   - The *Insert device module* dialog box appears:



   - On the right the device modules which are already assigned to the device are displayed.
3. Click the respective **Select...** button to select the corresponding device module or change an already existing assignment.
   - Select the desired device modules.
   - Accept selection with **OK**.

4. Click the **Complete** button.
   - The dialog box is closed and the device module/modules is/are assigned to the device selected in the *Project view*.

The device modules assigned to a device are shown under the device in the *Project view*:



Memory module manager, properties & documentation

If you select a device module in the *Project view*, the **Properties**, **Memory module manager** and **Documentation** tabs are provided in the *Workspace*.

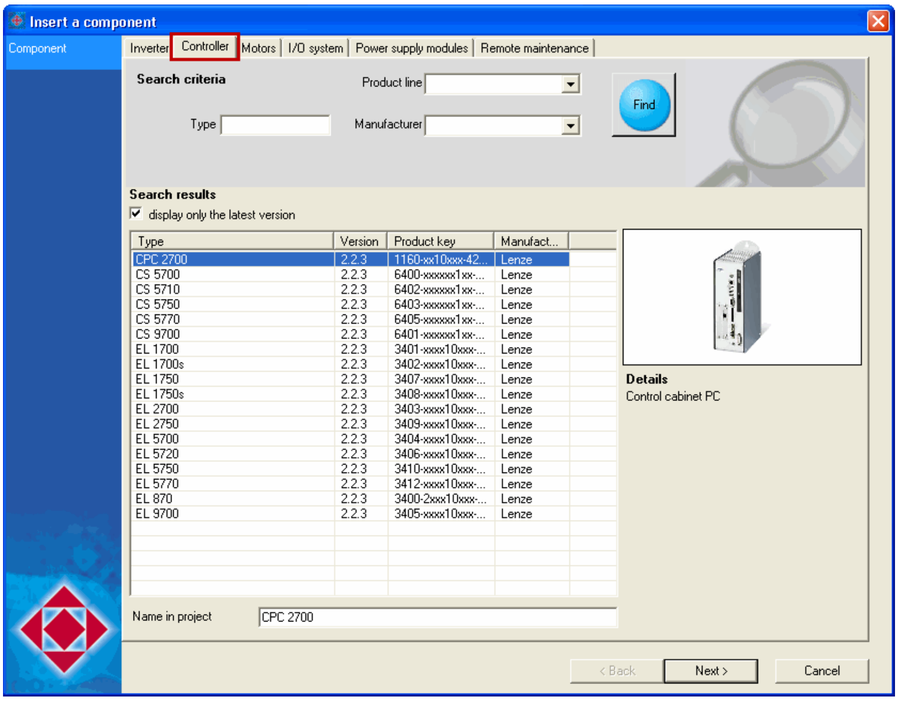
- In the **Memory module manager** tab all parameters of the device module are listed.
- In the **Properties** tab, the name and identification of the device module are displayed.
- In the **Documentation** tab you can add notes and documents in electronic form to the device module.
  Inserting a documentation (86)

5.3.4 Inserting an L-force Controller

How to insert an L-force Controller in the project:

1. Click the icon to open the wizard for adding a component.

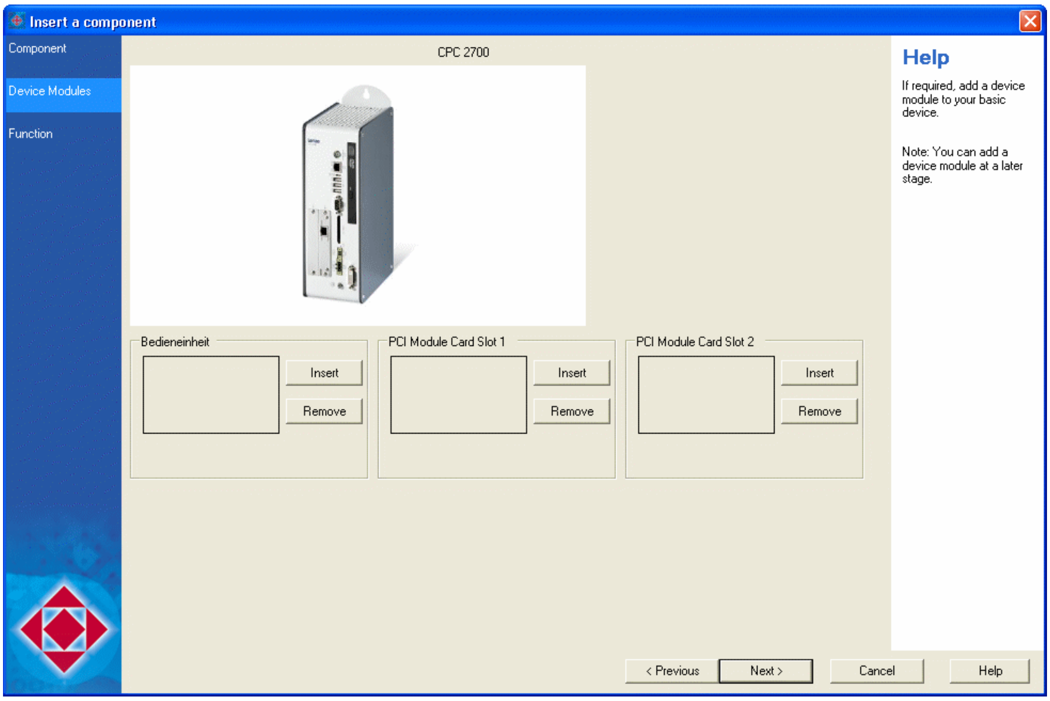
   Step 1 - Component



2. Unless it is already displayed, select the **Controller** tab.
   - All the Industrial PCs that can be selected are shown in the **Search results** list field.
3. If necessary, specify **search options** to restrict the Industrial PCs that can be selected:
   - **Name**:
     String that must be contained in the name of the Industrial PC.
   - **Product type/manufacturer**:
     Limitation of the selection to a specific type or manufacturer.
4. After a change with regard to the search options, click the **Find** button to update the selection.
   - In the **Search results** list field, only those Industrial PCs are then listed that match the characteristics specified by means of the **search options**.
   - If no **search options** have been specified, all the available Industrial PCs are shown.
5. Select the controller to be insertred in the **Search results** list field.
   - Further details of the selected controller are shown on the right-hand side.
6. Click the **Next** button.

Step 2 - Device modules

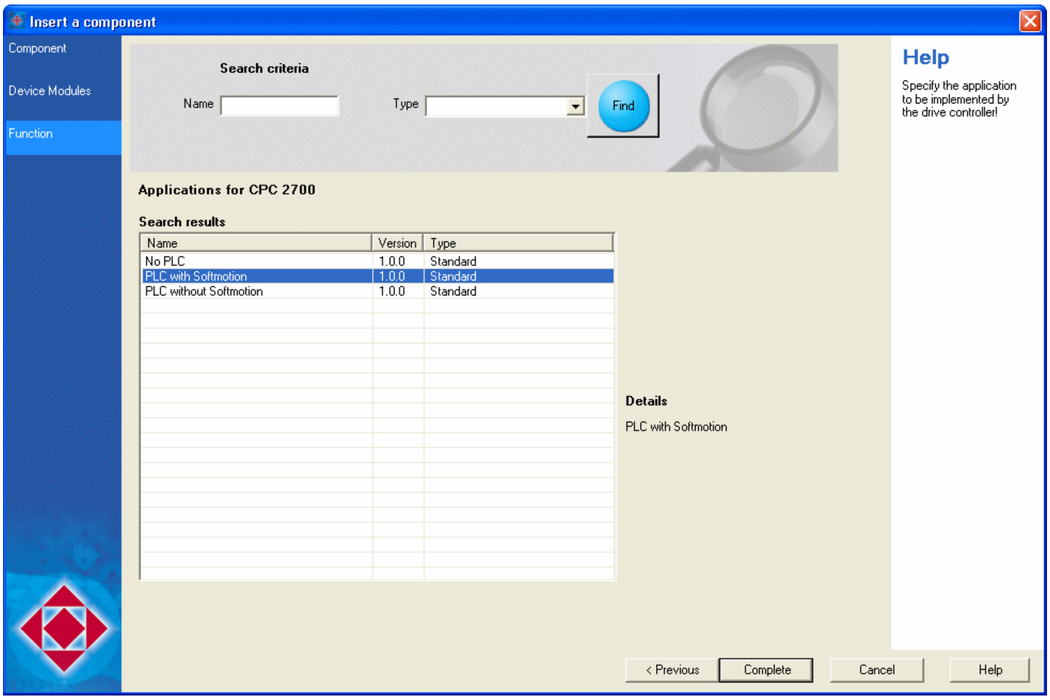
- Depending on the controller selected, different modules can be inserted in the *Device modules* dialog box.



7. Click the **Insert...** button to select the corresponding device module or operating unit.
    - Select the desired components.
    - Accept selection with **OK**.
    - A device module already selected can be deleted via the **Delete** button.
8. Click the **Next** button.

Step 3 - Application

9. Assign an application to the controller.



Name	Function
No PLC	• The controller only serves to the visualisation. • Create the visualisation with VisiWinNET.
PLC with Softmotion	• The controller is used as a soft PLC for motion synchronisation of drive controllers and for logic control.
PLC without Softmotion	• The controller is used as a soft PLC for logic control.

10. Click the **Complete** button.
    - The dialog box is then closed and the controller is inserted together with the components selected and the application selected.

5.3.5 Inserting a motor

Tip!

You can select the motor and additional components at the same time as you insert an axis if, in the first step, you activate the control field **Select individual components of the axis** and, in the second step, select the corresponding components. ▶ Inserting axes (📖 59)

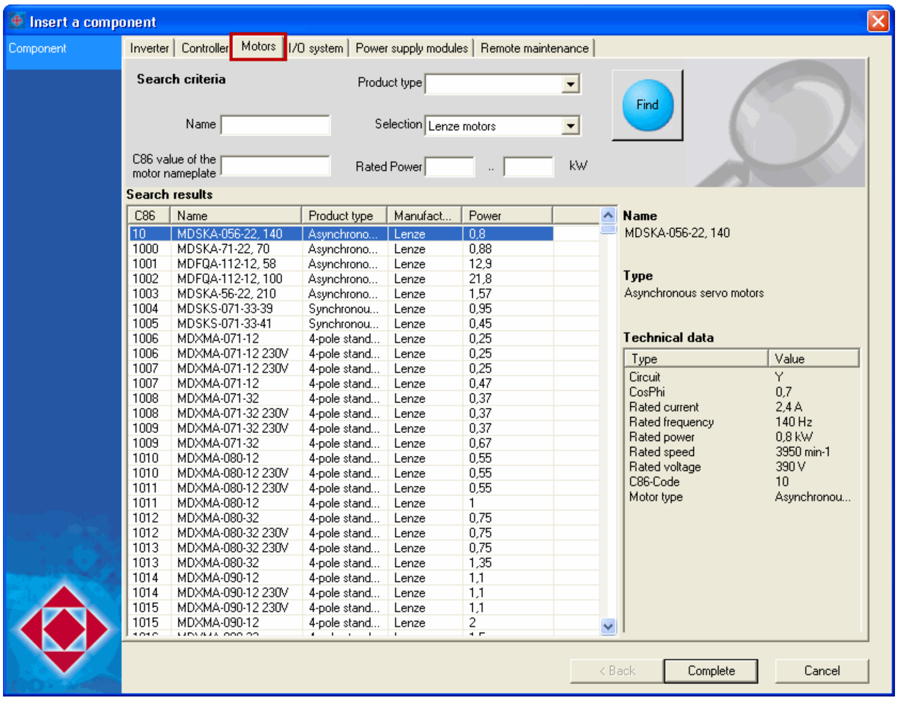
You can insert Lenze motors or user motors. For this, a catalogue of user motors must be available. For information on how to create and use user motors, please see the appendix. ▶ User motors (📖 298)

How to add a motor:

1. Open the *Project view* and select the system module or the axis into which the motor is to be inserted.
2. Click the icon to open the wizard for adding a component.

   Step 1 - Component

3. Select the **Motors** tab.
4. Select Lenze motors or user motors from the **Selection** list field.
   - All motors available are displayed in the **Search results** list field.



5. If necessary, specify **search options** in order to restrict the motors that can be selected:
   - **Name**:
     String that must be contained in the name of the motor.
   - **Product type/manufacturer**:
     Limitation of the selection to a specific type or manufacturer.
   - **C86-value**
     If you use a Lenze motor, you can enter the C86-value indicated on the nameplate of the motor to ensure that only specific motors are selected.
   - **Rated power**
     Limitation of the selection to a specific rated power range.
6. After a change with regard to the search options, click the **Find** button to update the selection.
   - In the **Search results** list field, only those motors that match the characteristics specified by means of the **search options** are listed.
   - If no **search options** have been specified, all available motors are shown.
7. Select the motor to be inserted in the **Search results** list field.
   - Further details of the selected motor and technical data are shown on the right-hand side.
8. Click the **Complete** button.
   - The dialog box then closes and the selected motor is inserted into the highlighted element.

Motor parameters, properties & documentation

If you select a motor in the *Project view*, the **Motor parameters**, **Properties**, and **Documentation** tabs will be provided in the *Workspace*.

- In the **Motor parameters** tab, all the parameters of the motor are listed. Underneath, the associated drive controller is also shown.
- In the **Properties** tab the designation and identification of the motor is displayed.
- In the **Documentation** tab you can add notes and documents in electronic form to the device module.
  Inserting a documentation (🕮 86)

5.3.6 Inserting an I/O system

The »Engineer« provides the I/O system 1000 and compact and modular IP20 systems. Modular I/O systems have the advantage that the individual modules can be flexibly connected and shifted.

Tip!

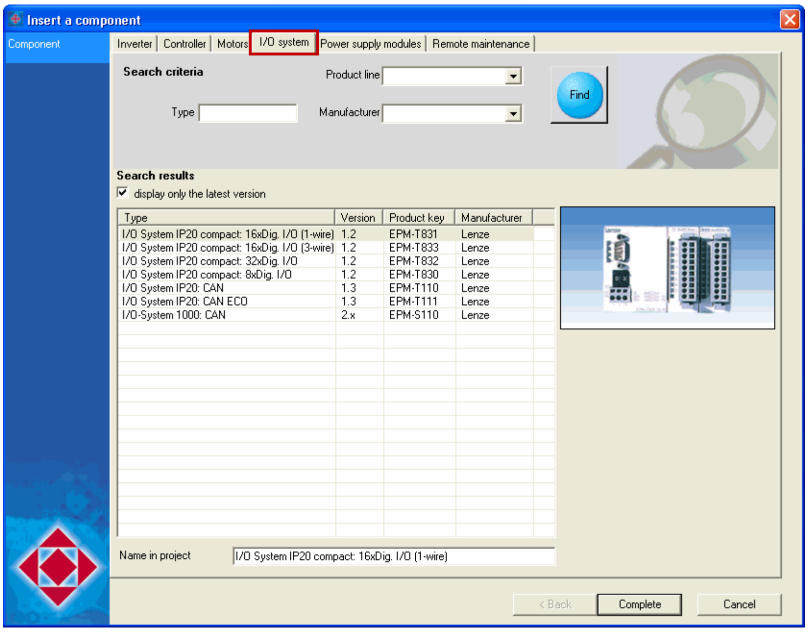
Detailed information on the topic "I/O system IP20" can be found in the "I/O system IP20" system manual.

How to add an I/O system:

1. Click the icon to open the wizard for adding a component.

   Step 1 - Component

2. Select the **I/O system** tab.
   - All I/O systems available are displayed in the **Search results** list field.



3. If necessary, specify **search options** to restrict the I/O systems that can be selected:
   - **Name**:
     String that must be contained in the name of the I/O system.
   - **Manufacturer**:
     Restriction of the selection to a certain type or manufacturer.

4. After a change with regard to the search options, click the **Find** button to update the selection.
   - In the **Search results** list field, only those I/O systems that match the characteristics specified by means of the **search options** are listed.
   - If no **search options** have been specified, all the available I/O systems are shown.

5. Select the I/O system to be inserted in the **Search results** list field.
   - On the right further details and technical data on the I/O system selected are displayed.
6. Carry out the further instructions as described in the subchapter for the corresponding I/O system:

   ▶ Compact I/O system IP20 (📖 74)

   ▶ Modular I/O system IP20 (📖 74)

5.3.6.1 System 1000

Further information on *Parameter setting & configuration* of the L-force I/O system 1000 can be found in the **I/O system 1000 software manual**

5.3.6.2 Compact I/O system IP20

A compact I/O system has a fixed number of digital inputs and outputs.

How to add a compact I/O system:

1. Carry out steps 1 ... 5 as described in the instructions in the chapter entitled "Inserting an I/O system (📖 73) ".
2. Click the **Complete** button.
   - The dialog box then closes and the compact I/O system is inserted into the highlighted element.

5.3.6.3 Modular I/O system IP20

A modular I/O system is the interface between the process level and the higher-level bus system.

For inserting a modular I/O system, proceed like for inserting the compact I/O system.

Note!

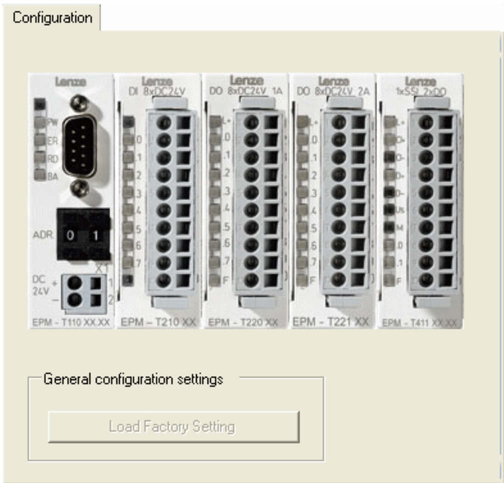
At least one module has to be inserted on the CAN gateway base station.

How to add a modular I/O system:

1. Carry out steps 1 ... 5 as described in the instructions in the chapter entitled "Inserting an I/O system (📖 73) ".
2. Select a modular I/O system (CAN Gateway) and click the **Next** button.

3. Insert the corresponding module by clicking the **Append module** or **Insert module** button.
   - If you click the **Append module** button, the selected module is placed at the end. If you click the **Insert module** button, the selected module is inserted in front of the highlighted module.
   - The other buttons can be used for editing the system.
4. Click the **Complete** button.
   - The dialog box then closes and the selected modular I/O system, together with the appended modules, is inserted into the highlighted element.

▶ A modular I/O system could look as follows:



Note!

Different tabs are shown, depending on the I/O module inserted.

Tabs of the I/O systems

If you select an I/O module in the *Project view*, different tabs will be provided in the *Workspace*. It depends on the module which tabs are shown.

CAN gateway

▶ In the **Configuration** tab the compiled modular system is presented.

▶ In the **Ports** tab, the input and output ports of the CAN gateway are shown.

▶ In the **All parameters** tab, the codes for parameterisation of the CAN gateway are shown.

▶ In the **Properties** tab, project information and catalogue information of the I/O module is displayed.

▶ In the **Documentation** tab you can add notes and documents in electronic form to the device module.
Inserting a documentation (📖 86)

CAN gateway module

- In the **Status** tab, the status of the inputs and outputs is displayed.
- In the **Parameters** tab all parameters of the module are listed. Via the parameter data of the digital modules, you define whether the control signals are to be transferred in the original polarity or in inverted polarity.
- In the **Properties** tab, project information and catalogue information of the I/O module is displayed.
- In the **Documentation** tab you can add notes and documents in electronic form to the device module.
  Inserting a documentation (86)

Compact modules

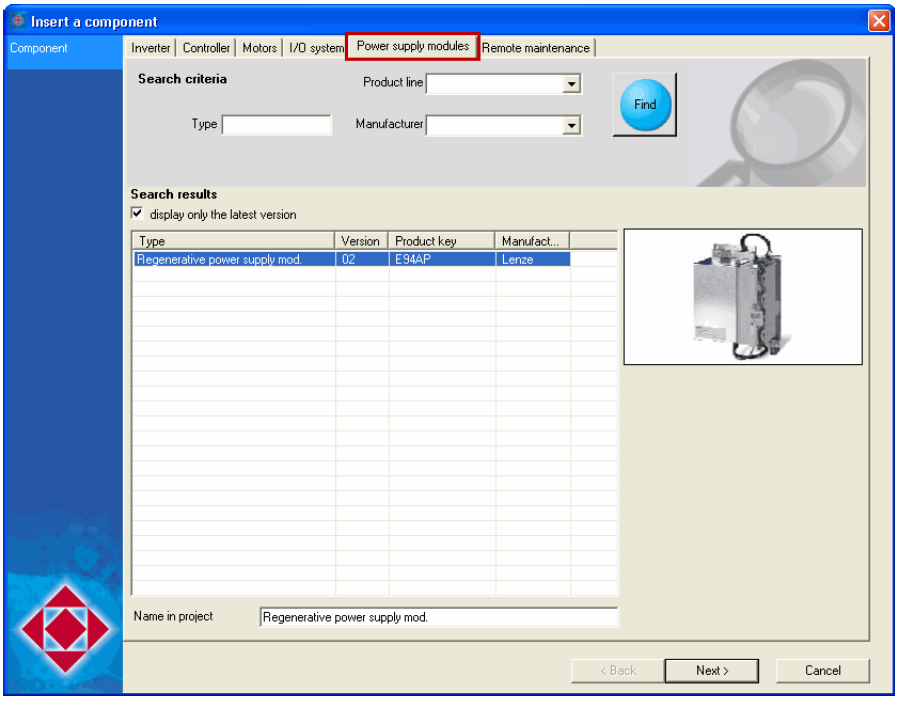
- In the **Configuration** tab, the compact system is shown.
- In the **Status** tab, the status of the inputs and outputs is displayed.
- In the **Parameters** tab all parameters of the module are listed. Via the parameter data of the digital modules, you define whether the control signals are to be transferred in the original polarity or in inverted polarity.
- In the **Ports** tab, the input and output ports of the module are shown.
- In the **All parameters** tab the codes for parameterising the compact module are shown.
- In the **Properties** tab, the name and identification of the I/O module are shown.
- In the **Documentation** tab you can add notes and documents in electronic form to the device module.
  Inserting a documentation (86)

5.3.7 Inserting a power supply module

How to insert a power supply module:

1. Open the *Project view* and select the system module or the axis into which the power supply module is to be inserted.
2. Click the icon to open the wizard for adding a component.

   Step 1 - Component

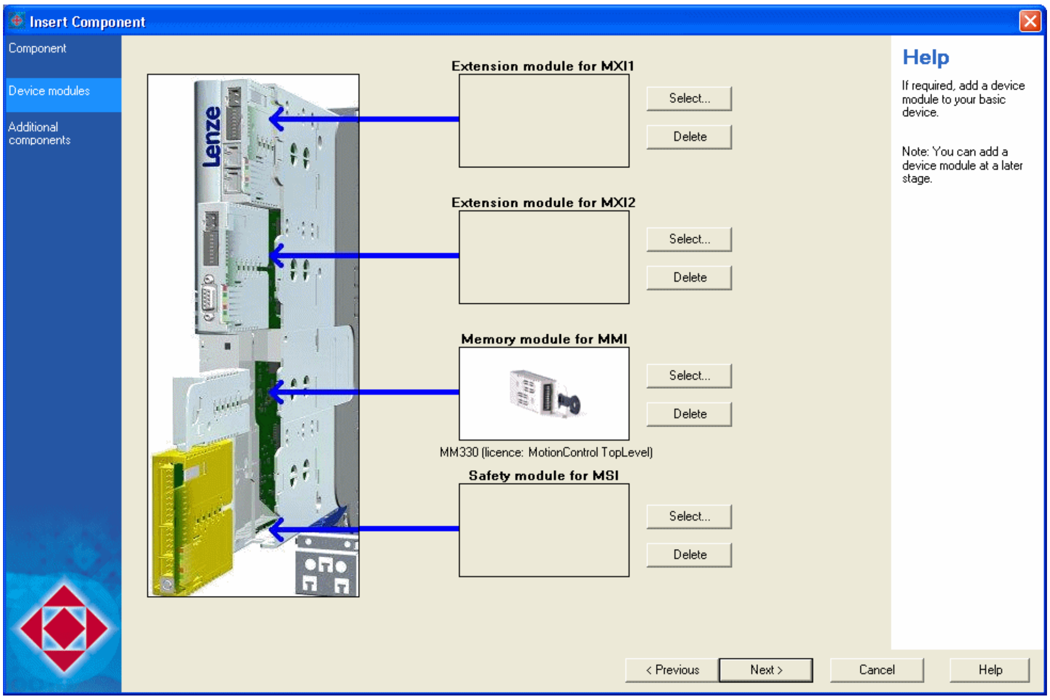


3. Unless it is already displayed, select the **Power supply modules** tab.
   - All power supply modules available are displayed in the **Search results** list field.
4. If necessary, specify **search options** to restrict the power supply modules that can be selected:
   - **Name**:
     String that must be contained in the name of the power supply module.
   - **Product type/manufacturer**:
     Limitation of the selection to a specific type or manufacturer.
5. After a change with regard to the search options, click the **Find** button to update the selection.
   - In the **Search results** list field, only those power supply modules that match the characteristics specified by means of the **search options** are then shown.
   - If no **search options** have been specified, all the available power supply modules are shown.
6. Select the power supply module to be inserted in the **Search results** list field.
   - On the right further details and technical data on the power supply module selected are displayed.
7. Click the **Next** button.

Step 2 - Device modules

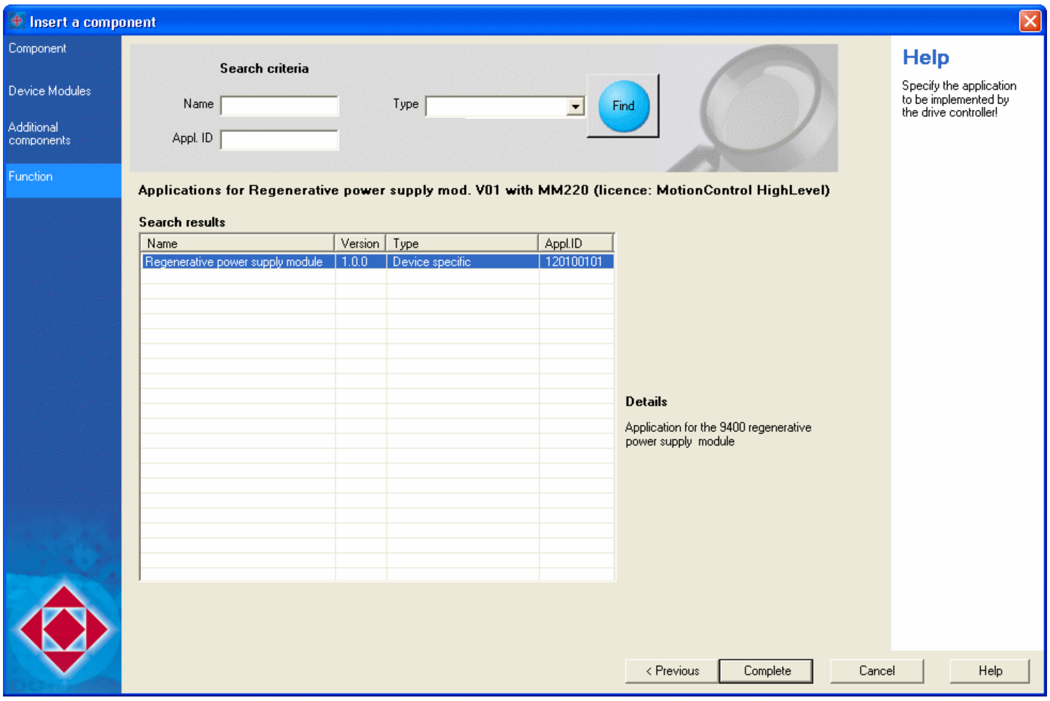
If the power supply module selected supports device modules, you can select the device modules available in this step.

- If the power supply module does not support device modules, this step is not displayed.



8. Click the **Select...** button to select the corresponding device module.
   - The selection is carried out in the same way as the selection of the power supply module.
   - Accept the corresponding selection by clicking **OK**.
   - A device module already selected can be deleted via the **Delete** button.
9. Click the **Next** button.
10. **Step 3 - other components**
    Select the other components which are to be added to the power supply module.
    - If you do not select a device application in this step, the power supply module is inserted without application.
11. Click the **Next** or **Complete** button.

- The applications for the power supply module selected are displayed.



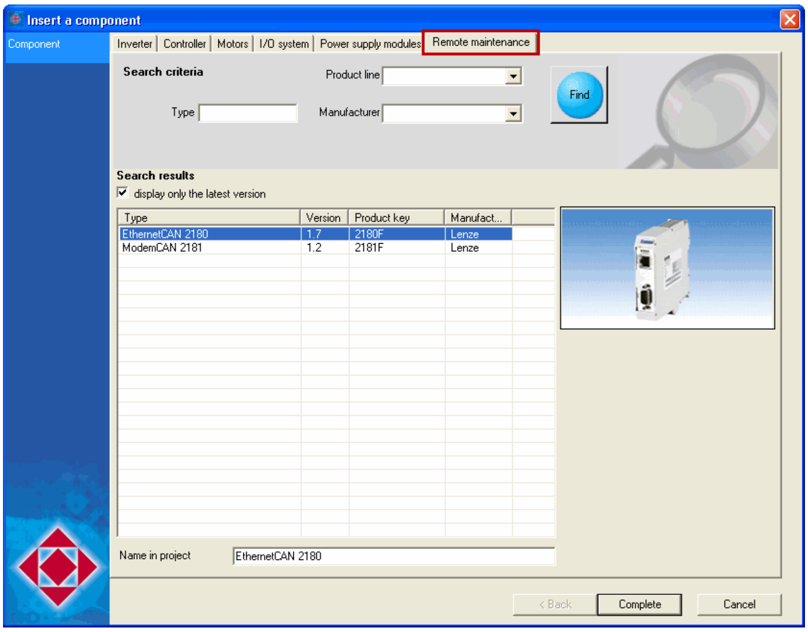
12. Select the desired application and click the **Complete** button.

5.3.8 Inserting the remote maintenance

How to insert a remote maintenance module:

1. Open the *Project view* and select the system module or the axis into which the power supply module is to be inserted.
2. Click the icon to open the wizard for adding a component.

   Step 1 - Component



3. Unless it is already displayed, select the **Remote maintenance** tab.
   - The **Search results** list field shows all **Remote maintenance modules** available.
4. Select the desired remote maintenance module.
5. Click the **Complete** button.

5.3.9 Inserting a gearbox

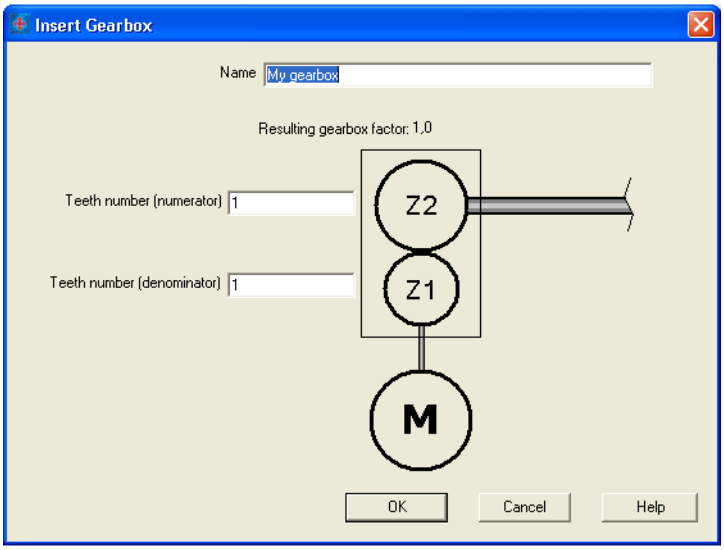
Apart from components such as drive controllers, motors and I/O systems, you can also insert system modules and axes into system modules.

Tip!

You can select the gearbox as well as additional components at the same time as you insert an axis if, in the first step, you activate the control field **Select individual components of the axis** and, in the second step, select the corresponding components. ▶ Inserting axes (📖 59)

How to add a gearbox:

1. Select the system module or the axis which the gearbox is to be inserted in from the *Project view*.
2. Click the icon.
   - The *Insert gearbox* dialog box appears:



3. Enter a name for the gearbox in the **Name** text field.
   - Optionally you can enter a comment on the gearbox in the **Comment** text field.
4. Enter the number of teeth of the gearbox in the **Teeth number (denominator)** and **Teeth number (numerator)** text fields.
   - The resulting gearbox factor is shown under the **Teeth number (denominator)** text field.
5. Click the **OK** button.
   - The dialog box then closes and the gearbox is inserted into the highlighted element.

Gearbox parameters, properties & documentation

If you select an inserted gearbox in the *Project view*, the *workspace* contains the **Gearbox parameters, Properties** and **Documentation** tabs.

- In the **Gearbox parameters** tab the gear transmission ratio and the moment of inertia can be set.
- In the **Properties** tab, the name and identification of the gearbox are shown.
- In the **Documentation** tab you can add notes and documents in electronic form to the gearbox. Inserting a documentation (86)

5.4 Inserting external components

You have the option of inserting devices that have been detected online or devices from other projects.

5.4.1 Insert device detected online

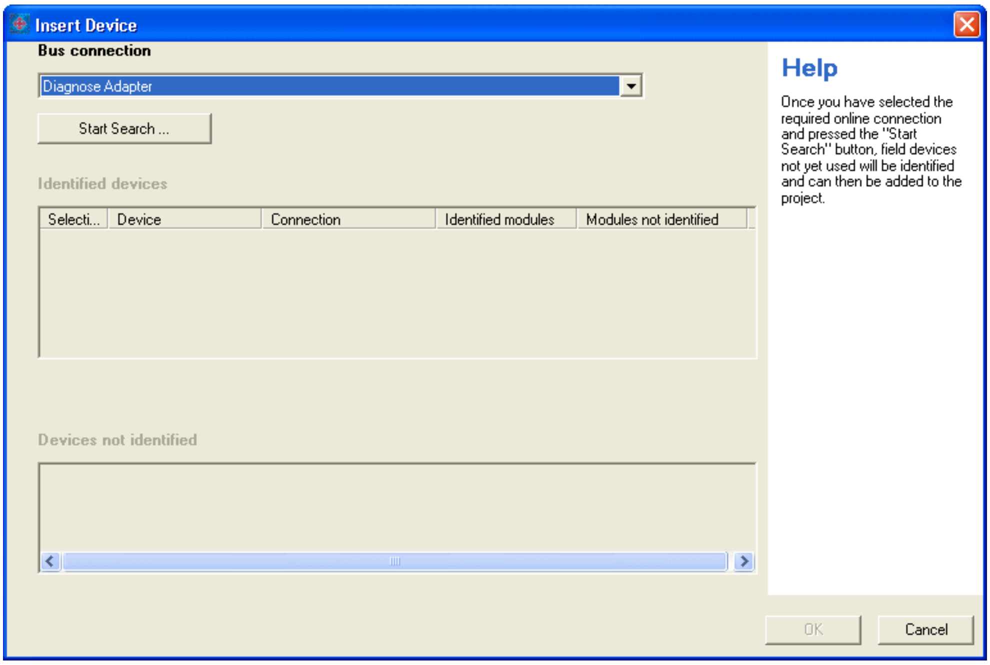
If your system consists of several drive controllers and some are not yet available in the »Engineer« project, you can integrate them directly in the project online.

Note!

The field device must have been switched on and must feature the corresponding functions.

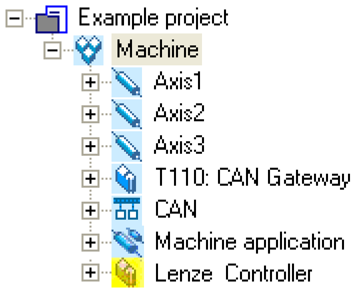
How to insert the field device online into the project:

1. Highlight the desired object into which the field device is to be inserted in the project tree.
2. Select the **Insert→Device detected online** menu command.
   - The *Insert device* dialog box appears.



3. Select the bus connection to be used from the **Bus connection** selection field.
   - The *Search for devices online* dialog box appears and an automatic search for field devices is carried out.
4. Close the *Search for devices online* dialog box.
   - The identified devices are shown in the *Insert device* dialog box.

5. Highlight the desired field devices and click **OK**.
    - The "Read from device" dialog box appears.
    - If the parameters are to be transferred to the »Engineer« project immediately, press **Start**.
    - If only the field device is to be integrated in the »Engineer« project, press **Close**.
    - The field device is now online in the »Engineer« project.

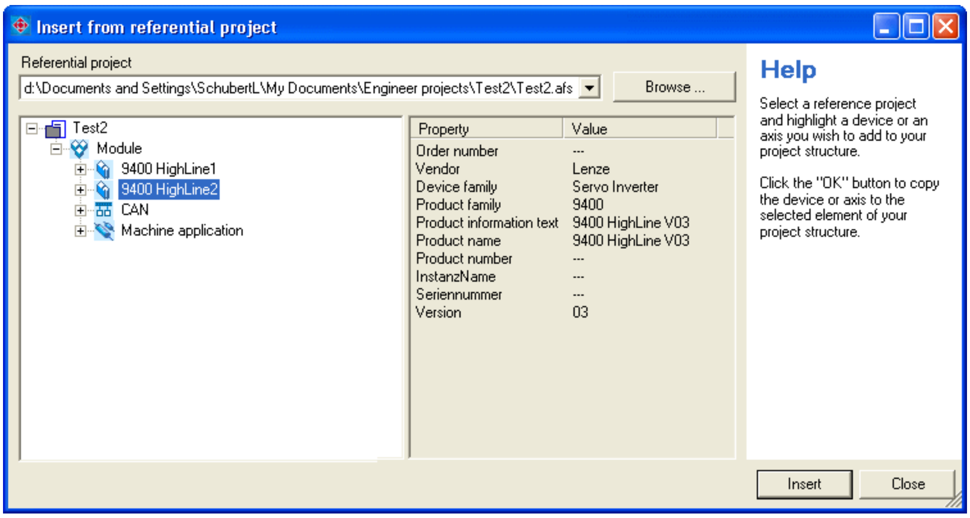


5.4.2 Insert from referential project

With this function you can import already configured field devices from other »Engineer« projects into a current »Engineer« project.

How to insert field devices from other projects:

1. Highlight the system module or axis in which the field device is to be inserted.
2. Select the menu command **Insert→Insert from referential project** .
    - The *Insert from referential project* dialog box is shown.
3. Search for the corresponding project and open it with the **Browse** button.
    - Only *.afs files can be searched for.



4. Select the desired field device and click **Insert**.
    - The field device is then inserted into the previously highlighted system module.

5.5 Replace component

The command **Replace component** renders it possible to replace devices of the same series. It makes sense, for instance, to replace the component within the project when the device software is updated.

Note!

The function **Replace component** can only be executed within the same device series!

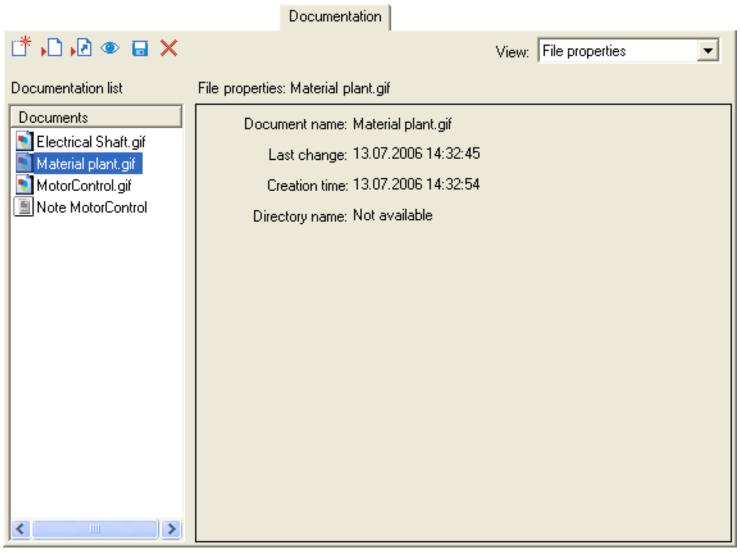
How to replace a component in the »Engineer« project:

1. Select the component to be replaced in the project tree.
2. Select the command **Replace component** in the context menu.
3. Select the desired component in the **Replacing a component** dialog box.
   - If no more recent software version of the corresponding component is available, no components can be selected.
4. After clicking **OK** the component is inserted in the project and replaces the previous component.

5.6 Inserting a documentation

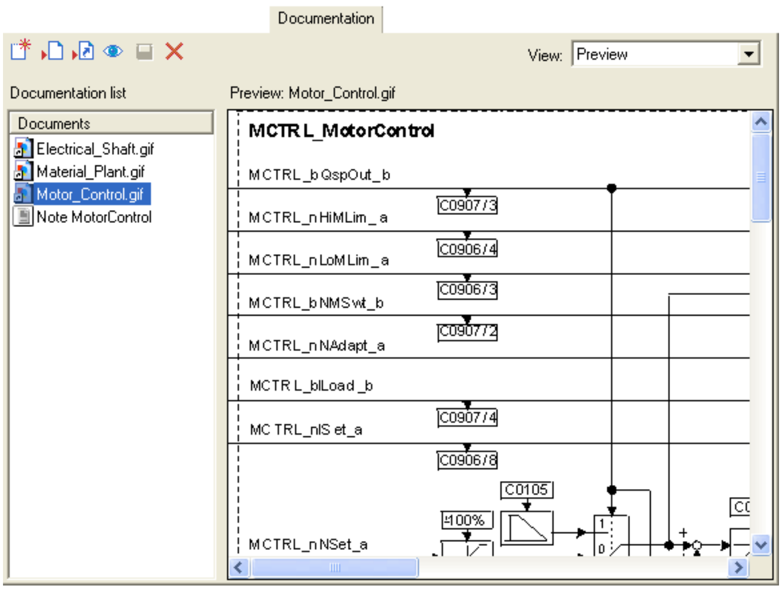
Via the **Documentation** tab you can add notes and documents that are available in electronic form to each element in the *Project view*.

- In this way, you can document the corresponding element or the whole installation and make important information on the project available to other people working on the project, e.g:
  - Sketches & photographs of the system
  - Processing tasks,
  - Work instructions,
  - Circuit diagrams,
  - CAD data,
  - Lists of parts, etc.



On the left in the **Documentation list** all documents available for the element are listed.

On the right the properties of the element selected from the **Documentation list** are shown.



If you select the **Preview** from the **View** list field, on the right a preview of the element selected from the **Documentation list** is shown instead.

Tip!

In the preview all document types which can be shown by the Microsoft® Internet Explorer, e.g. HTML and ASCII files, graphics in the JPEG or GIF format, or PDF documents can be displayed (if Adobe® Reader® is installed).

The document types which can be shown in detail depend on the display plug-ins installed for the Microsoft® Internet Explorer.

Editing the documentation list

The **Documentation list** is edited via the icons in the toolbar above.

▶ Click an icon to execute the corresponding function:

Icon	Function
	Insert note
	Copy file into the project • After you have selected the corresponding file within your desktop environment, a copy of this file is stored in the project folder.
	Add a linkage to a file • After you have selected the corresponding file within your desktop environment, a link to this document is stored in the project folder.
	Open document • By means of this function you can open a selected document from the documentation list.
	Save document selected • By means of this function you can save a copy of the selected document from the project folder to a selectable folder within your desktop environment.
	Delete element selected from the documentation list

Display area

Above the display area, the **View** list field has the selection "Preview" and "File properties":

Command	Function
Preview	Showing properties relating to the element selected in the documentation list
File properties	Showing a preview of the selected document or text of the selected note

6 Establishing an online connection

In this chapter you'll learn about how you can establish an online connection to a device with the »Engineer« and how you can close this online connection again.

In order to be able to establish an online connection to a device the respective device has to be visible in the *Project view*. The »Engineer« can be connected online to several devices at the same time (possible devices are controllers, industrial PCs, I/O systems, power supply modules) .

If a device available in the *Project view* is connected to the PC via corresponding communication accessories (e. g. diagnostic adapter, system bus adapter, or Ethernet), you can establish an online connection to this device, for instance in order to carry out parameter settings in the device, or to carry out a diagnostics of the device.

Stop!

If you change parameters in the »Engineer« while the controller is connected online, the changes will be directly accepted by the controller!

Note!

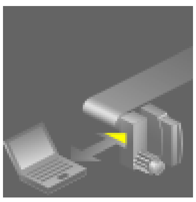
Detailed information about the respective bus system can be found in the corresponding communication manual.

▶ The functions for establishing/closing an online connection can be executed via the *Toolbar* or the **Online** menu:

Icon	Menu command	Shortcut
	Go online (📖 90)	**<F4>**
	Going offline (📖 103)	**<Shift>+<F4>**

Tip!

In the »Engineer« an existing online connection can be identified by the animated graphics below the *Project view bar*:



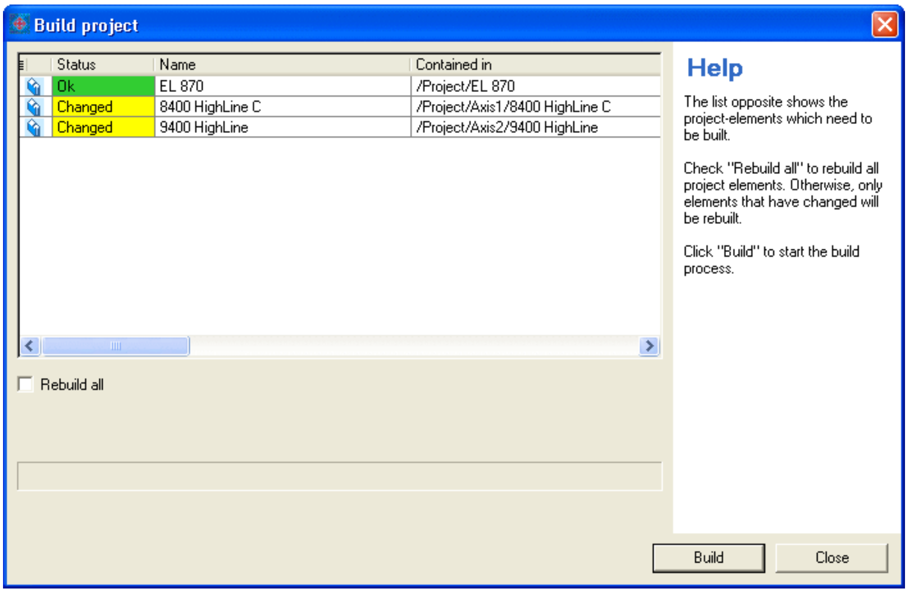
6.1 Build project

In order to render changes on a project effective, the project has to be updated. Each device inserted in the »Engineer« has a separate update status. Like this the update is only required for the device changed in each case.

How to update the project:

1. Click **Yes** to open the *Build project* dialog box.

   Tip: The dialog box can be opened via the button in the *Toolbar*, the **Tools → Build project** menu command, or the **<F11>** key.

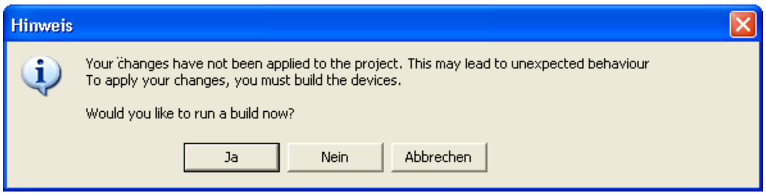
   - If not only the changed but all project elements are to be updated, select the **Rebuild all** option.

2. Activate the **Build** button to perform the update.
   - A progress bar in the *Build project* dialog box provides information on the respective worksteps.
   - When the update is completed, a note appears whether the update was successful.

3. Confirm the note with **OK**.
   - When the update has been executed successfully, the *Build project* dialog box is closed and the Go online process is continued.
   - If an error has occurred during the update, the *Build project* dialog box remains open. In this case, please observe the messages in the "Build" window. Click **Close** to close the dialog box and cancel the Go online process.

Going online with a changed project

When you select the command **Go online**, the »Engineer« first checks whether the current project settings already have been transferred to the devices. If one or several devices have the "changed" status, the following note will appear:



▶ Click **Yes** to build the project. Like this you accept the changes into the respective device.

6.2 Go online

Stop!

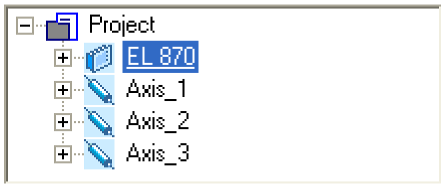
If you change parameters in the »Engineer« while the controller is connected online, the changes will be directly accepted by the controller!

How to establish an online connection to a device:

1. Select the device with which the online connection is to be established in the *Project view* of the »Engineer«:

Example 1: 9400 HighLine controller

Example 2: Industrial PC plus three axes



   Tip: You can establish an online connection to **all** or **several** devices by selecting the top project element in the *Project view* (project root element, see example 1: *Project*) or a system module. You can then choose from the *Communication path* dialog box which of the devices contained in the element selected are to be connected online.

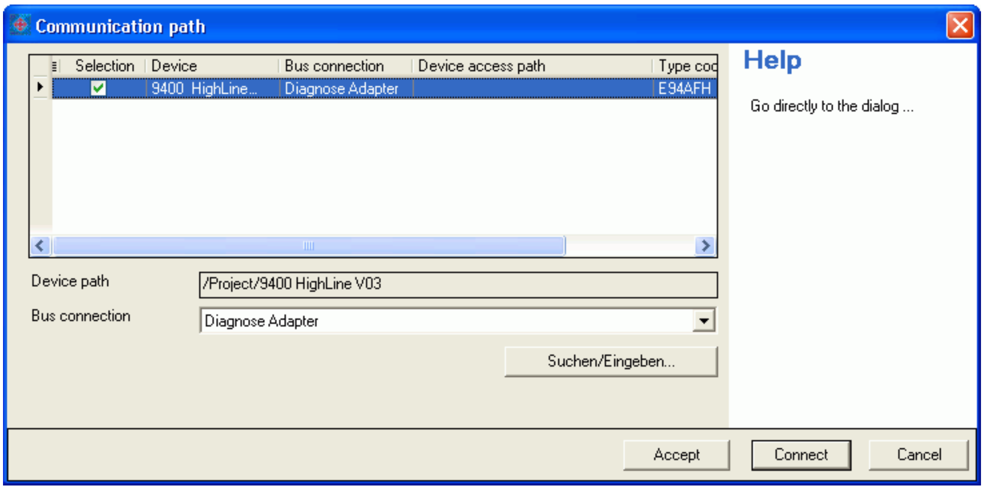
2. Click on the icon or select the **Online → Go online** menu command (keyboard command **<F4>**).

   If the changes carried out in your project have not yet been accepted, you are first asked whether an update is to be carried out. ▶ Build project (📖 89)

If an update is to be carried out:

- Click **Yes** to open the *Build project* dialog box.
- Click **Build** in the *Build project* dialog box to update the changed project elements.
- When the update is completed, a note appears whether the update was successful.

If a communication path has not yet been set for the device, the *Communication path* dialog box appears after the update has been carried out:



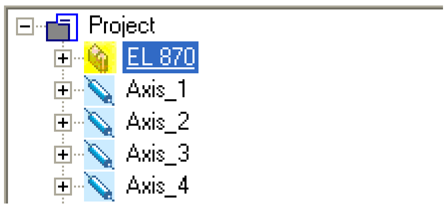
- Detailed information on how to set the communication path can be found in the following subchapter "Setting the communication path". (📖 92)

After the communication path to be used has been set correctly:

3. Click **Connect**.
   - The dialog box closes and the online connection to the device is established.
   - The available online connection to the device is displayed by a yellow highlighted icon in the *Project view*:

Example 1: 9400 HighLine controller

Example 2: Industrial PC plus four axes



Now you can use the icons and to easily build up and close an online connection with the device. The communication settings are only required when communication with a device is built up for the first time.

▶ If you want to change the communication path configured, select the **Online → Set communication path and go online** menu command.

- The desired changes for all devices of the project are to be carried out in the *Communication path* dialog box.

- When an online connection has been established the current parameter settings in the device are displayed in the »Engineer«
  - The yellow background colour signalises an online connection and the online parameters of a device. ▶ Displaying parameter values (📖 25)

6.2.1 Setting the communication path

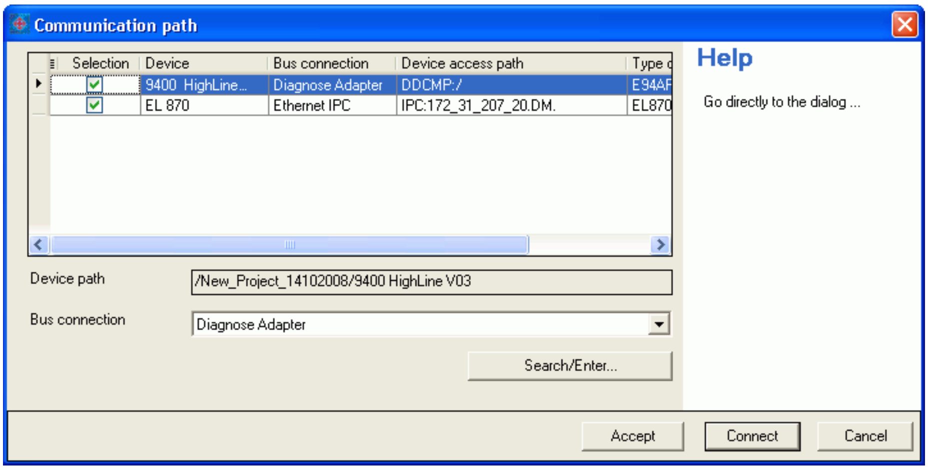
Note!

For "**going online**" the communication settings are only required when the first connection to the device is established. When the **Go online** command is executed again, the *Communication path* dialog box is no longer shown and the online connection via the bus connection set is established immediately.

To open the *Communication path* again, select the **Online→Set communication path and go online** menu command. Like this you can alter a communication path that has already been set.

In the *Communication path* dialog box, the selected device is shown in the upper list field together with the currently selected bus connection.

- If, instead of a device, the uppermost project element or a system module has been selected in the *Project view*, all the devices contained in the element selected are displayed:



[6-1] Example of the communication path with a 9400 HighLine drive controller and a controller

- If you select a device from the upper list field, you can set or alter the communication settings for this device in the lower dialog area.
  - The bus connection suitable for the respective device is preselected in the **Bus connection** list field and can be checked with the **Search/Enter** button.
  - The other bus connections available for a device in the **Bus connection** list field depend on the respective device and its communication modules/interfaces.
- By clicking the checkmark ☑ in the **Selection** column you can exclude the corresponding device from going online.

- If you press **Connect**, the online connection is established to all devices with the checkmark ☑ in the **Selection** column.

Configuring a bus connection

Detailed information on how to configure the respective bus connection can be found in the corresponding subchapter:

- Diagnostic adapter
- CAN system bus (📖 95)
- Ethernet / Ethernet controller (📖 96)
- PROFIBUS (📖 97)
- Gateway controller -> CAN system bus (📖 99)
- Gateway controller -> EtherCAT (📖 100)

6.2.1.1 Diagnostic adapter

For commissioning and diagnostics of a controller of the Inverter Drives 8400 and Servo Drives 9400 series you can e.g. use the diagnostic adapter offered by Lenze:

[6-2] Example of a connection via diagnostic adapter between an Engineering PC and a 9400 HighLine.

Note!

Observe the documentation supplied with the diagnostic adapter!

The online connection to the diagnostic adapter is a 1:1 connection.

Tip!

Via the menu command **Online→Status of diagnostic adapter**, you can have the operating status of the diagnostic adapters connected to the Engineering PC displayed.

Preconditions:

- The diagnostic adapter is connected to the diagnostic interface X6 at the controller and to a free USB port at the (Engineering) PC.
- The driver required for the diagnostic adapter is installed.
- The control electronics of the controller is supplied via the X2 plug with 24-V low voltage.

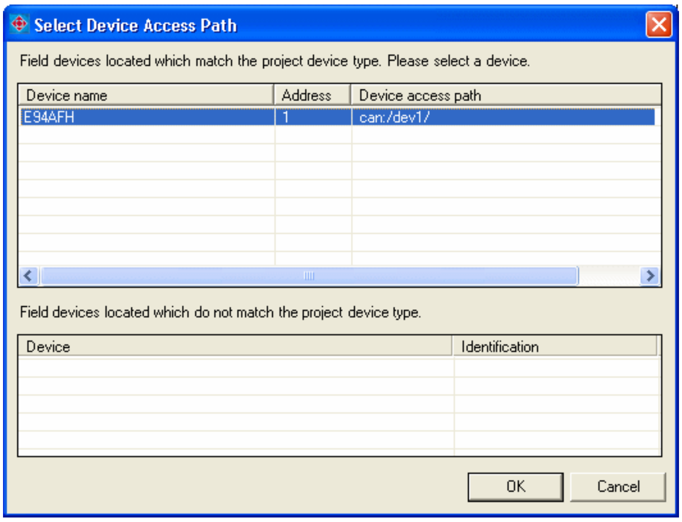
How to configure an online connection via the diagnostic adapter:

1. Go to the *Communication path* dialog box and select "Diagnostic adapter" from the **Bus connection** list field.

   The following step is only required if several diagnostic adapters are connected to the PC:

2. Press **Search/Enter...**.

- The *Select device access path* dialog box is shown:



3. Select the corresponding device from the **Field devices located** list field.
4. Click the **OK** button.
   - The *Select device access path* dialog box is closed.
   - In the *Communication path* dialog box, the **Device access path** column displays the corresponding device access path (e.g. "can:/dev1/").

6.2.1.2 CAN system bus

Certain Lenze products are provided with an integrated system bus interface.

▶ Among other things, process data and parameter values can be exchanged between the nodes via the system bus interface. Furthermore, the interface allows for the connection of other components such as peripheral terminals, operator and input devices (HMIs), as well as external control and host systems.

▶ The system bus interface transfers CAN objects in accordance with the CANopen communication profile (CiA DS301, version 4.02), which was created under the umbrella association of CiA (CAN in Automation) to conform with the CAL (CAN Application Layer).

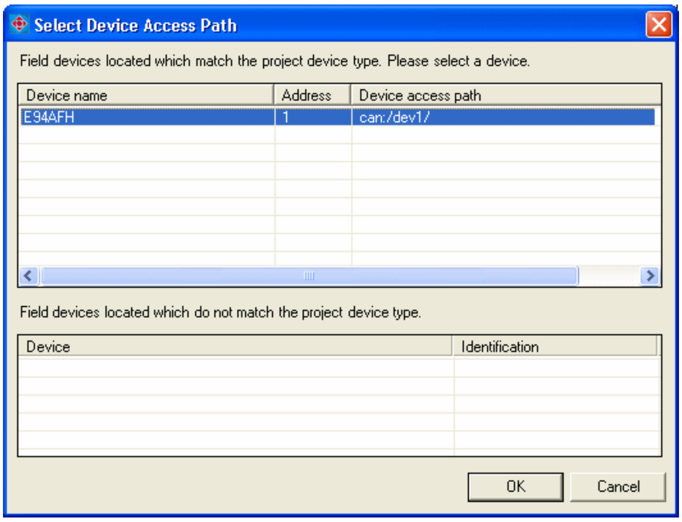
Tip!

Detailed information about the subject "System bus (CAN)" can be found in the Lenze library in the "System bus (CAN)" Communication Manual.

How to configure an online connection via the system bus (CAN):

1. Go to the *Communication path* dialog box and select "System bus CAN" from the **Bus connection** list field.
2. Press **Search/Enter...**.

- The *Select device access path* dialog box is shown:



3. Select the corresponding device from the **Field devices located** list field.
4. Click the **OK** button.
   - The *Select device access path* dialog box is closed.
   - In the *Communication path* dialog box, the **Device access path** column displays the corresponding device access path (e.g. "can:/dev1/").

6.2.1.3 Ethernet / Ethernet controller

You can establish an online connection to the device via a TCP/IP network if the device (e.g a controller) is equipped with an Ethernet network adapter and the PC is also provided with an access to this TCP/IP network (e.g. via a network interface card).

Note!

For the communication settings in the »Engineer« you require the IP address of the device.

Tip!

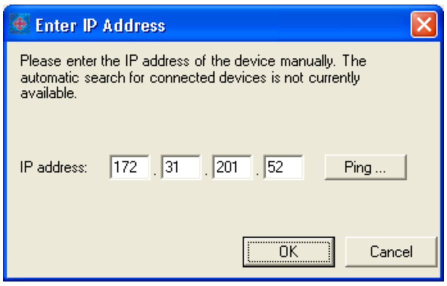
Note down the set IP address using an adhesive label on the device.

Detailed information on the "Ethernet" can be found in the "Ethernet" communication manual.

How to configure an online connection via Ethernet:

1. Go to the *Communication path* dialog box and select "Ethernet" or "Ethernet controller" from the **Bus connection** list field.
2. Press **Search/Enter...**.

- The *Enter IP address* dialog box is displayed:



3. Enter the IP address of the device.
   - By pressing **Ping** you can carry out a simple test on whether a device can actually be reached via the IP address set.
     Please note: However, this has not necessarily got to mean that the intended device can be reached via this IP address!
4. Click the **OK** button.
   - The *Enter IP address* dialog box is closed.
   - In the *Communication path* dialog box, the **Device access path** column displays the corresponding device access path (e.g. "IPC:172_31_207_20.DM.").

6.2.1.4 PROFIBUS

For each of the Inverter Drives 8400 and Servo Drives 9400 series of devices, there is a PROFIBUS communication module with which you can set up an online connection to a field device via PROFIBUS. »Engineer« uses the PROFIBUS DPV1 function as a Class 2 master.

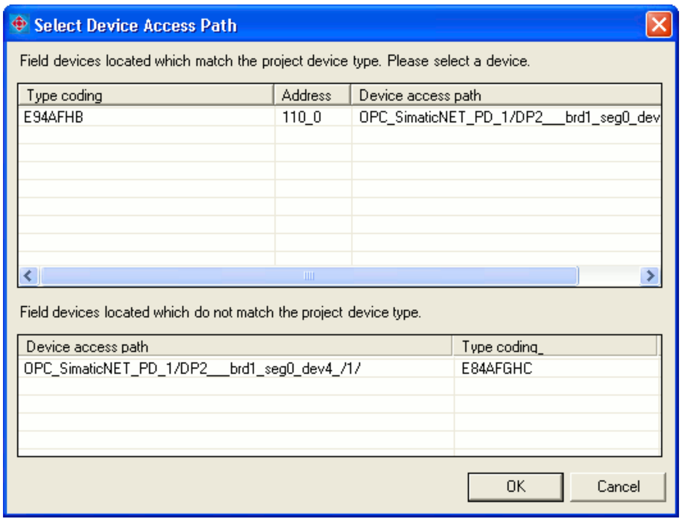
Note!

In order to be able to set up an online connection via PROFIBUS, the following requirements must first be met:

- Installation of the ProfilServer: The ProfilServer is available as a separate setup on the »Engineer«installation CD.
- The Engineering PC (Windows PC on which »Engineer« has been installed) must have a suitable PROFIBUS interface. For this purpose, a PROFIBUS card and the associated driver software have to be installed, For more information on installation of the PROFIBUS card, please refer to the manufacturer's documentation.

How to configure an online connection via PROFIBUS:

1. Open the *Communication path* dialog box in the **Bus connection** list field and select the "PROFIBUS" entry.
2. Press **Search/Enter...**.
   - The *Select device access path* dialog box is shown:



3. Select the corresponding device from the **Field devices located** list field.
4. Click the **OK** button.
   - The *Select device access path* dialog box is closed.
   - In the *Communication path* dialog box, the **Device access path** column displays the corresponding device access path (e.g. "OPC_SimaticNET_PD_1/DP2___brd1_seg0_dev4_/1/").

6.2.1.5 PROFINET

For the Servo Drives 9400 device series a PROFINET communication module is provided, by means of which you can establish an online connection to a field device via PROFINET.

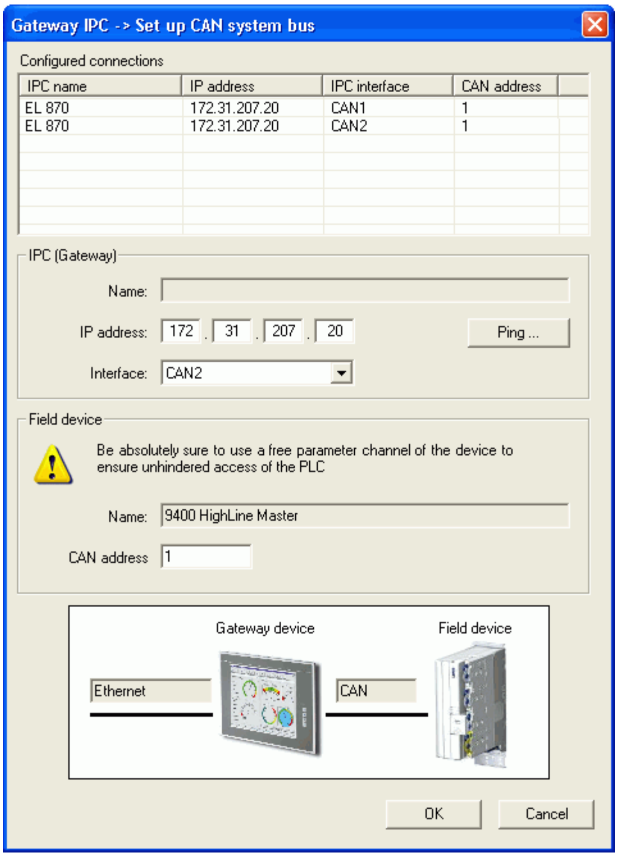
Further information on the *Parameter setting & configuration* with PROFINET can be found in the **PROFINET communication manual**

6.2.1.6 Gateway controller -> CAN system bus

The controller offers a gateway function to establish an online connection to a field device via the system bus (CAN).

How to configure an online connection to a field device which is connected to the controller via the system bus (CAN):

1. Go to the *Communication path* dialog box and select the entry "Gateway controller > CAN system bus" from the **Bus connection** list field.
2. Press **Search/Enter...**.
   - The *Gateway controller -> Set up CAN system bus* dialog box is shown:



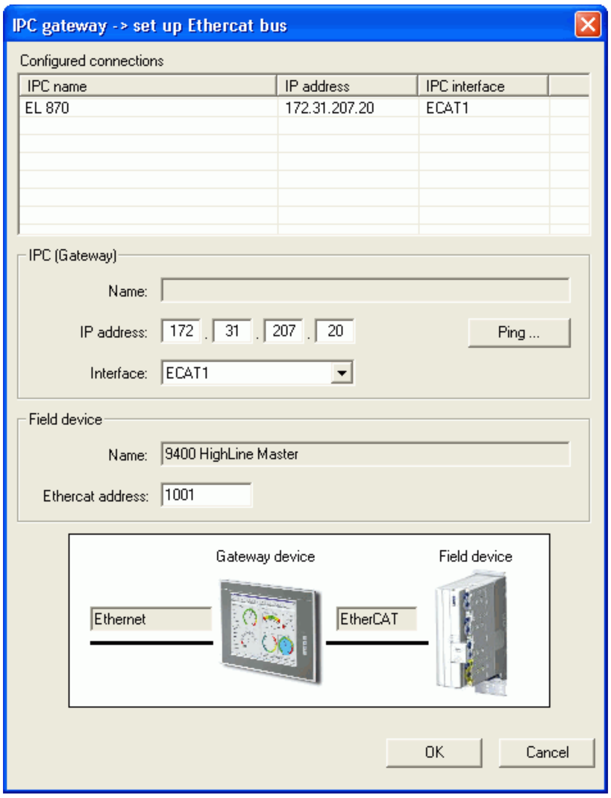
3. Enter the IP address of the controller.
   - By pressing **Ping** you can carry out a simple test on whether a device can actually be reached via the IP address set.
     Please note: However, this has not necessarily got to mean that the intended device can be reached via this IP address!
4. Click the **OK** button.
   - The *Gateway controller > Set up CAN system bus* dialog box is closed.
   - In the *Communication path* dialog box, the **Device access path** column displays the corresponding device access path (e.g. "IPC:172_31_207_254.CAN.can1.dev1.").

6.2.1.7 Gateway controller -> EtherCAT

The controller offers a gateway function to establish an online connection to a field device via EtherCAT.

How to configure an online connection to a field device which is connected to the controller via EtherCAT:

1. Go to the *Communication path* dialog box and select the entry "Gateway controller -> EtherCAT" from the **Bus connection** list field.
2. Press **Search/Enter...**.
   - The *Gateway controller -> Set up EtherCAT bus* dialog box is shown:



3. Enter the IP address of the controller.
   - By pressing **Ping** you can carry out a simple test on whether a device can actually be reached via the IP address set.
     Please note: However, this has not necessarily got to mean that the intended device can be reached via this IP address!
4. Click the **OK** button.
   - The *Enter IP address* dialog box is closed.
   - In the *Communication path* dialog box, the **Device access path** column displays the corresponding device access path (e.g. "IPC:172_31_207_254.ECAT.ecat1.dev1001.").

6.2.2 Checking the serial number

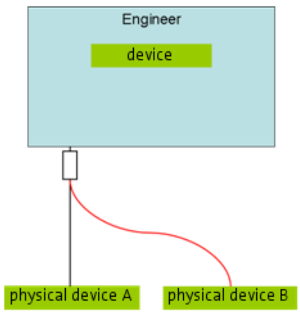
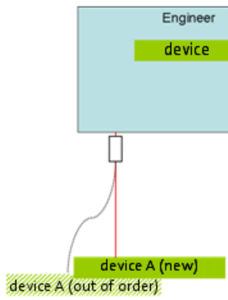
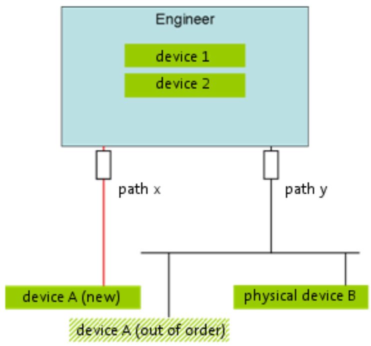
This function extension is available from »Engineer« HighLevel V2.9 upwards!

The »Engineer« checks the serial number of the device when going online.

- The serial number is visible in the *Properties* tab.
- If a device accesses a communication path which is already in use, an error message will be issued.
- The following situations may occur when establishing a connection:
  - Communication path is currently being used by another device (📖 101)
  - Communication path is currently being used by another device (📖 102)

6.2.2.1 Communication path is currently being used by another device

By means of the serial number the »Engineer« can spot a device that is connected online being replaced by another device. Every time an online connection is established the »Engineer« compares the serial number of the physical device with the serial number saved for this device. If the communication path is currently being used by another device, a note will give information on the use of the communication path.

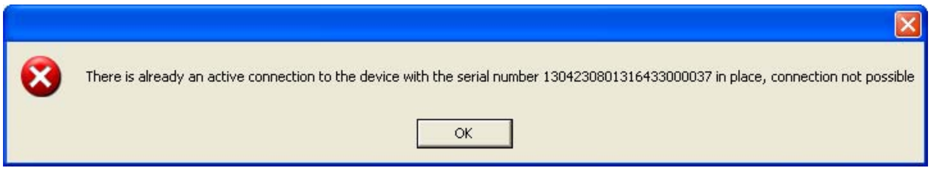
Physical device replaced	Physical device replaced	Physical device and communication path replaced
Example 1: "Replug" device on diagnostic adapter	**Example 2: Device exchange for service purposes**	**Example 3: Device exchange and different communication path**
		
• The physical device A has been projected as the device in the »Engineer«. • The physical device A is "replugged" and replaced by the physical device B. • After confirming the query dialog the present connection can be used with the physical device B.	• The physical device A has been projected as the device in the »Engineer«. • The physical device A (out of order) is replaced by device A (new). • If servicing is required, device A (new) can go online using the present connection.	• The two devices A and B have been projected and commissioned in the »Engineer«. • Ethernet, for instance, is the communication path. • The physical device A (out of order) is replaced. • Device A (new) goes online using a new communication path, e.g. diagnostic adapters. • Device 2 goes online using another communication path. Device B remains unchanged.

- Another projected device is using the communication path selected:

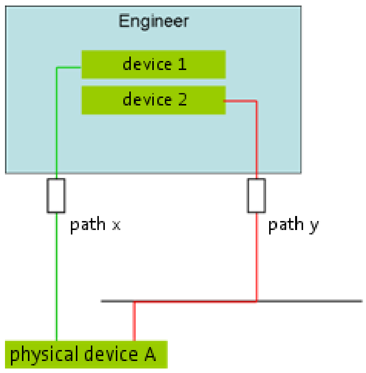
- The physical device is already using another communication path:
  - The »Engineer« displays the serial number and the name of the project device:
    The real device with the serial number <xyz> has already been connected to <name of the project device>.
  - A connection to the project device can be established by confirming the query with **Yes**.

6.2.2.2 Communication path is currently being used by another device

The »Engineer« issues a warning if several devices within the same project attempt to access the same communication path. This prevents several devices from being online via the same communication path.



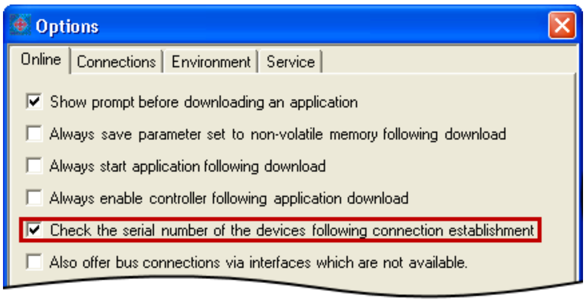
- Further use of the communication path is not possible. Activating the **OK** button closes the dialog box. Select another configuration for the communication path of the other device. ▸ Setting the communication path (📖 92)

Several project devices access the same physical device	Function
	• By means of the serial number the »Engineer« detects that several project devices attempt to access the same physical device via different device access paths. • If one of the other project devices is online, the communication path will be occupied. The second device attempting to use the communication path will be set offline immediately. **Remedy:** The communication path must be set. • The reading out of the serial number must be switched off manually. ▸ Setting the communication path (📖 92) ▸ Switching off the serial number check (📖 103)

6.2.2.3 Switching off the serial number check

How to switch off the check of the serial number:

1. Select the **Tools → Options** menu command.
    - The *Options* dialog box is displayed.
2. In the **Online** tab, deactivate the option **Check serial numbers of the devices after establishment of connection**:



3. Click **OK** to close the *Options* dialog box again.

6.3 Going offline

How to terminate an online connection to a device:

1. Open the *Project view* and select the device to which an online connection is to be established.
    - Alternatively you can select the upper project element in the *Project view* to close the online connection to all devices contained in the project or in the system module.
2. Click the icon or press **<Shift>+<F4>**.

6.4 Optical location - device identification

The "Optical location" function serves to locate the position of a specific device within a machine system.

If the "Optical location" function is activated, the »Engineer« causes the device connected online to blink with all LEDs for an adjustable time. After the time has elapsed, or if the user exits the function beforehand, the device controls its LEDs normally again.

Note!

- The "Optical location" function is available depending on the device.
- An online connection to the device that is to be located has to be established.

How to activate the optical location:

1. Select desired device in the project tree
   - Establish online connection to the device ▸ Go online (📖 90)
2. Click the icon or select the menu command **Online→Optical location**
   - Optionally the period for which the device to be located is to be activated can be selected from the selection list.

6.5 System bus configurator

The menu command **Online→System bus configurator** serves to open the system bus configurator which can be used to configure the communication parameters of the Lenze PC system bus adapters connected to the PC.

Moreover the system bus configurator serves to do the following:

- Activate/deactivate available PC system bus adapters for the use with the Lenze tools,
- Define one of the active PC system bus adapters as standard for the use with the Lenze tools,
- Add more PC system bus adapters for configuration or removing available PC system bus adapters from the configuration again,
- Carry out a diagnostic process on whether a PC system bus adapter is able to communicate with all nodes,
- Display information on the device drivers used.

Tip!

Detailed information on the system bus configurator can be found in the online help for the system bus configurator.

6.6 PROFINET address configurator

Use the menu command **Online→PROFINET address configurator** to open the "Allocate IP addresses" dialog window, via which you can display and change the IP settings of PROFINET nodes.

Note!

The device search only shows devices which are connected via the local Ethernet segment. Devices connected via a router/switch are not displayed.

- Use this command to prepare the desired PROFINET nodes for an online connection.
- By clicking the **Search devices** button you can carry out the search for connected devices again anytime.

7 Device functions in the online mode

This chapter describes how you can do the following when an online connection to the device has been established:

- Executing control functions such as "Start program" or "Inhibit controller" in the device via the »Engineer«
- Transferring parameter settings of the »Engineer« project (and optionally the drive application) to the device.
- Transferring the parameter settings currently stored in the device to the »Engineer« project.

Overview of device functions in the online mode

Device function		Devices supported: Inverter Drives 8400	Servo Drives 9400	Controller	I/O system
Control functions for drive controllers (📖 107)					
	Enable controller (📖 108)	●	●	-	-
	Inhibit controller (📖 108)	●	●	-	-
	Start application (📖 109)	-	●	-	-
	Stop application (📖 109)	-	●	-	-
Application and parameter set transfer (📖 110)					
	Download program (📖 111)	-	●	-	-
	Download parameter set (📖 114)	●	●	●	●
	Upload parameter set (📖 116)	●	●	●	●
	Store parameter set (📖 118)	●	●	●	-
Diagnostics (📖 119)		●	●	●	-
Data logger (📖 121)		●	●	-	●
Oscilloscope (📖 137)		-	●	-	-

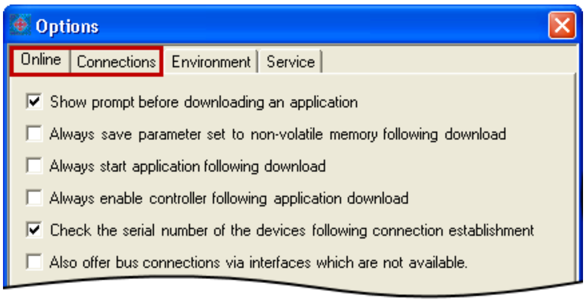
Tip!

Detailed information on how to establish an online connection to the device can be found in the previous main chapter "Establishing an online connection". (📖 88)

7.1 Options

You use the **Tools→Options** menu command to open the *Options* dialog box. In this dialog box, you can then carry out general settings for data transfer in the **Online / Connections** tabs:

- The **Service** tab solely addresses to Lenze service staff.



Tab	Function
Online	Optional settings relating to the response during an online connection: • Activate confirmation prompt • Behaviour after the application has been downloaded • Prompt asking for the serial number of a device • Representation of the bus connections
Connections	Specifying the (*Timeout* / *Scan Timeout*) transfer values for the following forms of communication: • CAN system bus • Ethernet NRT • Diagnostics
Service (for Lenze employees only!)	**Note: The activation of the service settings can result in a malfunction of the corresponding device! The service settings may only be carried out by (and on instruction by) Lenze service personnel!** Activating advanced service settings: • Service codes • Going online with a device without checking the firmware version • Extended channel selection for internal motor control in the oscilloscope

7.2 Control functions for drive controllers

For a drive controller inserted into the project (8400 and 9400 device series), you can execute the functions indicated in the following sections if you are connected to the device online.

Stop!

If a system module that contains several devices has been selected instead of a device in the *Project view*, the respective control function is executed in all the devices of the system module to which an online connection has been established.

Note!

Before a control function is carried out within the device, there first is a confirmation prompt on whether the function is to be carried out.

If you confirm the confirmation prompt with **No**, the corresponding control function is not carried out.

▶ The control functions can be executed via the *Toolbar* or the **Online** menu:

Icon	Menu command	Be sure to observe:	Shortcut
	Enable controller (📖 108)	⚠ ▸ Safety instructions (📖 15)	<F8>
	Inhibit controller (📖 108)		<F9>
	Start application (📖 109)	⚠ ▸ Safety instructions (📖 15)	
	Stop application (📖 109)		

7.2.1 Enable controller

Danger!

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 moving machine parts.

How to deactivate controller inhibit:

1. Select the controller for which the controller inhibit is to be deactivated in the *Project view*.
2. If no online connection to the device has been established yet:

   Click the icon or select the menu command **Online → Go online** to establish an online connection to the device. Go online (90)
3. Click the icon or select the menu command **Online → Enable controller**.
4. Confirm the safety query on whether the controller is to be enabled with **Yes**.
   - Then the controller inhibit in the controller is deactivated if there is no further precondition for a controller inhibit (e. g. via digital terminal).
   - By clicking or via the menu command **Online → Inhibit controller** you can set controller inhibit in the controller again.

7.2.2 Inhibit controller

How to set the controller inhibit:

1. Select the controller for which the controller inhibit is to be set in the *Project view*.
2. If no online connection to the device has been established yet:

   Click the icon or select the menu command **Online → Go online** to establish an online connection to the device. Go online (90)
3. Click the icon or select the menu command **Online → Inhibit controller**.
4. Confirm the safety query on whether the controller is to be inhibited with **Yes**.
   - The controller then is inhibited.
   - By clicking the icon or via the menu command **Online → Enable controller** you can cancel the controller inhibit in the drive controller.

7.2.3 Start application

Danger!

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.

How to start the application in the controller:

1. Select the controller for which the application is to be started in the *Project view*.
2. If no online connection to the device has been established yet:

   Click the icon or select the menu command **Online → Go online** to establish an online connection to the device. ▶ Go online (📖 90)
3. Click the icon or select the menu command **Online → Start application**.
4. Confirm the safety query on whether the application in the controller is to be started with **Yes**.
   - Then the application in the controller is started.
   - By clicking or via the menu command **Online → Stop application** you can stop the application in the controller again.

7.2.4 Stop application

How to stop the application in the controller:

1. Select the controller for which the application is to be stopped in the *Project view*.
2. If no online connection to the device has been established yet:

   Click the icon or select the menu command **Online → Go online** to establish an online connection to the device. ▶ Go online (📖 90)
3. Click the icon or select the menu command **Online → Stop application**.
4. Confirm the safety query on whether the application in the controller is to be stopped with **Yes**.
   - Then the application in the controller is stopped and controller inhibit is set.
   - By clicking or via the menu command **Online → Start application** you can start the application in the controller.

7.3 Application and parameter set transfer

If an online connection to the device has been established you can transfer the parameter set of the device to the »Engineer« project, and vice versa. Furthermore you can transfer a (modified) application from the »Engineer« to the device.

Stop!

If a system module that contains several devices is selected instead of a device in the *Project view*, the selected transfer function is executed with all the devices of the system module to which an online connection has been established.

▶ The transfer functions can be executed via the *Toolbar* or the **Online** menu:

Icon	Menu command	Shortcut
	Download program (📖 111)	
	Download parameter set (📖 114)	<F5>
	Upload parameter set (📖 116)	<F7>
	Store parameter set (📖 118)	

Order of data transfer to the device

The data transfer to the device is used to be carried out in the following sequence:

1. **Stop devices**: In this phase the data transfer is prepared, e.g. controllers are inhibited and applications are stopped.
2. **Transfer data**: In this phase, the application, the parameters, and, if so, other data (e.g. cam data) are transferred (depending on the command selected).
3. **Start devices**: In this phase the data transfer has been completed, devices and applications are started and controllers are enabled.

7.3.1 Download program

Note!

This function is only available for the Servo Drives 9400 series.

Together with the application, the complete (offline) parameter set is transferred to the controller as well.

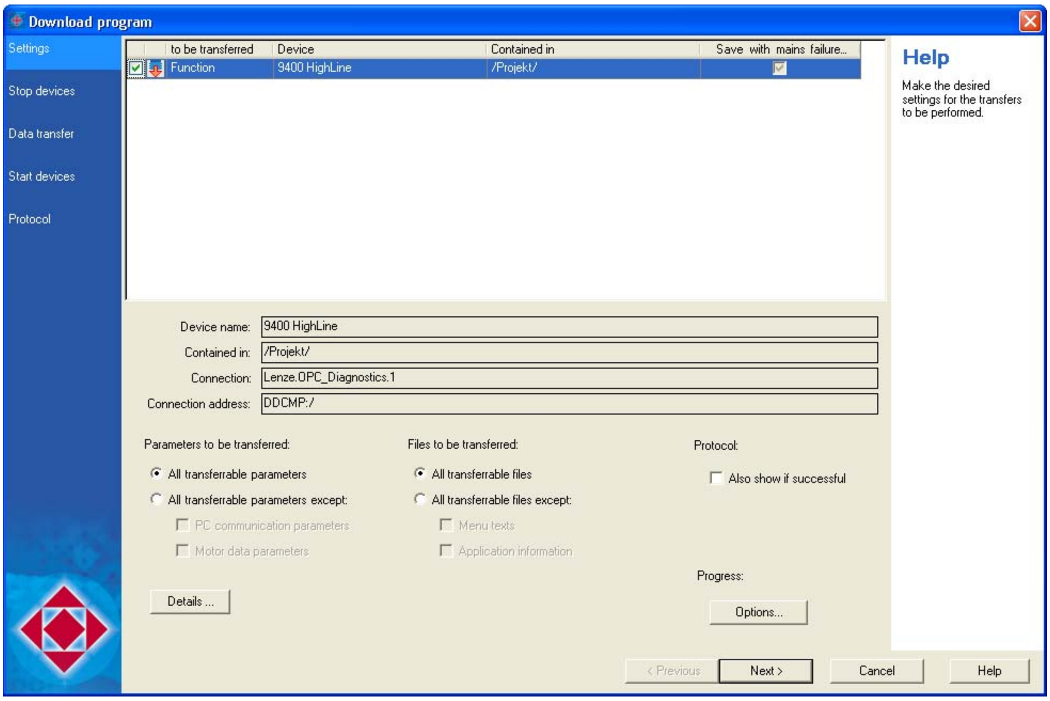
How to transfer the application and the parameter set from the »Engineer« to the device:

1. Select the device which the application and parameter set are to be transferred to in the *Project view*.
2. If no online connection to the device has been established yet:

   Click the icon or select the menu command **Online → Go online** to establish an online connection to the device. ▶ Go online (📖 90)
3. When there is an online connection to the device:

   Click the icon or select the menu command **Online → Download program**.
   - The *Download program* dialog box is displayed.

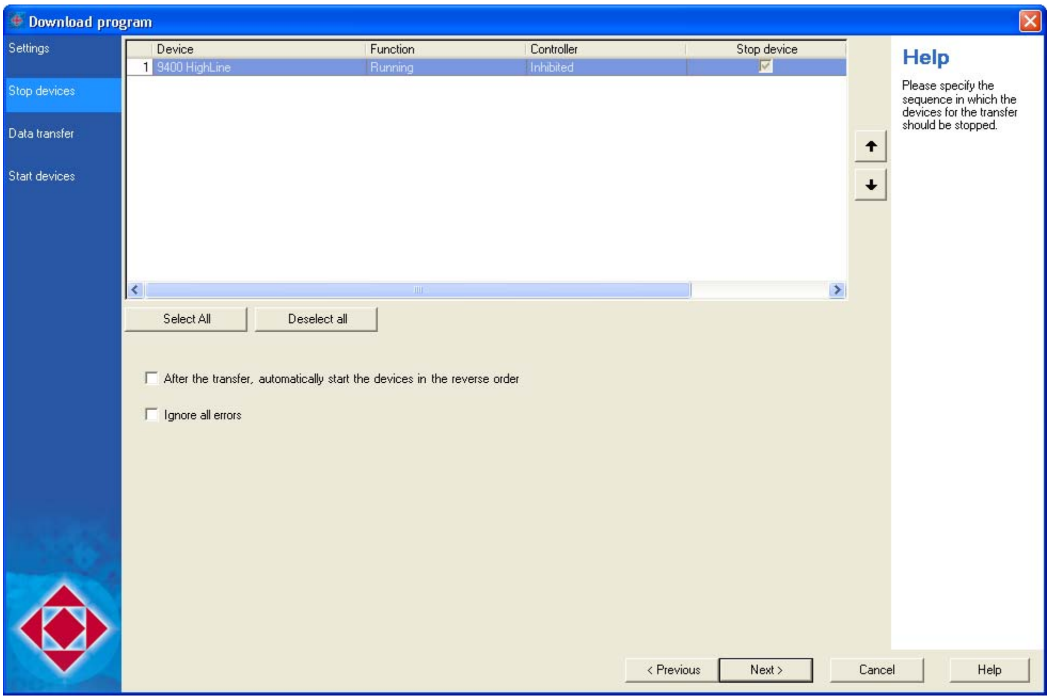
   Step 1 - Settings



4. Define the required options for the transfers to be executed.
   - If you click **Details...** all parameters which are <u>not</u> transferred to the device are listed in the *Parameter set details* dialog box.
   - The **Options...** button serves to open the *Options*, dialog box where you can make general settings for the data transfer. ▶ Options (📖 106)

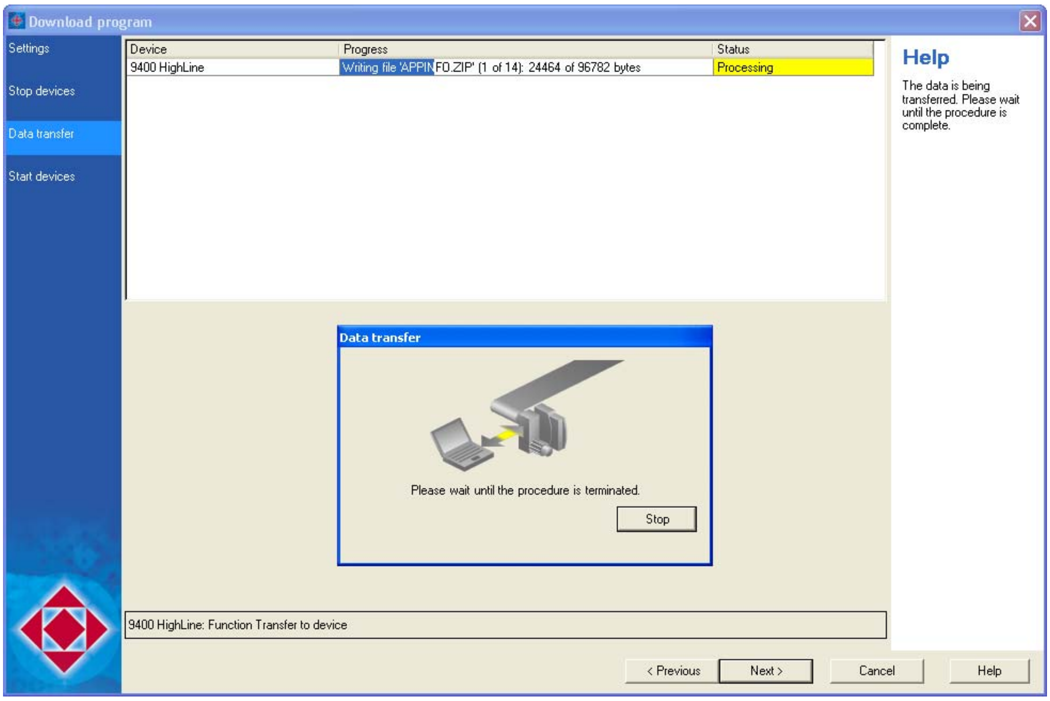
5. Click the **Next** button.

Step 2 - stop devices



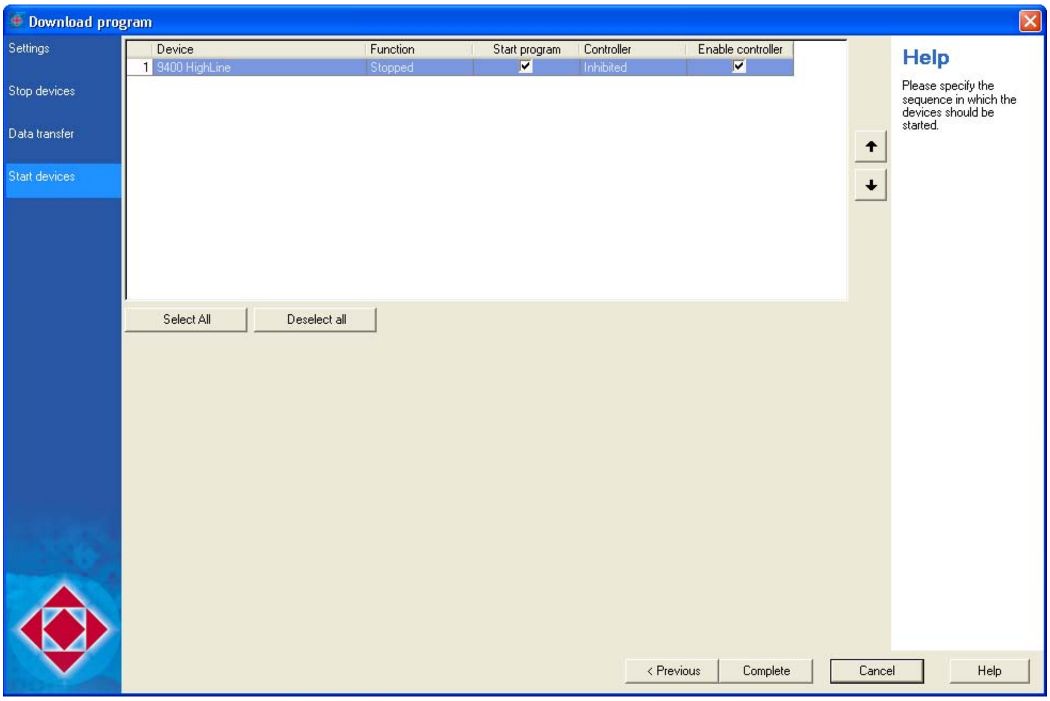
6. Define the required options for stopping the devices.
   - When transferring data to several devices, in this step you can for instance define the sequence in which the devices are to be stopped for the data transfer.
7. Click the **Next** button.
8. Confirm the query on whether the selected devices are to be stopped now with **Yes**.
   - The devices selected are stopped.
   - The data transfer is started.

Step 3 - data transfer



The progress of the data transfer is displayed. After a successful data transfer, it is going on automatically:

Step 4 - start devices



9. Define the desired options (and, for several devices, the sequence) for starting the devices.

10. Click the **Complete** button.
    - The devices selected are started.
    - After a successful execution, the dialog box is closed automatically unless you have activated the **Also show if successful** option in the first step.

7.3.2 Download parameter set

By means of this transfer function, the (offline) parameter set of the »Engineer« project is transferred to the device.

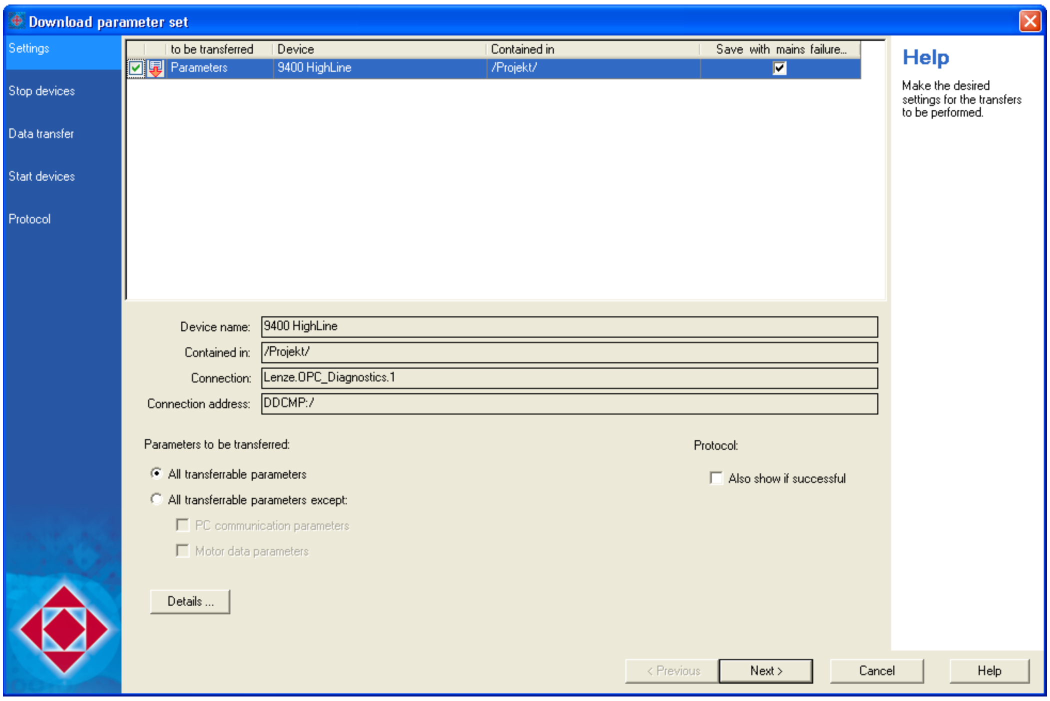
How to transfer the parameter set from the »Engineer« to the device:

1. Select the device to which the parameter set is to be transferred in the *Project view*.
2. If no online connection to the device has been established yet:

   Click the icon or select the menu command **Online → Go online** to establish an online connection to the device. ▶ Go online (📖 90)
3. When there is an online connection to the device:

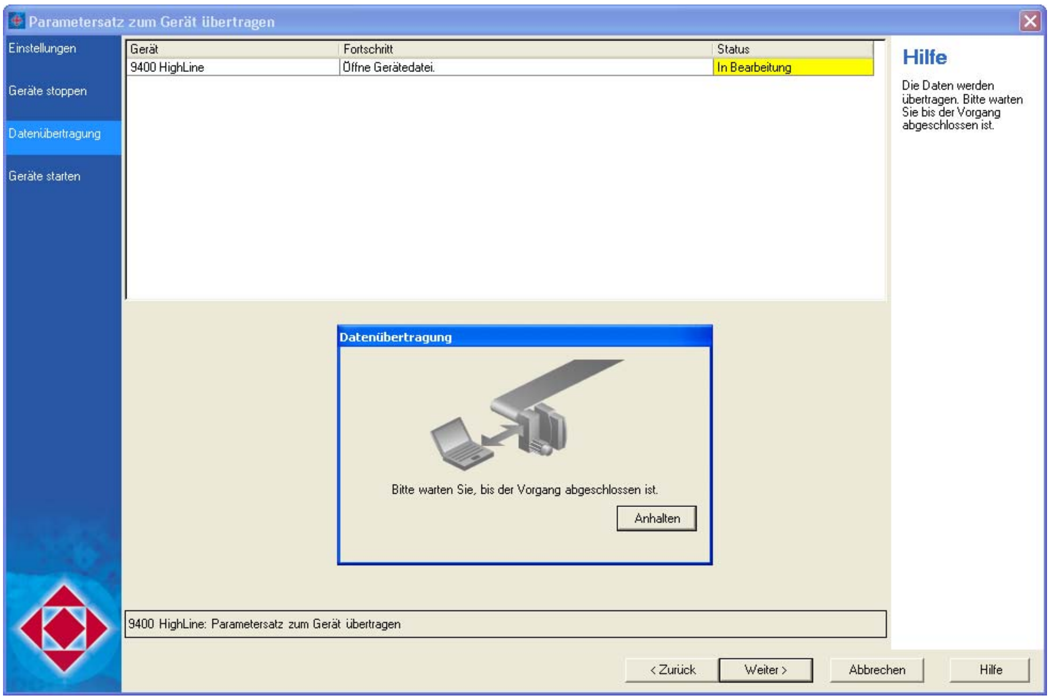
   Click the icon or select the menu command **Online → Download parameter set**.
   - The *Download parameter set* dialog box is displayed.

   Step 1 - Settings



4. Define the required options for the transfers to be executed.
   - You can download **All parameters** to the device, or exclude specific parameters. Activate the desired control fields to **not** download the respective parameters to the device.
   - If you click **Details...** all parameters which are not transferred to the device are listed in the *Parameter set details* dialog box.
   - The**Options...** button serves to open the *Options* dialog box where you can make general settings for the data transfer. ▸ Options (📖 106)
5. Click the **Next** button.
6. **Step 2 - stop devices (optional, required for specific parameters)**
   - Define the required options for stopping the devices.
   - When transferring data to several devices, in this step you can for instance define the sequence in which the devices are to be stopped for the data transfer.
7. Click the **Next** button.
8. Confirm the query whether the selected devices are to be stopped now with **Yes**.
   - Then the selected devices are stopped and the data transfer is started.

Step 3 - data transfer



The progress of the data transmission is displayed.

Step 4 - start devices
Define the desired options and, for several devices, the sequence for starting the devices.

9. Click the **Complete** button.
   - The selected devices are restarted.
   - After a successful execution, the dialog box is closed automatically unless you have activated the **Also show if successful** option in the first step.

7.3.3 Upload parameter set

By means of this transfer function, the parameter set that is currently available in the device is transferred to the »Engineer« project.

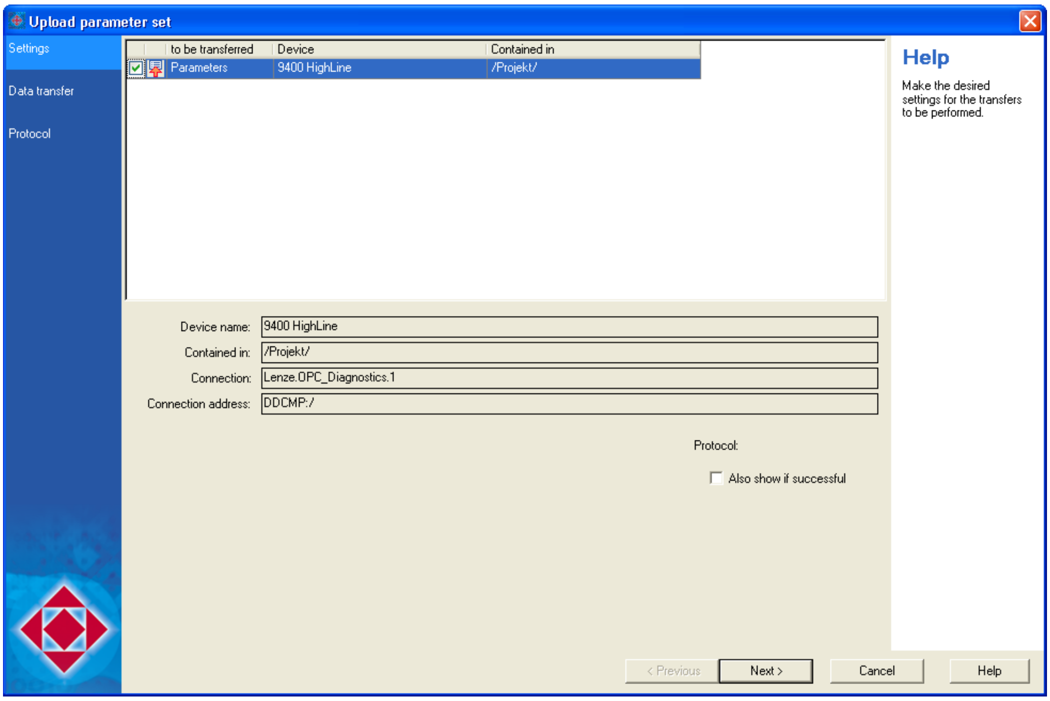
How to transfer the parameter set from the device to the »Engineer«:

1. Select the device from which the parameter set is to be read in the *Project view*.
2. If no online connection to the device has been established yet:

   Click the icon or select the menu command **Online → Go online** to establish an online connection to the device. Go online (90)
3. When there is an online connection to the device:

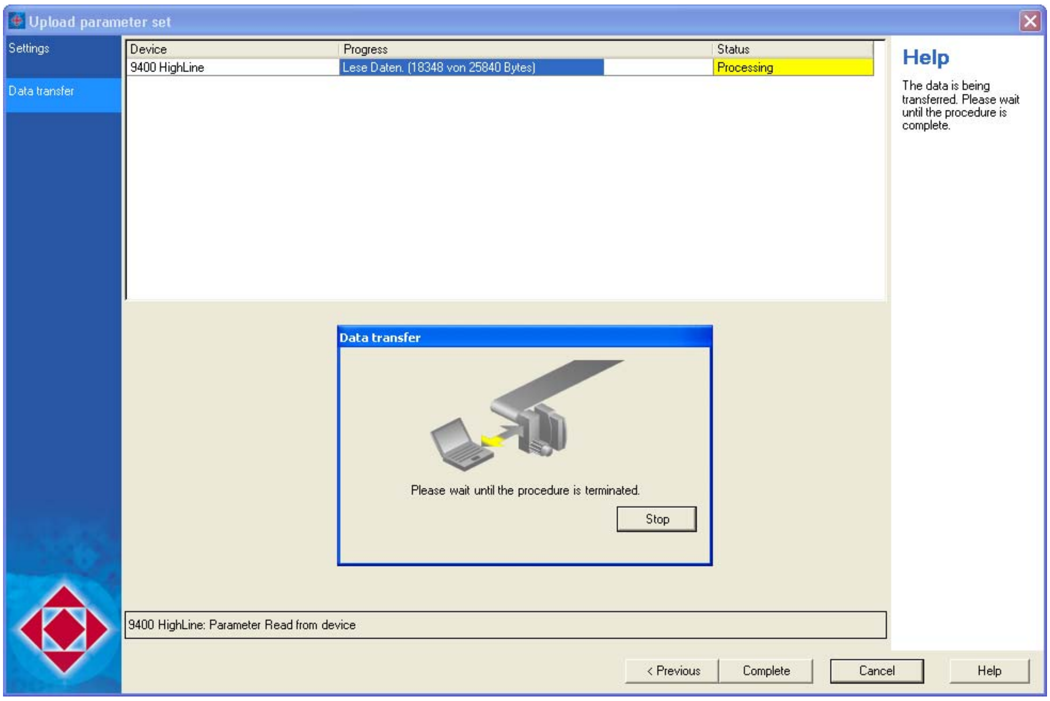
   Click the icon or select the menu command **Online → Upload parameter set**.
   - The *Upload parameter set* dialog box is displayed:

   Step 1 - Settings



4. Define the required options for the transfers to be executed.
   - The **Options...** button serves to open the *Options*, dialog box where you can make general settings for the data transfer. Options (106)
5. Click **Next** to start data transfer.

Step 2 - data transfer



The progress of the data transfer is displayed. After a successful execution, the dialog box is closed automatically unless you have activated the **Also show if successful** option in the first step.

7.3.4 Store parameter set

In order to prevent parameter settings carried out in the device from being lost by mains switching, you have to explicitly save the parameter set with mains failure protection in the device.

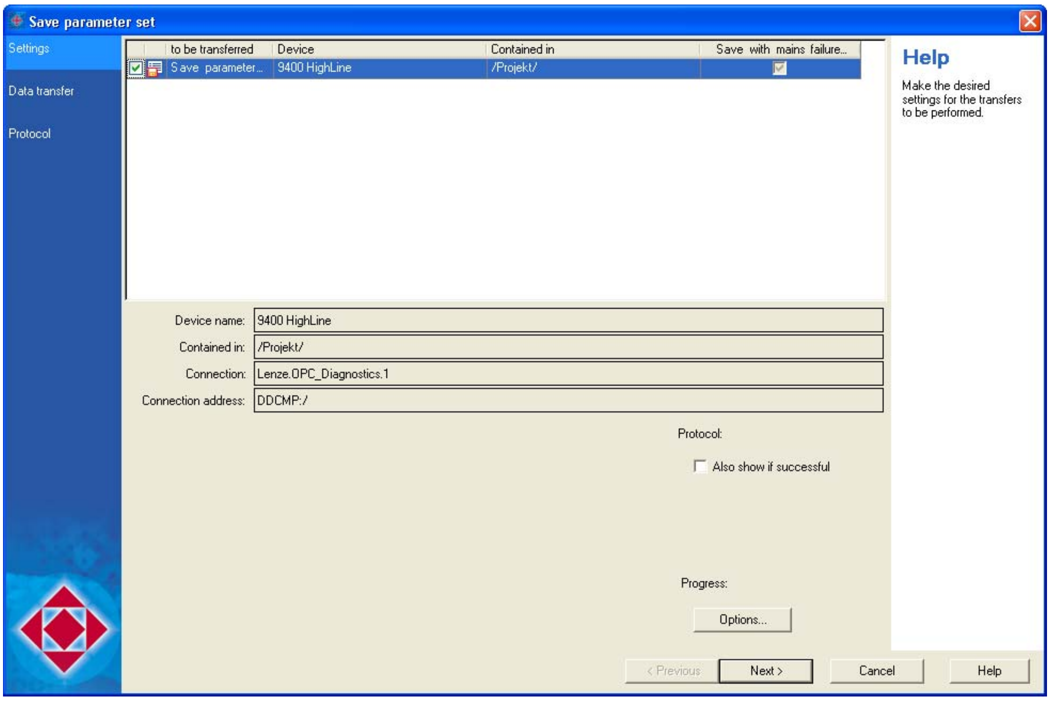
How to save the parameter set in the device:

1. Select the device in which the current parameter settings are to be saved with mains failure protection in the *Project view*.
2. If no online connection to the device has been established yet:

   Click the icon or select the menu command **Online → Go online** to establish an online connection to the device. ▸ Go online (📖 90)
3. When there is an online connection to the device:

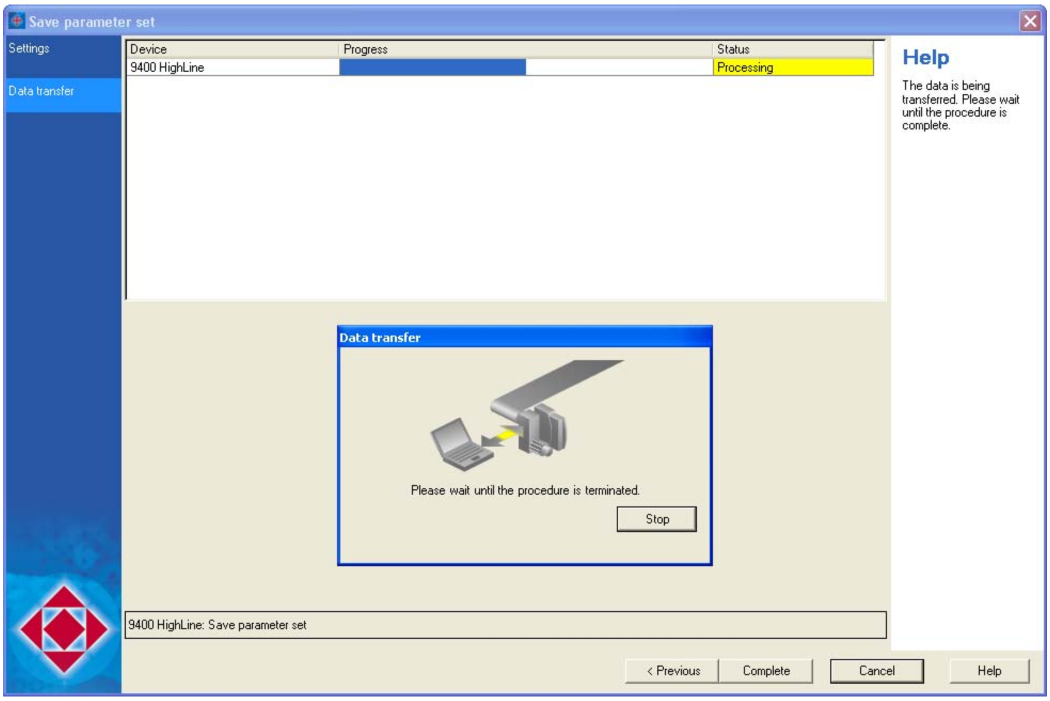
   Click the icon or select the menu command **Online → Store parameter set**.
   - The *Save parameter set* is displayed.

   Step 1 - Settings



4. Define the required options for the transfers to be executed.
   - The **Options...** button serves to open the *Options* dialog box where you can make general settings for the data transfer. ▸ Go online (📖 90)
5. Click **Next** to start data transfer.

Step 2 - data transfer



The progress of the data transfer is displayed. After a successful execution, the dialog box is closed automatically unless you have activated the **Also show if successful** option in the first step.

7.4 Diagnostics

With the »Engineer« you can carry out diagnostics of the device connected (if an online connection has been established).

Note!

The available diagnostics options for a device depend on the respective device and can therefore only be explained here with an example!

Also read the documentation supplied with the corresponding device before you start working!

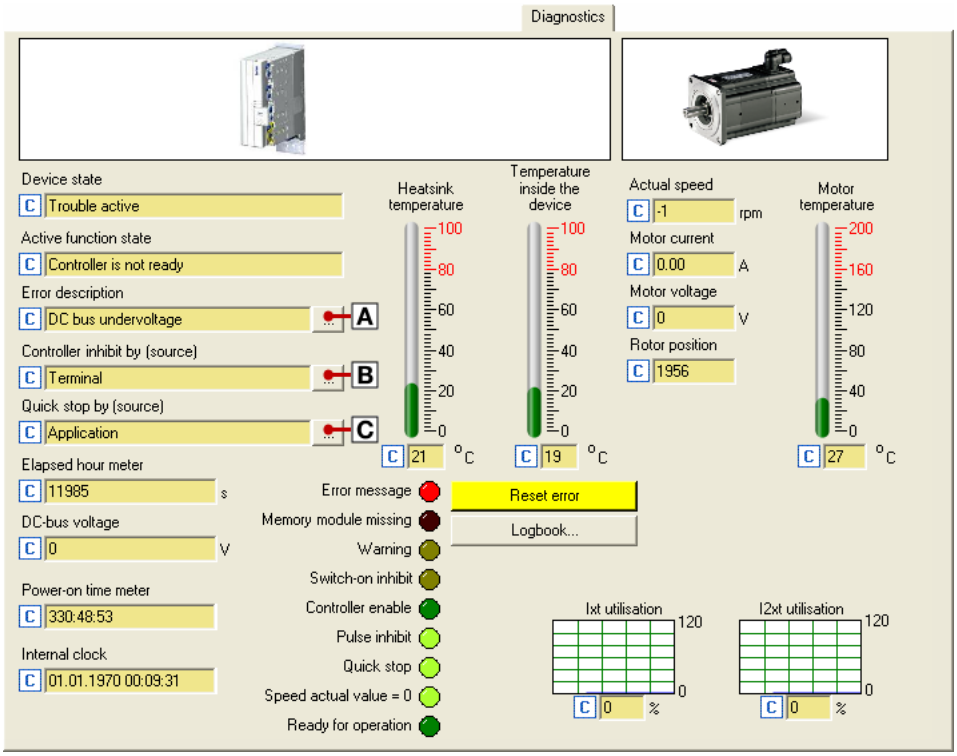
How to carry out diagnostics:

1. Select the corresponding device in the *Project view*.
2. If no online connection to the device has been established yet:

   Click the icon or select the menu command **Online → Go online** to establish an online connection to the device. ▶ Go online (📖 90)

3. Select the **Diagnostics** tab.
   - When an online connection has been established, the **Diagnostics** tab displays current status information about the device.

Example of diagnostics for 9400 HighLine



Button		Function
...	A	Show details of the current error.
	B	Show all active sources for the controller inhibit.
	C	Show all active sources for quick stop.
Reset error		Acknowledge error message (if the error cause has been removed).
Logbook...		Show logbook of the controller.

7.5 Data logger

This function is available in »Engineer« HighLevel V2.10 and higher!

The data logger serves to record the temporal course of parameter values and display it as a line diagram.

- The data logger is available in the »Engineer« for all parameterisable devices.
- For cross-device recording, the data logger is also available for the upper project element, for system modules, and for axes.

Note!

In contrast to the oscilloscope function integrated in some controllers, the data logger records the parameter value only with the aid of the computer. Thus, the measurement is not time-equidistant (not in real time)!

General procedure

Go to the data logger user interface, select the parameters to be recorded and set the required trigger condition and sampling rate. If there is an online connection to the device, the measurement can be started. With a valid configuration, the values of the selected parameters are then read in via the existing online connection and displayed graphically as a line diagram.

Typical applications

- Graphic display of any measured variable (e.g. output frequency, DC-bus voltage, and motor current)
- Detection of process factors without additional measuring devices (as e.g. oscilloscope, voltmeter, and ammeter)
- Support during commissioning, maintenance, and troubleshooting
- Comfortable documentation of the device behaviour/application in connection with product liability and quality assurance

Special features

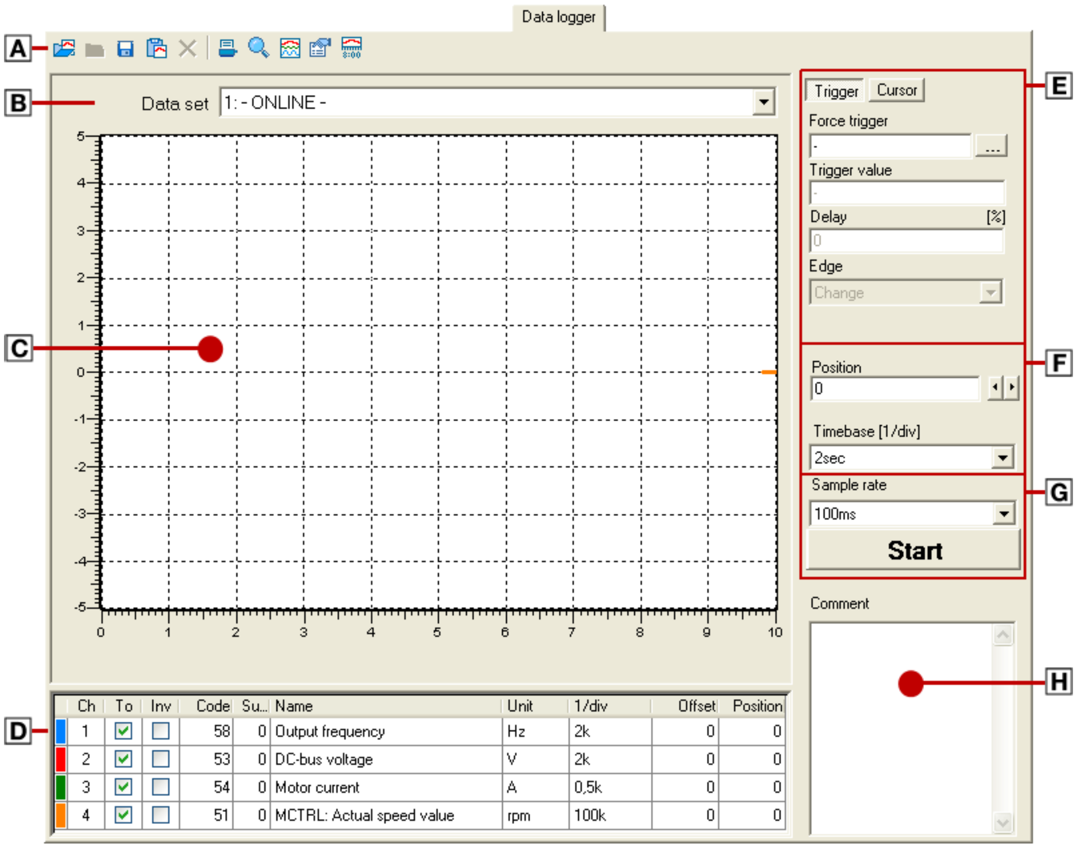
- Measuring on four independent channels at the same time
- Triggering to a channel, a parameter, or immediate start
- Detecting measured values before and after the trigger event (pre/post trigger)
- Cursor and zoom function for analysing the measurement
- Saving & loading the data logger recording
- Reuse of data logger configurations
- Export of the measured values via the clipboard for further processing

7.5.1 User interface

How to get to the data logger user interface:

1. Select the device the parameter values of which are to be recorded in the *Project view*.
   - For a cross-device recording, you can alternatively select the upper project element, a system module, or an axis.
2. Select the **Data logger** tab in the *Workspace*.

The user interface of the data logger contains the following control and function elements:



A Data logger toolbar	E Trigger/cursor settings
B Data record selection	F Horizontal settings
C Diagram	G Recording settings
D Vertical settings	H Comment

7.5.1.1 Data logger toolbar

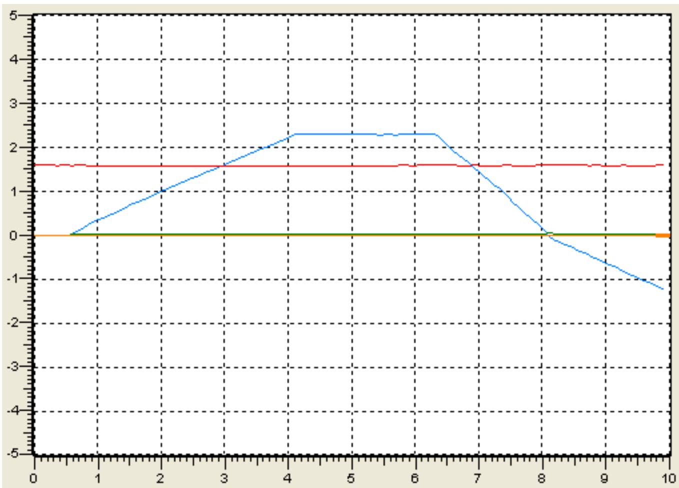
Icon	Function
	Loading/importing data records (📖 134)
	Closing the data record (📖 135)

Icon	Function
	Saving/exporting a data record (📖 133)
	Copying a data record to the clipboard (📖 136)
	Deleting a data record in the project (📖 135)
	Print diagram
	Activate zoom function ▸ Adjusting the representation (📖 130)
	Activate automatic scaling function ▸ Adjusting the representation (📖 130)
	Commenting a data record (📖 133)
	Using the time axis (📖 129)

7.5.1.2 Diagram

The diagram represents the detected parameter values as interpolated curves.

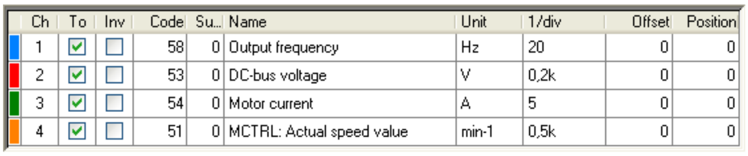
- In order to adapt the representation, we provide you with a zoom function and an automatic scaling function.
- The curves can be optionally shown/masked out, presented in any colour, and overlapped with the signal characteristics of other recorded parameters.



[7-1] Example diagram

7.5.1.3 Vertical settings

The parameters to be recorded are configured via the list field below the diagram:



	Ch	To	Inv	Code	Su...	Name	Unit	1/div	Offset	Position
	1	☑	☐	58	0	Output frequency	Hz	20	0	0
	2	☑	☐	53	0	DC-bus voltage	V	0,2k	0	0
	3	☑	☐	54	0	Motor current	A	5	0	0
	4	☑	☐	51	0	MCTRL: Actual speed value	min-1	0,5k	0	0

Column	Meaning
-	Curve colour for the representation in the diagram • Double-click this field to open the *Colour* dialog box for selecting another curve colour.
Ch	Channel number • Read only
On	On/off
Inv	Inversion on/off
Code	Code of the parameter to be recorded • Read only
Subcode	Subcode of the parameter to be recorded • Read only
Device	Name of the device that contains the parameter to be recorded. • From »Engineer« V2.10, the data logger is also available for the upper project element, for system modules, and for axes for a cross-device recording. In this case, the list field additionally contains the "device" column.
Name	Name of the parameter to be recorded • Double-click this field to open the *Insert channel* dialog box for selecting the parameter to be recorded. ▸ Selecting the variables to be recorded (📖 126)
Unit	Scaling • Double-click this field to open the *Scaling* dialog box for setting the scaling for the parameter to be recorded.
1/Div	Vertical scale factor • Click this field to open the list field *f*or selecting the vertical scale factor.
Offset	Offset value • The offset value depends on the scale factor and is marked by a dashed line in the curve colour in the left-most position of the diagram.
Position	Position value • The position value is independent of the scale factor and marked by a line in the left-most position of the diagram.

7.5.1.4 Trigger/cursor settings

Trigger

When the **Trigger** button is active, the input fields for configuring the trigger condition are shown. ▸ Defining the trigger condition (📖 128)

Cursor

If the **Cursor** button is active instead, you can read single measured values of a selectable channel by means of a vertical measurement line in the diagram. A second vertical measurement line serves to display the difference between two measured values. ▸ Reading individual measured values (📖 131)

Group field	Meaning
Channel	Channel selection
Value	Display of the measured value positioned at the active measurement line
Differential value	Display of the difference between the measured values positioned at the two measurement lines

7.5.1.5 Horizontal settings

The **Horizontal** group field serves to define the time base and the horizontal position. ▸ Defining the recording time/sampling rate (📖 127)

Input field	Meaning
Position	Definition of the horizontal display position • You can either enter a value directly into the input field or define the position by the arrow buttons. • When pressing the arrow buttons and the **<Ctrl>** key at the same time, you can increase the increment to accelerate the shift.
Time base [1/Div]	Selection of the time base • The current time base setting multiplied by ten results in the recording time. • Change the time base to stretch or compress measurements that have already been completed.

7.5.1.6 Recording settings

Use the **Recording** group field to select the sampling rate and start recording.

▶ Since the measured data memory has a limited capacity, a compromise must be found between the sample rate and the recording time that results from the time base setting. ▸ Defining the recording time/sampling rate (📖 127)

7.5.2 Operation

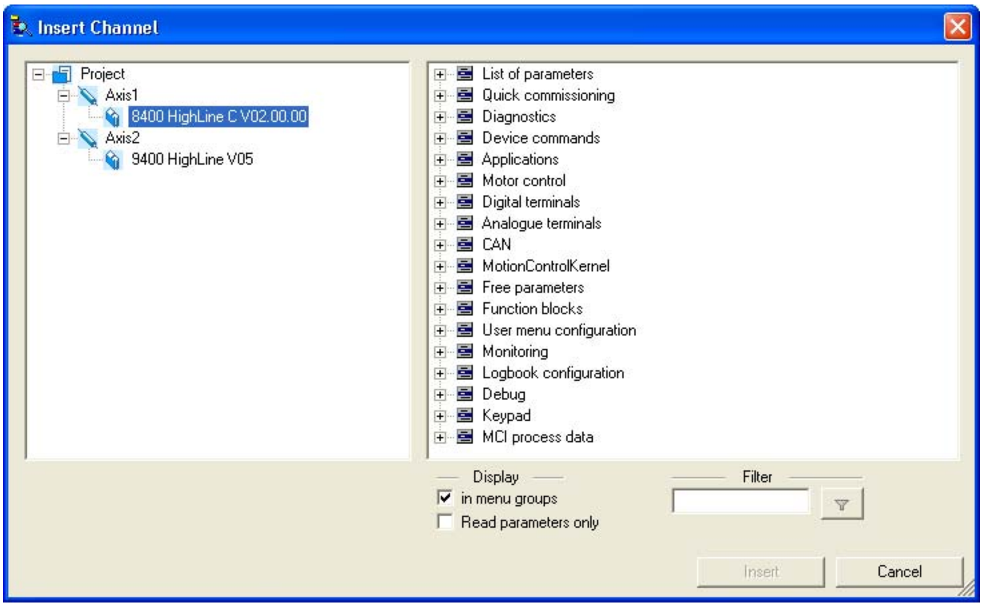
This chapter describes step-by-step how to record the signal characteristics of controller variables and represent, analyse, document and process them in the oscilloscope.

7.5.2.1 Selecting the variables to be recorded

The data logger supports up to four channels, i.e. max. four parameters can be recorded in a data record. These parameters are selected via the list field below the diagram.

How to select a parameter for recording:

1. Double-click the **Name** field for the channel to be set.
   - The *Insert channel* dialog box is displayed:



   - From »Engineer« V2.10, the data logger for a cross-device recording is also available for the upper project element, system modules, and axes. In this case, the *Insert channel* dialog box additionally contains a project view on the left which serves to select the corresponding device.
   - When the **In menu groups** option is activated, all parameters are shown as they are assigned to their functions and devices.
   - When the **Read parameters only** is activated, only the display parameters of the device are shown.
   - The button in the **Filter** field serves to reduce the list of available parameters. If you e.g. enter the text "ain1" and then click the button, only the parameters the name of which contain this text are displayed for selection.
2. Select the parameter to be recorded from the list field.
3. Click the **Insert** button.
   - The dialog box then closes and the selection is accepted.
4. Repeat the steps 1 ... 3 to select further parameters to be recorded.

You can change and cancel a selection subsequently at any time.

How to change a selection:

1. Double-click the **Name** field for the channel to be changed.
2. Make a new selection in the *Insert channel* dialog box.
3. Click the **Insert** button.
   - The dialog box then closes and the selection is accepted.

How to cancel a selection again:

1. Right-click the channel to be deleted.
   - A *Context menu* for this channel appears.
2. Select the **Delete channel** menu command from the *Context menu*.

7.5.2.2 Defining the recording time/sampling rate

Note!

If you change the time base or the sampling rate, the currently represented line diagram will be deleted.

How to define the duration and sampling rate for recording:

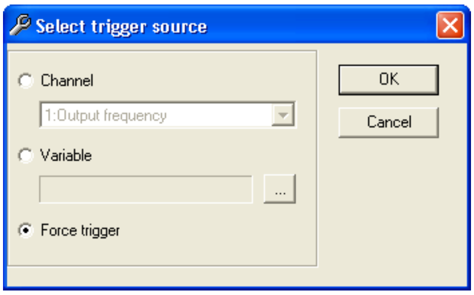
1. Select the required time base from the **Time base** list field in the **Horizontal** group field.
   - The current time base setting multiplied by ten results in the recording time.
   - Since the size of the measured data memory is limited, a compromise between sampling rate and recording time is generally made.
2. Select the required sampling rate from the **Sampling rate** in the **Recording** group field.

7.5.2.3 Defining the trigger condition

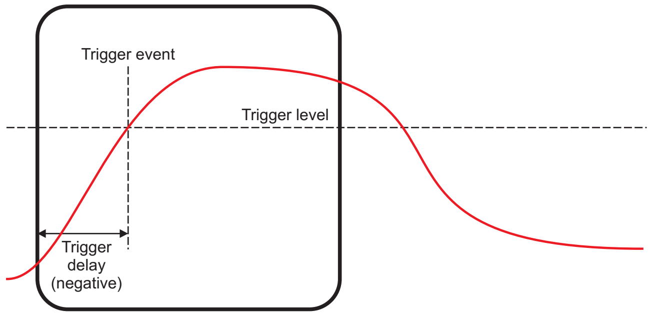
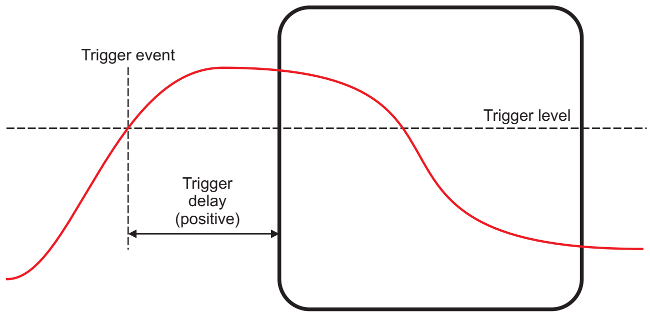
The trigger condition serves to define at what time the recording is started. The data logger provides different trigger conditions which serve to control the recording of the measured values.

How to define the trigger condition:

1. When the cursor display is activated:
   Click the **Trigger** button to show the input fields for configuring the trigger condition.
2. Click the ... button after the first input field to open the *Select trigger source* dialog box:



3. Select the required trigger source:
   - **Channel**: It is triggered to one of the channels configured in the **Vertical** table.
   - **Variable**: It is triggered via any parameter. In contrast to triggering to a channel, no recording channel is required here.
   - **Force trigger**: No trigger condition, recording starts immediately after the start
4. Click the **OK** button to accept the selection and close the dialog box again.
5. Set trigger value, delay and edge.
   - Further information on this can be obtained from the following table.

Setting	Function
Trigger value	Value from which on triggering is activated. • The trigger level is not effective for triggering on Boolean variables.
Delay	Time delay between recording and trigger event.
Pre-trigger	Select a negative delay time to detect signals **prior** to the trigger event.  • The trigger time is designated by a dotted line in the diagram. • With triggering on occurrence of an event, it is thus possible to detect the values that have caused the event.
Post-trigger	Select a positive delay time to detect signals occurring a certain time **after** the trigger event. 
Edge	If the trigger source is a channel or a variable, you can choose between the following trigger modes:
Positive edge	For triggering on a BOOL parameter: • Trigger activation requires a FALSE-TRUE transition. For triggering on a different parameter: • For trigger activation, the selected trigger value must be exceeded.
Negative edge	For triggering on a BOOL parameter: • Trigger activation requires a TRUE-FALSE transition. For triggering on a different parameter: • For trigger activation, the selected trigger value must be fallen below.
Change	For triggering on a BOOL parameter: • Trigger activation requires a state change. For triggering on a different parameter: • For trigger activation, the current value must be different than the last value.

7.5.2.4 Using the time axis

The icon in the *Data logger toolbar* serves to activate the "Time axis" mode for a continuous measurement.

In this mode, the data memory for the measured data operates according to the ring buffer principle, i.e. if the data memory is full and new measured data arrive, the oldest measured data will be deleted. The time axis is tracking, similar to a cardiogram.

Note!

If you change the mode, the currently represented line diagram will be deleted.

7.5.2.5 Starting/stopping recording

How to start/stop recording:

Click **Start** to start recording.

- Instead of **Start** the **Stop** button is displayed now.
- In the standard mode, recording automatically stops at the end of the time axis. The **Stop** button serves to abort recording.
- In the "Time axis" mode, recording will only be stopped if you click **Stop**.

7.5.2.6 Adjusting the representation

After recording, the measured values are visualised in the diagram. If required, you can now adjust the representation using the zoom function or the automatic scaling function.

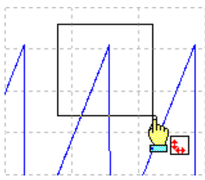
Tip!

From »Engineer« V2.10, a scrollbar appears below the time axis as soon as the diagram does not show the complete measurement anymore.

You can use the scrollbar to move the visible section horizontally. The time-axis inscription and the position indicator are automatically corrected during scrolling.

Zoom function

Go to the *Data logger toolbar* and click the icon to activate the zoom function.

Zoom function	Proceeding	
Zoom selection		Hold down the left mouse button and draw the section to be zoomed:  • The selection is shown with a frame. • When the left mouse button is released, the selection is zoomed in the diagram.
Horizontal/vertical shift of selection		Hold down the left and right mouse button and move the mouse pointer on the horizontal scale to the left or right or on the vertical scale to the top or bottom to shift the selection accordingly. • With a three-button mouse, you can use the mouse button in the middle.

Zoom function	Proceeding
Horizontal stretching	Hold down the left mouse button and move the mouse pointer on the horizontal scale to the left to stretch the shown selection from the right edge. • Moving the mouse pointer in opposite direction continuously reduces the stretching.
	Hold down the right mouse button and move the mouse pointer on the horizontal scale to the right to stretch the shown selection from the left edge. • Moving the mouse pointer in opposite direction continuously reduces the stretching.
Vertical stretching	Hold down the left mouse button and move the mouse pointer on the vertical scale to the bottom to stretch the shown selection from the top. • Moving the mouse pointer in opposite direction continuously reduces the stretching.
	Hold down the right mouse button and move the mouse pointer on the vertical scale to the top to stretch the shown selection from the bottom. • Moving the mouse pointer in opposite direction continuously reduces the stretching.
Return to original representation	Click the right mouse button in the diagram to return step by step to the original representation.

Automatic scaling function

Use the automatic scaling function to automatically scale and reposition the representation of selectable signal characteristics in the oscillograph and reset the offset to "0".

How to carry out automatic scaling:

1. Go to the *Data logger toolbar* and click the icon to activate the automatic scaling function.
2. Select the channels/parameters for automatic scaling in the *Select variable* dialog box.
3. Click the **OK** button.
    - The dialog box is closed and the selected channels/variables are scaled automatically.

7.5.2.7 Reading individual measured values

In addition to the zoom and scaling function, the data logger offers a "cursor function" that can be used to display individual measured values of a selectable channel or the difference between two measured values.

▶ If the **Cursor** has been pressed, the cursor function is active and two movable vertical measuring lines are shown in the diagram.

How to use the cursor function:

1. Click the **Cursor** button.
2. Select the channel for which individual measured values are to be indicated from the **Channel** list field.

3. Hold down the left mouse button and drag the red vertical measuring line to the desired position.
    - The active measuring line is represented by a continuous line, the inactive measuring line is represented by a dotted line.
    - If you position the mouse pointer over the inactive measuring line, the measuring line automatically becomes active.
    - The value measured at the position of the active measuring line is indicated in the **Value** group field.
    - The difference between the values measured at the two measuring lines is indicated in the **Differential value** group field.

7.5.2.8 Comparing peak values

This function is available from »Engineer« V2.10!

Several values displayed in the data logger can be compared to each other using a horizontal measurement line.

▶ The horizontal measurement line is displayed when the **Cursor** button has been pressed.

▶ The measurement line is automatically created based on the current cursor point and thus cannot be shifted.

7.5.3 Data records

If several data records are loaded in the data logger at the same time, the data record to be displayed is selected via the **Data record** list field. There are three types of data records:

Online data record

The online data record is the only data record which serves to establish a connection to the target system. When the online data record has established the connection completely, it can communicate with the target system.

▶ In the **Data record** list field, the online data record is marked with a prefixed asterisk (*).

Offline data record

The offline data record is a data record already stored in the project and loaded in the data logger again, or a data record imported from a file.

Merge data record

The merge data record is automatically available in the **Data record** list field if two or more data records are loaded in the data logger at the same time.

▶ In the merge data record, several characteristics from the currently loaded data records can be overlaid, e.g. to compare signal characteristics from different recordings.
Overlay function (📖 136)

7.5.3.1 Commenting a data record

This function is available from »Engineer« V2.10!

You can add a comment to the selected data record.

- The comment is saved together with the data record, both when being saved in a file and in a project.
- When you select a data record with a comment for loading in the *Load data record* dialog box, this comment will be shown in the dialog box.

How to add a comment to the selected data record:

Option 1: Enter the comment directly into the **Comment** text field.

Option 2: Go to the *Data logger toolbar* and click the icon to open the *Comment* dialog box for entering the comment.

7.5.3.2 Saving/exporting a data record

After the variables to be recorded have been selected and the required settings have been entered, you can save the configuration and recording, if already executed, for future use in the project or export them to a file.

Note!

The reuse of a saved configuration is only reasonable for controllers of the same type, as otherwise due to a scaling of the oscilloscope channels that is not adapted, incorrect values are displayed!

How to save the data record in the project:

1. Go to the *Data logger toolbar* and click the icon.
   - The *Save data record* dialog box appears.
2. Enter a name in the **Name of the data record to be stored** input field.
3. Click the **Filing in the project** button.
   - The dialog box is closed and the current data record is filed in the project.

Note!

The data record will only be saved if the whole project is saved!

How to export the data record to a file:

1. Go to the *Data logger toolbar* and click the icon.
   - The *Save data record* dialog box appears.
2. Enter a name in the **Name of the data record to be stored** input field.
3. Click the **Export to file** button.
4. Specify the data record to be stored and the filing folder in the *Save as* dialog box.
5. Click the **Save** button.
   - The dialog box is closed and the current data record is saved.

7.5.3.3 Loading/importing data records

Configurations/data records already stored can be reloaded into the data logger any time, e.g. for the overlay function.

Note!

The reuse of a saved configuration is only reasonable for controllers of the same type, as otherwise due to a scaling of the oscilloscope channels that is not adapted, incorrect values are displayed!

How to load a data record from the project:

1. Go to the *Data logger toolbar* and click the icon.
   - The *Load data record* dialog box appears.
2. Select the data record to be loaded from the **Data record** list field.
3. If the data record is to be used as configuration, select the **As configuration...** option.
4. Click **Open**.
   - The dialog box is closed and the selected data record is loaded.
   - If the configuration to be loaded contains variables that are no longer available in the controller, these variables are automatically removed from the configuration.

How to import a data record from a file:

1. Go to the *Data logger tool bar* and click the icon.
   - The *Load data record* dialog box appears.
2. Select the **From a file** option.
3. Click the **Search...** button.
4. Select the file to be imported within the desktop environment from the *Open* dialog box.

5. If the data record is to be used as configuration, select the **As configuration...** option.
6. Click **Open**.
   - The dialog box is closed and the selected data record or configuration is imported.
   - If the configuration to be loaded contains variables that are no longer available in the controller, these variables are automatically removed from the configuration.

7.5.3.4 Closing the data record

This function is available from »Engineer« V2.10!

You can close an open offline data record at any time.

- ▶ After a data record is closed, it will not be available anymore in the **Data record** list field. The data logger changes automatically to the display of the next offline data record in the list field.
- ▶ If the closed data record was included in the MERGE data record, its channels will be removed from the MERGE data record.
- ▶ If all offline data records have been closed, the data logger changes to the online data record if the device is currently online. Otherwise, no data record will be displayed.

Go to the *Data logger toolbar* and click the icon to close the currently displayed offline data record.

7.5.3.5 Deleting a data record in the project

How to delete the currently displayed offline data record:

1. Go to the *Data logger toolbar* and click the icon.
   - You are prompted for confirmation whether you really want to delete the data record.
2. Confirm the prompt with **Yes** to delete the data record.
   - The data record is closed and then deleted in the project.
   - After a data record is closed, it will not be available anymore in the **Data record** list field. The data logger changes automatically to the display of the next offline data record in the list field.
   - If the closed data record was included in the MERGE data record, its channels will be removed from the MERGE data record.
   - When all offline data records have been deleted, the data logger changes to the online data record.

7.5.3.6 Overlay function

The overlay function serves to lay several characteristics from the currently loaded data records on top of each other, e.g. to compare signal characteristics from different recordings.

- If two or more data records are loaded in the data logger, e.g. an online data record and a data record saved before in the project, a "merge" data record is automatically provided in the **Data record** list field.
- If the merge data record is selected, the desired characteristics to be overlaid or compared can be selected from the loaded data records in the **Vertical channel settings** group field.
- If an online data record is used in the merge data record, an update is carried out in the merge data record in the case of a renewed recording.
- Removing variables from an offline or online data record causes the characteristics in the merge data record to be deleted.

7.5.3.7 Copying a data record to the clipboard

For documentation purposes, it is possible to copy the measured data of a data record as a table or, alternatively, the data logger user interface as a picture, to the clipboard for use in other programs.

How to copy measured data or a picture of the user interface to the clipboard:

1. Go to the *Data logger toolbar* and click the icon.
   - The *Clipboard* dialog box appears.
2. Select **Curve points** if the measured data are to be copied to the clipboard as a table, or select **Screenshot** if the data logger user interface is to be copied to the clipboard as a picture.
3. Click the **OK** button.
   - The dialog box is closed and the selected option is copied to the clipboard.

7.6 Oscilloscope

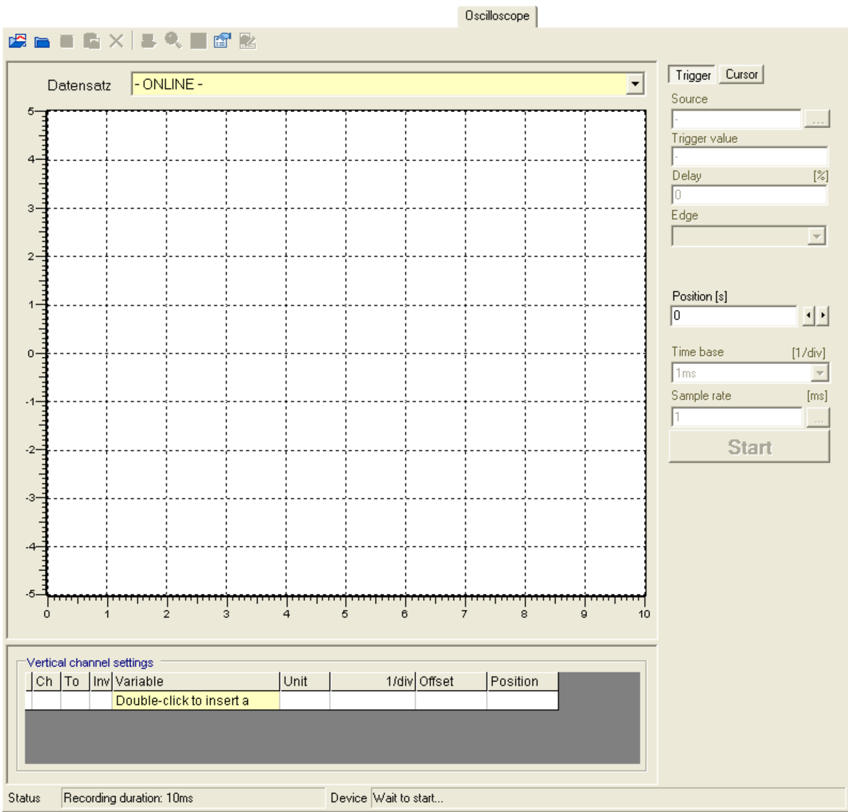
Some Lenze devices have an integrated oscilloscope function which you can use to support start-up, maintenance and troubleshooting.

- If a device is provided with this oscilloscope function, the **Oscilloscope** tab via which you can parameterise the oscilloscope function is additionally available for the device in the workspace.

Tip!

Detailed information on the oscilloscope function can be found in the documentation to the corresponding device.

Example: Oscilloscope function for the 9400 HighLine



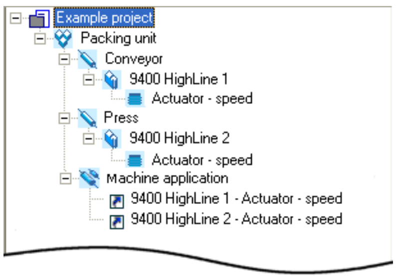
8 Defining the system functionality

This chapter describes how to define the functions of your overall system in the »Engineer«. For this purpose you describe the information which is communicated between the devices of your system for your devices to interact in the desired way. Furthermore you define the precise function of the individual devices within your system (parameterising and configuring devices).

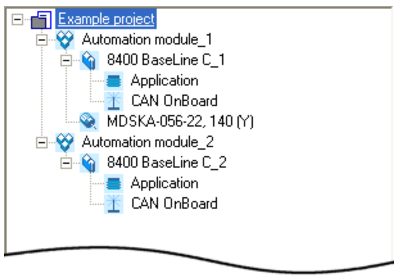
8.1 Representation in the project view

For this purpose, the *Project view* represents the correlation between the elements of the system structure consisting of system modules and axes and the logic.

Example 1: System with two 9400 HighLine drive controllers



Example 2: System with one 8400 Baseline C drive controller



- The symbols below the devices represent the application selected for the respective device.
- A higher-level machine application is always required if several devices have to exchange information with each other, as applications can only be interconnected within a machine application.
- In contrast to networks, with regard to function not the network-specific settings, but the contents and the structure of the communicated variables are of interest.

Note!

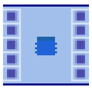
Configurations that have been carried out are **not immediately** accepted in device-specific parameter assignments (the known codes for Lenze devices)!

- This acceptance only is effected later on in the course of a compilation process for the entire project.
- During the compilation process, network-specific and device-specific generators are activated which automatically generate the relevant parameter assignments and applications.

8.2 Terminology used

Applications & ports

The function of a device in the »Engineer« is symbolised by its **Application**. An application can be viewed as a block that is mostly configurable via parameters and is provided with external connection points, so-called **Ports**:

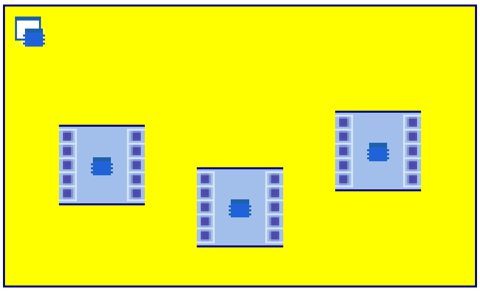


- A device always brings along an application which may also be empty or unconfigured.
- Via input ports, for instance setpoints and control commands can be transferred to the application, via output ports an application can provide actual values and status messages.
- Examples of applications are "speed control" and "torque control".

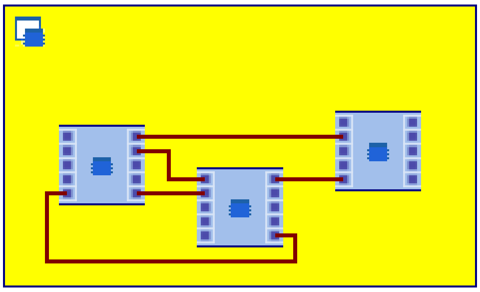
Machine application

A function of the system which is implemented by the interaction of several devices in the »Engineer« is symbolised by a **Machine application**.

- A machine application is generated by defining the applications which form this machine application by allocation in a first step:

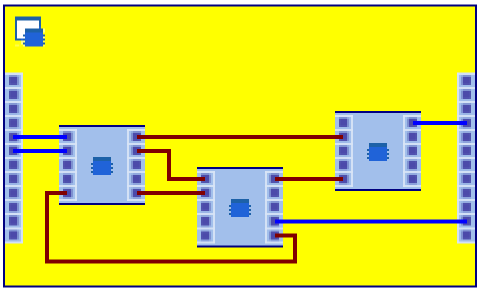


- The second step is to interconnect the ports of the applications assigned with each other and like this describe the applications between which information is exchanged:



Ports for machine applications

You can also define **Ports** for a machine application to realise an exchange of information between different machine applications:



- In principle, not only applications but also machine applications that have already been configured can be allocated to a machine application. This makes it possible to create hierarchical application structures.
- An "electrical shaft" is an example of a machine application. Establishing an interconnection via an electrical shaft (193)

Application variables

The information to be exchanged between applications is called application variables.

- A "control word" is an example of an application variable.

Element variables

An application variable in turn consists of so-called **Element variables**.

- The configuration of an application variable of element variables is defined by the application which generates the respective variable and provides it to its environment via an output port.
- Examples of element variables:
  – Variable of the BOOL type for exchanging the "set controller inhibit" control signal.
  – Variable of the DINT type for exchanging the speed setpoint.

Note!

The configurations which you generate within the functions can be network-independent!

- For instance, if you define that an application variable is communicated between two applications with a specific cycle time, you do not yet have to specify within the functions the process data object which the variable is imaged to and the network via which the process data object will actually be communicated.

8.3 General notes with regard to the procedure

For describing the functions of the system, the following procedure is recommended:

Note!

The procedure described in the following is based on **one** application for the project, however, a project can also contain **several** applications for representing hierarchical structures!

1. Parameterise& configure the devices

Carry out the parameter settings required for the individual devices and the applications assigned.

▶ Parameterising & configuring the devices (📖 142)

2. Generate a machine application

Generate a machine application within a system module or an axis to realise device-independent functions.

▶ Inserting & configuring a machine application (📖 179)

3. Compile the whole project

Have the whole project compiled to automatically generate all relevant parameter assignments for the networks and devices contained in the project.

8.4 Parameterising & configuring the devices

If you select a device in the *Project view*, different tabs are provided to you in the *Workspace*, via which you can parameterise, configure, and diagnose the device.

Note!

The tabs provided for a device and the possible settings resulting therefrom are device-specific and therefore are only explained by means of examples here!

Also read the documentation supplied with the corresponding device before you start working!

Tab	Information
Application parameter	Via the **Application parameters** tab you can parameterise the application assigned to the device. ▸ Parameterising the application (📖 156)
FB Editor	In the case of certain devices, the application can be reconfigured by means of a corresponding interconnection with the help of the **FB Editor** tab. ▸ Function block editor (FB Editor) (📖 159)
Terminal assignment	Via the **Terminal assignment** tab you can configure the digital and analog input and output terminals of the device. ▸ Configuring the terminal assignment (📖 154)
Ports	Via the **Ports** tab you can add ports to the application for a data exchange with other applications. ▸ Port editor (📖 162)
User menu	The **User menu** tab serves to create a parameter list from frequently used parameters. ▸ User menu (📖 176)
Diagnostics	Via the **Diagnostics** tab you can for instance carry out a diagnostics of the device connected when an online connection has been established. ▸ Diagnostics (📖 119)
Data logger	The **Data logger** tab serves to record the temporal course of parameter values. ▸ Data logger (📖 121)
Oscilloscope	Via the **Oscilloscope** tab you can use an integrated oscilloscope function for supporting commissioning, maintenance, and troubleshooting. ▸ Oscilloscope (📖 137)
All parameters	Via the **All parameters** tab you can have all parameter settings of the device displayed and also alter them. ▸ Setting parameters (📖 144)
Properties	In the **Properties** tab general information about the device is displayed, e. g. manufacturer, order number, and device series. ▸ Displaying the properties (📖 143)
Documentation	You can use the **Documentation** tab to add notes or documents in electronic form to the device. ▸ Inserting a documentation (📖 86)

8.4.1 Displaying the properties

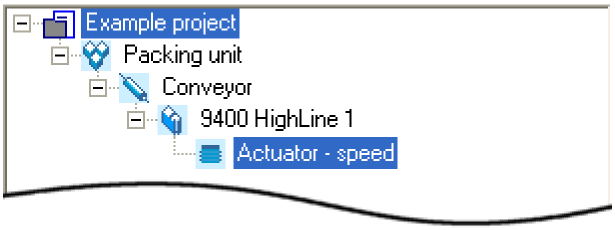
The **Properties** tab shows the property information available for a device.

- The **Catalogue information** shows the information for the device stored in the »Engineer« catalogue.
- The **Physical component** shows the information read from the device, which is available when an online connection has been established.

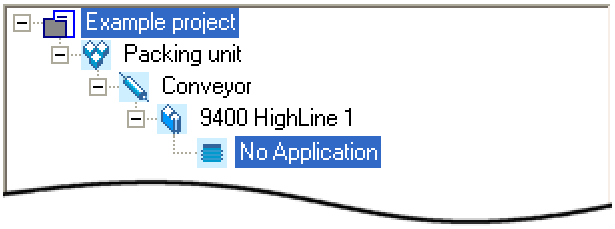
8.4.2 Assigning an application to the device

If you insert a device, you can also optionally select an application available for the corresponding device after having selected the device to be inserted.

- The application selected is attached to the device in the *Project tree*:



- If, during insertion, an application is not selected for the device, a so-called "empty application" is assigned to the device.



- You can replace the application assigned to the device with another application that is available for the device anytime:
  – Highlight the desired drive controller.

Note!

If an application is replaced, the present parameterisation, configuration, and the program for the device are lost!

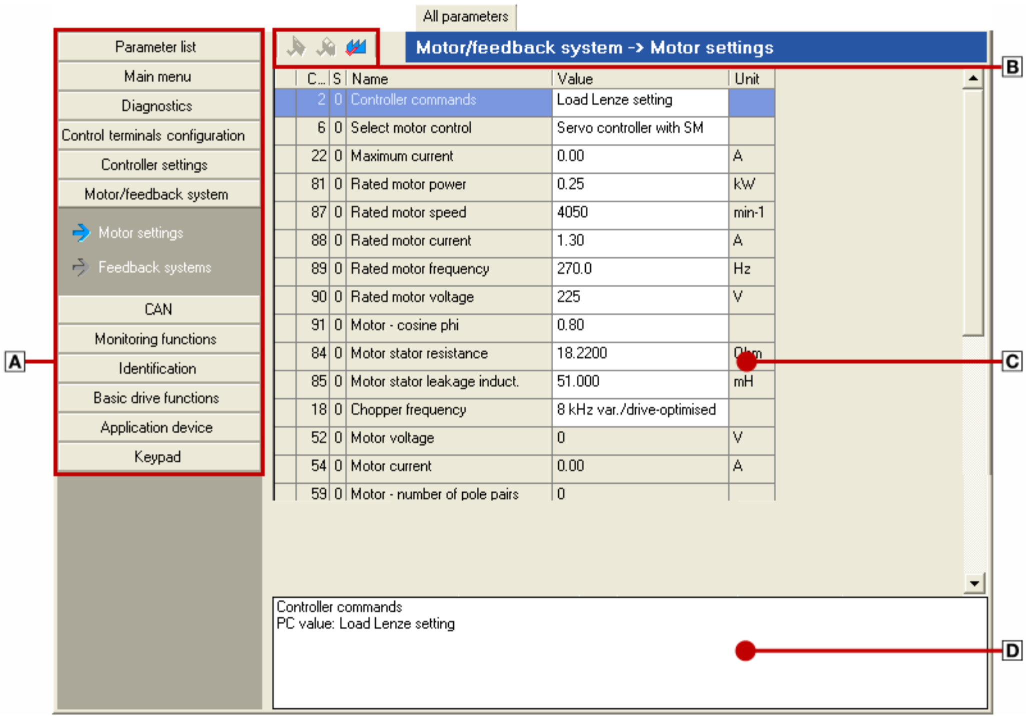
How to replace an application:

1. Select the controller under which the application to be replaced is located in the *Project view*.
2. Select the menu command **Insert→Application**.
   - As an alternative, execute the **Insert application** command in the context menu of the drive controller.
   - The *Insert application* dialog box appears.
3. Select the new application.

4. Click the **OK** button.
5. Confirm safety query with **Yes** to replace the existing application with the application selected.
   - The dialog box is closed and the previous application is replaced with the application you have just chosen.

8.4.3 Setting parameters

Via the **All parameters** tab of a device or an application you can have the parameter settings of the corresponding device displayed and also modify them, e.g. in order to define further functional settings for the device:



- ▶ The parameters are classified in different categories which you select via the buttons in area A.
  - If you click one of the buttons for the categories, the subcategories are shown and can be selected with a mouse-click.
  - If you change to another category, the subcategories of the previously selected category are masked out again.
- ▶ In area C all parameters of the category/subcategory selected are shown.
  - By clicking the corresponding column header, you can alter the sequence of the parameter list and change over between ascending and descending order.
  - If you select the first category "Code list", all parameters of the corresponding device are displayed in the parameter list.

- Area D includes an "Information area" that can be optionally displayed. The information area shows further information on the parameter selected.
  – You can show or conceal the information area by means of the **Information area** command in the *Context menu* of the parameter list.

8.4.3.1 Terminology used

Offline/online

With regard to the representation of the parameter setting, the modes "Offline" and "Online" are differentiated.

- If no online connection to the device is available, the parameter list is in the "Offline mode". In this mode the parameter list displays so-called "Offline parameters" presenting the parameter settings of the device saved within the project. ▸ Altering a parameter offline (📖 147)
- However, if an online connection to the device is available, the parameter list is in the "Online mode". In this mode the parameter list displays so-called "Online parameters", presenting the parameter settings which are currently existing within the device. ▸ Altering parameters online (📖 148)
- In the »Engineer« offline and online parameters are identified by a different background colour:

Colour	Example	Meaning
White	1,2345	Offline parameter • The device is not connected "online" with the »Engineer«. The parameter value set in the project is displayed.
Yellow	1,2345	Online parameter • The device is connected "online" with the »Engineer«. The current parameter value of the device is displayed. • The symbol ≠ behind a parameter value indicates that the value in the device differs from the parameter value set in the project.
Red	1,2345	Communication error (time-out) for an online parameter • The communication connection to the device is interrupted.

Tip!

In the information area below the parameter list the current mode (offline/online) is displayed on the right side.

In order to show the code value as a hexadecimal value, click the menu item **View→Show values in hex format**. This function has a global effect on the codes with integral numerical values in dialogs and parameter lists.

Display parameters

"Display parameters" are parameters which only serve as display of status information and actual values and which only permit reading access.

▶ In the »Engineer« display parameters are also identified by a different background colour:

Colour	Example	Meaning
Light grey	1,2345	Offline display parameter
Pale yellow	1,2345	Online display parameter • The device is "online", i.e. connected to »Engineer«. The current parameter value of a display parameter of the device is shown.
Red	1,2345	Communication error (time-out) for an online display parameter • The communication connection to the device is interrupted.

8.4.3.2 Working in the parameter list

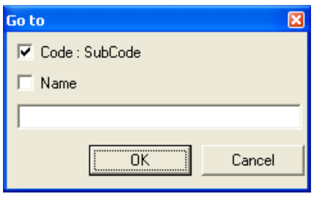
On the top edge (area B) the parameter list is provided with a toolbar which enables the parameter transfer from the project into the device and vice versa.

▶ Click on an icon to execute the corresponding function.

Icon	Function
	▸ Accepting parameter settings in the device (📖 149) *
	▸ Accepting the parameter settings of the device (📖 149) *
	▸ Resetting parameters to the default setting (📖 149)
* Function only possible when an online connection has been established.	

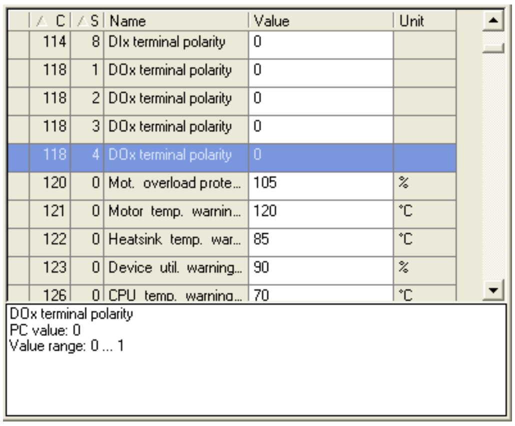
Tip!

Via the **Go to** command in the *Context menu* you can go quickly to a parameter in the list by entering the parameter number or name:



8.4.3.3 Altering a parameter offline

If you are "offline" and therefore are not connected with the device, the parameter settings for the respective device saved within the project are displayed in the direct mode in the "Value" column:



☐ Offline parameter

☐ Offline display parameter

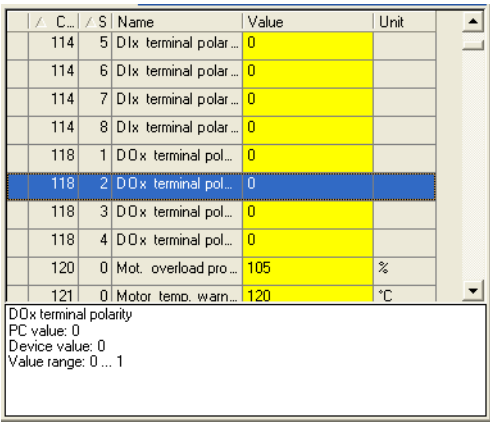
- In the offline mode you can carry out all required parameter settings for a device, whereby the corresponding device at this time does not have to be physically available or connected to the PC.
- As a result, you can take your time in "preconfiguring" the project, for example, and you can transfer the complete parameter set to the device at a later time.
- All settings in the parameter list are saved together with the project and thus are provided again in the next »Engineer« session.

How to alter a parameter setting "offline" in the project:

1. Select the parameter to be altered from the list.
2. Enter the new value in the **Value** column, or select it from the options defined.
   - Invalid or impermissible values are "red" in the input field.
   - Values that have not been accepted yet are "blue" in the input field.
3. Press the **<Input key>** to accept the changed value.
   - You can reject the entry by pressing the **<Esc>** key.

8.4.3.4 Altering parameters online

If you are connected to the device "online", instead of the parameter settings saved within the project the current parameter settings of the device are displayed in the direct mode in the "Value" column:



- Online parameter
- Online display parameter

- The values are continuously updated in a cyclic manner.
- The symbol ≠ behind a parameter value indicates that the value in the device differs from the parameter value set in the project.
- In the information area below the parameter list further information on the parameter selected is displayed, such as for instance the value set in the project.

Note!

If you alter a parameter value when an online connection has been established, this setting is also accepted for the corresponding device!

How to alter a parameter setting "online" in the project and the device:

1. If an online connection to the device has not yet been established:

   Click the icon in the *Toolbar* or select the menu command **Online → Go online** in order to establish an online connection to the device.
   Go online (90)
2. Select the parameter to be altered from the list.
3. Enter the new value in the **Value** column, or select it from the options defined.
   - Invalid or impermissible values are "red" in the input field.
   - Values that have not been accepted yet are "blue" in the input field.
4. Press the **<Input key>** to accept the changed value.
   - You can reject the entry by pressing the **<Esc>** key.
   - If you leave the input field without accepting the altered value, you are asked whether the altered value is to be accepted or rejected.

8.4.3.5 Resetting parameters to the default setting

How to reset a parameter to the default setting:

1. Select the parameter to be altered from the list.
2. Click the icon in the *Parameter toolbar* to reset the selected parameter to the default setting.

8.4.3.6 Accepting the parameter settings of the device

If you are connected to the device "online", you can accept parameter settings of the device easily in the project. Go online (90)

How to accept parameter settings of the device in the project:

1. Select the parameter from the parameter list.
   - The ≠ symbol behind a parameter value indicates that the value in the device is different to the parameter value stored in the project.
2. Click the icon in the *Parameter toolbar* to accept the selected parameter setting of the device in the project.

8.4.3.7 Accepting parameter settings in the device

If you are connected to the device "online", you can accept the parameter settings stored in the project to the device.
Go online (90)

How to accept parameter settings of the project in the device:

1. Select the parameter from the parameter list.
   - The ≠ symbol behind a parameter value indicates that the value in the device is different to the parameter value stored in the project.
2. Click the icon in the *Parameter toolbar* to accept the selected parameter setting of the project in the device.

8.4.4 Comparing parameter sets

This function serves to compare the parameter set of a device (parameter set A) to a parameter set B.

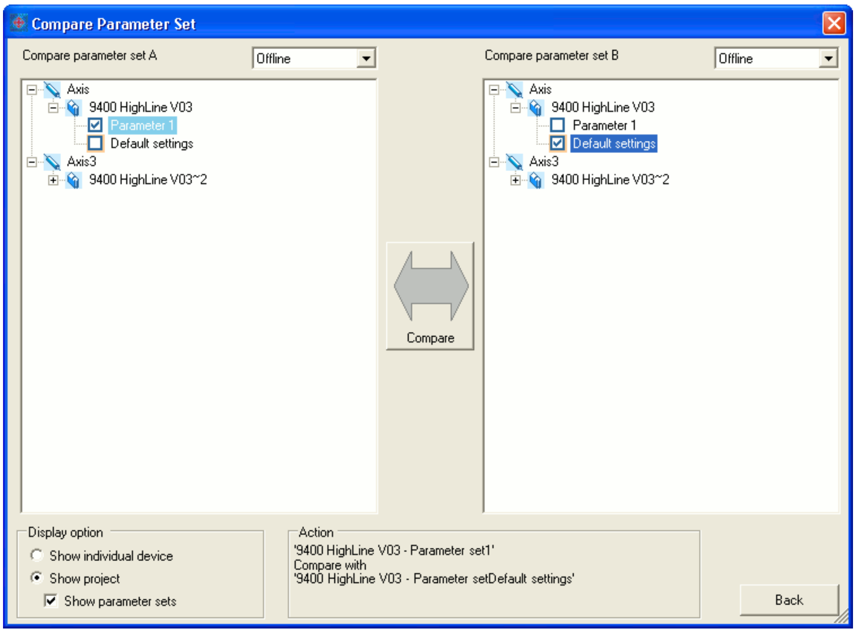
The following parameter sets can be compared:

- Online parameters of the device with offline parameter settings of the »Engineer« project
- Online parameters of the device with the predefined default settings

▶ Offline parameters of two devices

How to carry out a parameter comparison:

1. Go to the *Project view* and select the device the parameter settings of which are to be compared.
2. Select the **Application data → Compare parameter sets** menu command or execute the **Compare parameter sets...** menu command via the context menu of the device.
3. Go to the *Compare Parameter Set* dialog box and select the parameter sets to be compared (*Compare parameter set A* and *Compare parameter set B*):

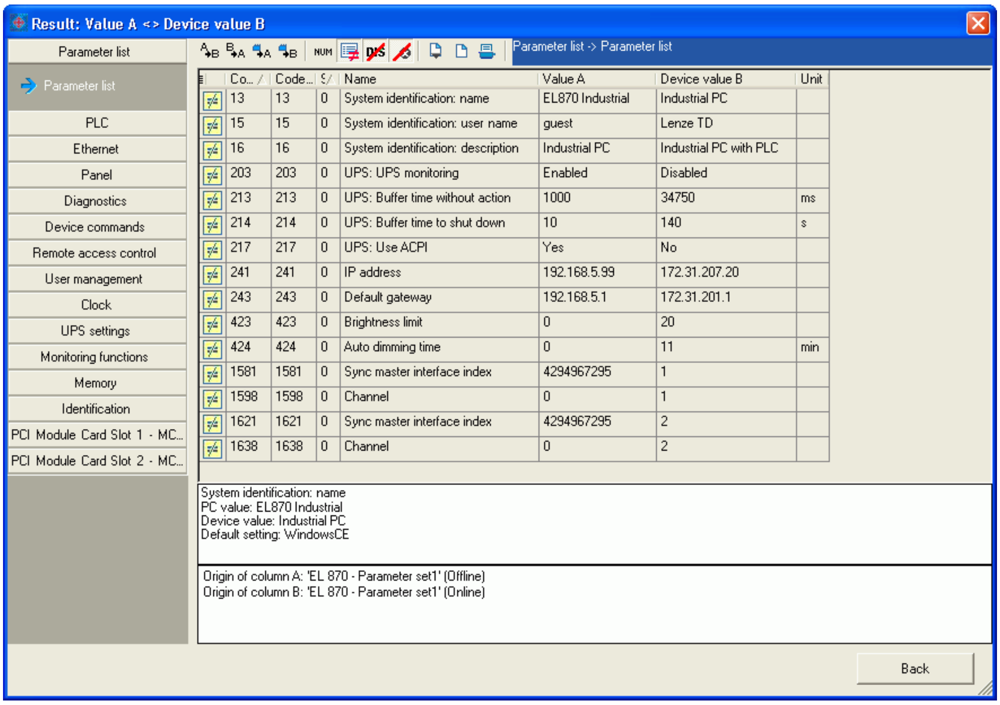


[8-1] Compare parameter set: Example - Industrial PC EL 870

   - In order to execute a comparison with the parameter set of an online-connected device, select "Online" in one of the upper list fields.
   - The *Display option* area serves to filter the project view and show only specific parameters.
4. Click the **Compare** button:
   - The parameter settings of the device are read out and the process of the data transmission is displayed in the *Transfer* dialog box.
   - After the data transmission has been completed, the result of the comparison is displayed in the form of a parameter list in the *Compare parameters* dialog box.
   - In the default setting, the parameter list only specifies the parameters the value of which in the device differs from the parameter value saved in the project.

Structure of the comparison list

After a successful data transmission, the comparison result is shown in a parameter list. The parameters are arranged in different categories and subcategories which can be selected via the buttons on the left:



[8-2] Example for a comparison list of two parameter sets

- In the parameter list on the right all parameters of the category/subcategory are shown.
  - By clicking the corresponding column header, you can alter the sequence of the parameter list and change over between ascending and descending order.
  - If you select the first category "Code list", all parameters of the corresponding device are displayed in the parameter list.
  - The icon in front of a parameter in the comparison list indicates that the values in column A differ from value B.

The *Result: Value A <> Device value B* dialog box is provided with a toolbar in the upper position.

- Click an icon to execute the corresponding function.

Tip!

By using the **<Shift>** and **<Ctrl>** keys you can select several parameters at the same time.

Icon	Function
	Copy selected parameters from column A to column B.
	Copy selected parameters from column B to column A.
	Copy default setting of a selected parameter to column A.
	Copy default setting of a selected parameter to column B.
	Show parameters numerically.
	Only show parameters the comparison values of which are different in column A and column B.
	Mask out all parameters featuring a read only access.
	Mask out all parameters which are available either in column A or in column B (added or omitted).
	Export current code view to a *.csv file.
	Show print view of the code view
	Print code view

The following information is visible below the parameter list:

Information	Meaning
Parameter: Value	**Code name with the assigned value,** Example: *Identify system: User name*
PC value	Value in the »Engineer« project, example: *PC value: User*
Value in the device	Value which is stored in the device, example: *Device value: Lenze*
Default setting	Preset default setting, example: *Default setting: Guest*

8.4.5 Copying parameter sets

This function serves to copy a parameter set to a device.

The following parameter sets can be copied:

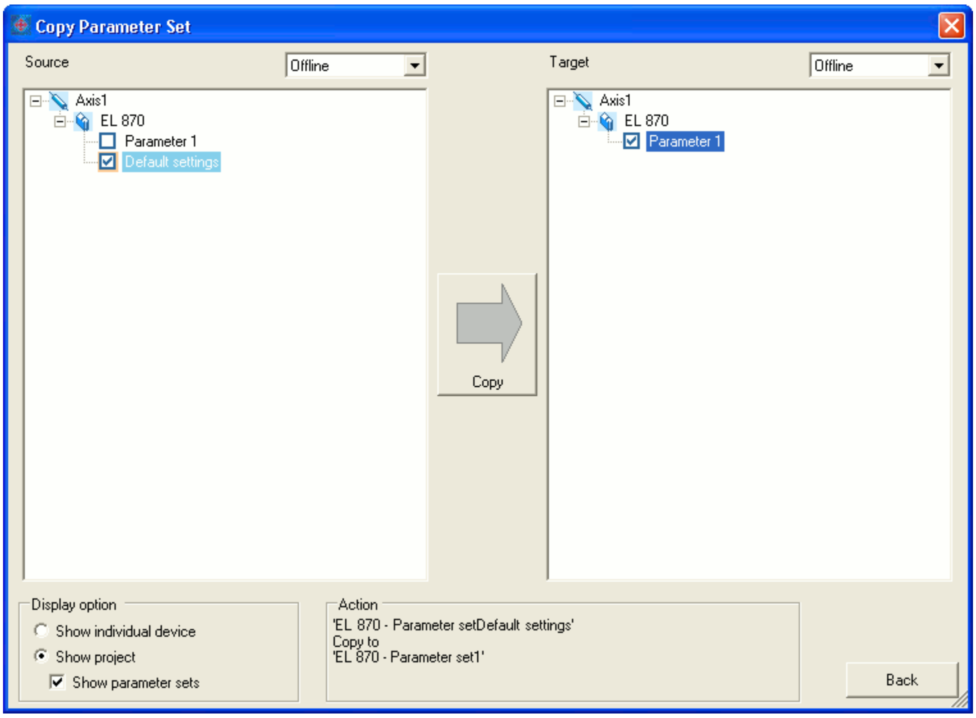
- Offline parameter set of an »Engineer« project,
- Default setting of a device.

Note!

- Identical parameter sets cannot be copied to each other.
- Source and target parameter set must not overlap.
- Only offline parameter sets can be copied.

How to copy the parameter sets of a device:

1. Go to the *Project view* and select the device the parameter sets of which are to be copied.
2. Select the **Application data → Copy parameter sets** menu command or execute the **Copy parameter sets...** menu command via the context menu of the device.
3. Got to the *Copy parameter set* dialog box and select the parameter sets to be compared (*Source* and *Target*):



[8-3] Copy parameter set: Example - Industrial PC EL 870

- The *Display option* area serves to filter the project view and show only specific parameters.

4. Click the **Copy** button.

8.4.6 Configuring the terminal assignment

You can configure the digital and analog input and output terminals of a device by means of the **Terminal assignment** tab for the device. With the **Control terminals** selection field, you can change between the digital and analog terminals.

Note!

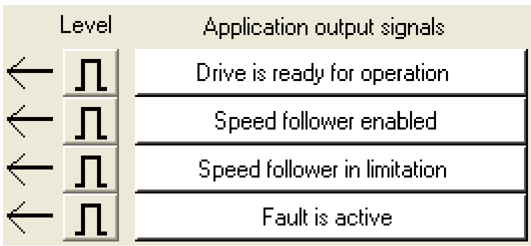
The display of the **Terminal assignment** tab and the possible settings specified are device-dependent!

Also read the documentation supplied with the corresponding device before you start working!

8.4.6.1 Changing the terminal assignment

Depending on the device application assigned to the device and on the default setting of the device, terminals can already be linked to internal signals. This assignment, however, can be changed if required.

Click the corresponding buttons in the **Application** group field to alter the I/O configuration for the associated terminal.

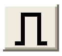
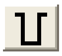


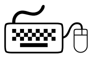
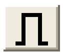
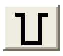
8.4.6.2 Setting the gain & offset of the analog terminals

Click the ▷ button to parameterise the gain and offset for the associated analog terminal.

8.4.6.3 Setting the active level of the digital terminals

For each digital terminal the set active level is displayed:

Icon	Meaning
	Digital terminal is "High active"
	Digital terminal is "Low active"

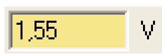
 Click on the  or  button to alter the active level for the associated digital terminal from "high-active" to "low-active" or from "low-active" to "high-active".

8.4.6.4 Displaying the actual status of the terminals

If an online connection to the device is available, the **Terminal assignment** tab displays the actual state of the terminals.

Analog inputs/outputs

For the analog inputs/outputs the corresponding actual value is displayed as voltage value:



- The actual values for the analog inputs are displayed in accordance with the selected form of signal adaptation (offset & gain) in each case.

Digital inputs/outputs

For the digital inputs the current status is visualised by an "LED":

Icon	Meaning
	Off
	On

- The status display for the digital inputs is effected in consideration of the terminal polarity set.

8.4.7 Parameterising the application

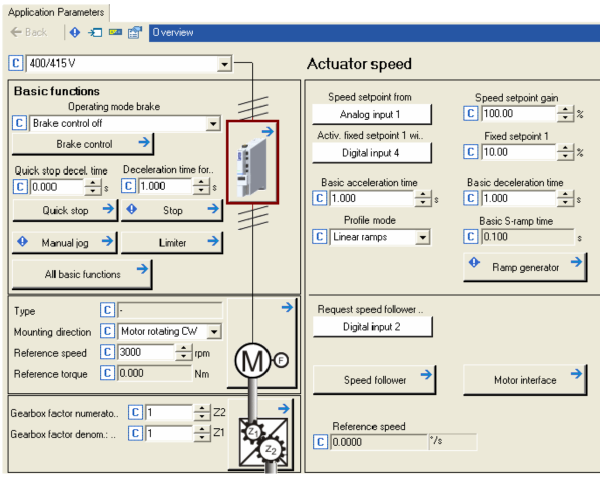
Use the **Application parameters** tab to parameterise the application assigned to the device and to parameterise other components (e.g. motor, brake, gearbox) connected to the device.

8.4.7.1 Working in the "Application parameters" tab

> **Note!**
>
> The display of the **Application parameters** tab and the possible settings specified are device-dependent!
>
> **Also read the documentation supplied with the corresponding device before you start working!**

The **Application parameters** tab contains several levels of parameter dialogs.

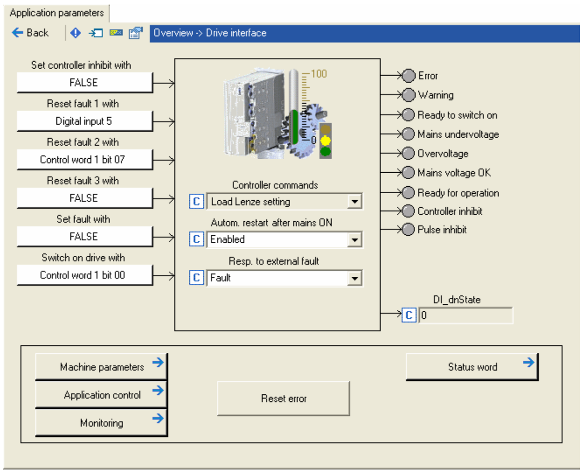
- The top "Overview" level shows all the device functions that can be parameterised and also shows the device components that can be parameterised in the form of buttons (➔ symbol):



[8-4] "Application parameters" tab for a drive controller, e.g. 9400 HighLine

- If you click a button marked with the ➔ symbol, you move one level lower in the corresponding parameter dialog.

– In this example, the button framed in red has been clicked:



- This parameter dialog can also have further subordinate parameter dialogs, depending on the complexity.
- Some pictographs are marked with a so-called marker symbol, which is intended to tell you that some settings still have to be made in the associated parameter dialog..
  – If you click such a pictograph in order to change over to the associated parameter dialog, the marker is automatically reset (removed).
- If you click somewhere in the white input field of a code with the right-hand mouse button, you can transfer the value to the monitor with the **Accept in monitor window** command.

Toolbar

The **Application parameters** tab is provided with an individual toolbar in the upper position, which in the following text is called "Application parameters toolbar".

- Click on an icon to execute the corresponding function.

Icon	Function
	Back to the previously displayed parameter dialog.
	Set flag for the current parameter dialog. • The marker symbol on a pictograph is intended to tell you that some settings still have to be made or checked in the associated parameter dialog.
	▸ Going directly to a parameter dialog (📖 158)
	Display online values of the inputs. • The actual state of the inputs is displayed directly on the buttons.
	Add note • You can add a note to each parameter dialog.

Tip!

The blue header always displays the current parameter dialog level:

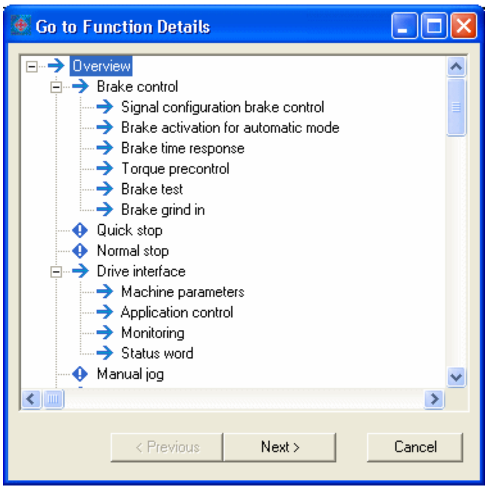
8.4.7.2 Going directly to a parameter dialog

If you want to change to a parameter dialog which is not directly one level higher or lower, you can use the function "Go directly to the dialog...".

▶ You can also use this function to have all parameter dialogs for the application displayed in a hierarchical tree topology.

How to go directly to a parameter dialog:

1. Click the icon in the *Application parameters toolbar*.
   - The *Go to the function detail* dialog box is displayed:



   Tip!

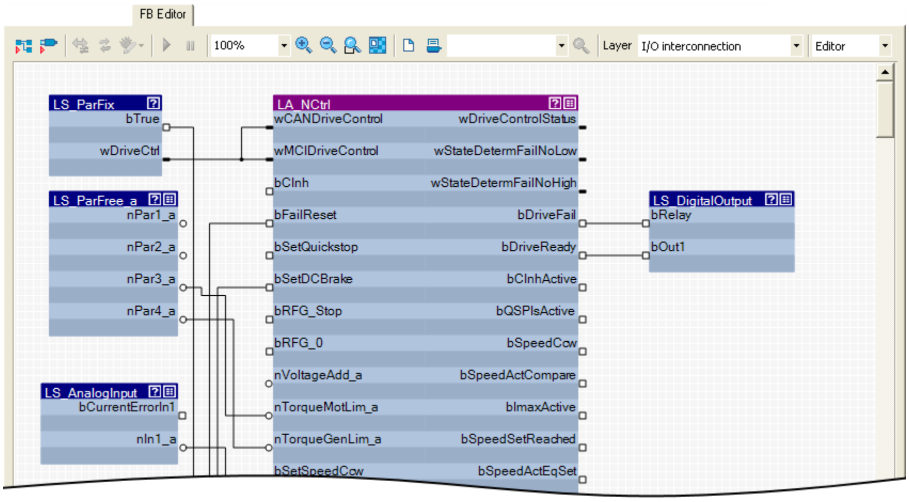
   Simultaneously to the display of this dialog box you can carry out further settings on the **Application parameters** tab and change to other parameter dialog levels. The accentuation of the current parameter dialog level in the tree topology also is updated when the changeover is effected.

2. Select the parameter dialog to be displayed from the hierarchical structure or navigate through the structure via the **Back** or **Next** button.
   - The parameter dialog selected in each case is displayed immediately in the **Application parameters** tab.
   - The dialog box entitled *Go to the function detail* remains open until the **Cancel** button is clicked.

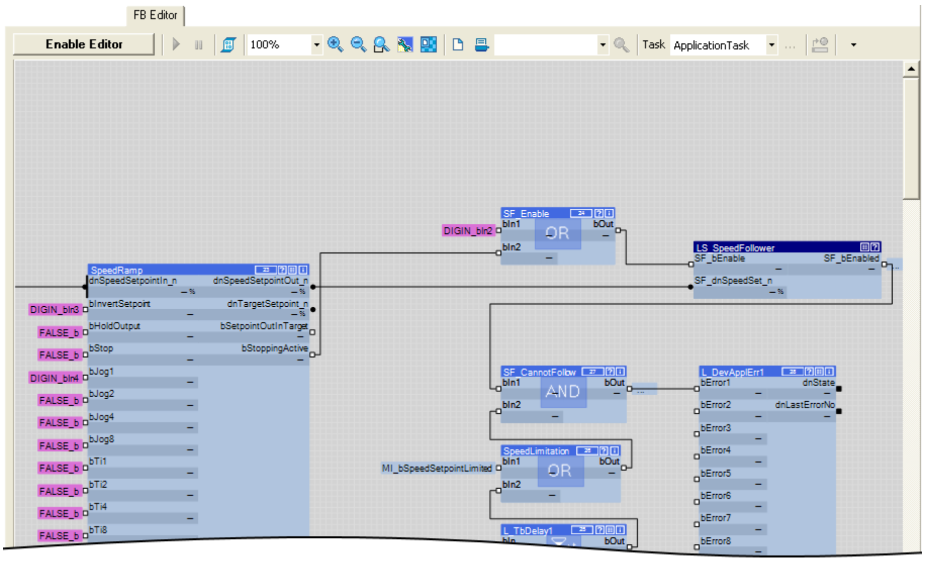
8.5 Function block editor (FB Editor)

The applications of devices of the Inverter Drives 8400 and Servo Drives 9400 series (from runtime software licence Motion Control HighLevel) cannot only be parameterised, but the underlying function block interconnection can be reconfigured and extended by individual functions (e.g. process controllers, arithmetic functions, logic modules as well as ramp generators and integrators).

For this purpose, the *Workspace* provides the **FB Editor** tab with the function block editor (FB Editor) for the 8400 and 9400 device series:



[8-5] FB Editor for 8400 StateLine C



[8-6] FB Editor for 9400 HighLine (here in the "Viewer" mode)

Note!

The functionality and the basic image of the FB Editor are different for both device series (e.g. L-force Servo Drives 9400 and L-force Inverter Drives 8400).

Detailed information on the respective FB Editor can be found in the documentation of the function library for the corresponding device series.

Tip!

By means of the magnifier function of the FB Editor the visible area of the interconnection can be zoomed in/zoomed out. For this, click on the magnifier icons or use the desired percentage value from the selection list.

8.5.1 Navigating within the FB Editor

Navigation by means of the mouse

By pressing the middle mouse button (press scroll wheel), you can navigate through the FB Editor by means of mouse movements.

Tip!

The icon symbolises that the navigation function with the mouse is activated.

This function is activated by default. If you are using an alternative software for controlling the mouse, this function may not be available.

Navigation by means of the keyboard

Via the following key combinations you can systematically navigate through the FB Editor:

Shortcut	Function
<Ctrl> + <i>	Navigate **upwards** in the FB-Editor
<Ctrl> + <k>	Navigate **downwards** in the FB-Editor
<Ctrl> + <j>	Navigate **to the right** in the FB-Editor
<Ctrl> + <l>	Navigate **to the left** in the FB-Editor

8.5.2 Printing the function block interconnection

By means of the **Print** command you can print the function block interconnection. Alternatively you can print a detailed report for which you can select further information.

How to print the function block interconnection:

1. Execute the **Print** command in the context menu of the FB Editor.

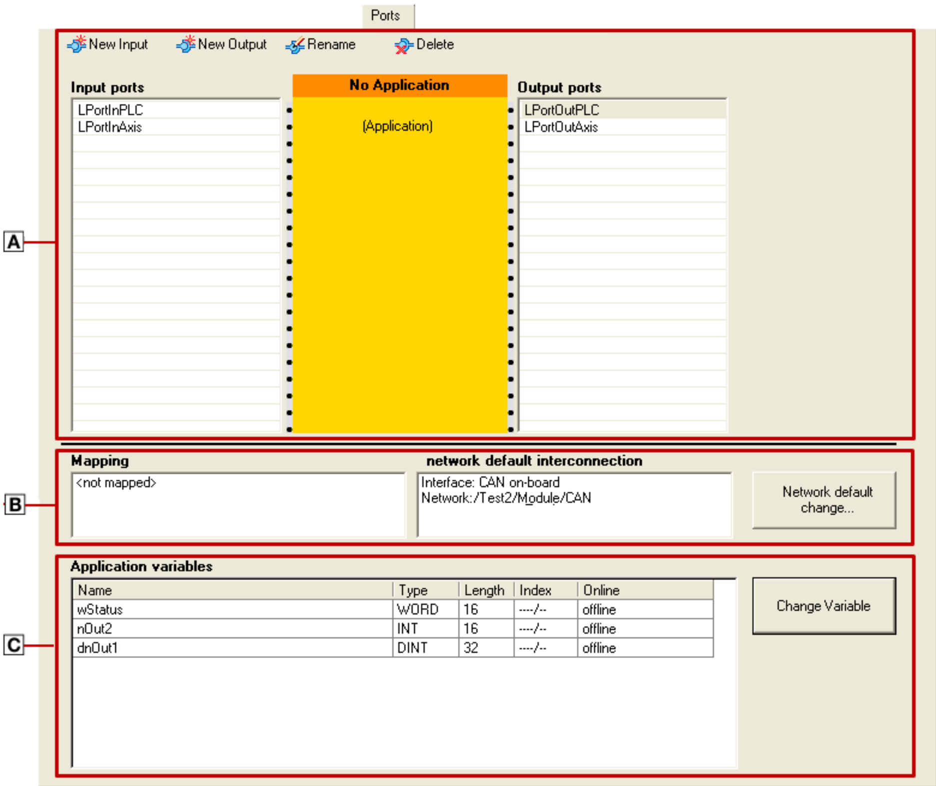
2. Select the desired command in the submenu.

Command	Function
Print report	Print detailed FB report with further information • Select options which the report is to include: – Contents – Processing table – Graphics – Parameters
Print interconnection	• Select the desired scaling for the output format • Print current function block interconnection
Print view of interconnection	Show print view for the function block interconnection to select a suitable scaling for the output format

8.6 Port editor

The port editor serves to create and visualise ports.

- A port is an interface which sends and receives data at runtime via an application. The data transferred via port represent a group of inseparable pieces of information which are sent and received in one piece.
- Most applications have ports which are already fixedly predefined.
- The port editor can both be called for an application on a device and for a comprehensive application (machine application) via the **Ports** tab.



A Port definition B Communication/mapping C Variable definition

Port definition

Display of all input and output ports of an application/ machine application.

- Mapped ports are printed in **bold**.
- The icons serve to create new ports and process available ports:

Icon	Function
	Add input or output port. ▶ Adding a port (📖 168)
	Rename port selected. ▶ Renaming a port (📖 175)
	Delete port selected. ▶ Deleting a port (📖 175)

Mapping

Display of the process data object on which a port is currently mapped.

- A port can be mapped on no, one, or several process data objects.
- Example:
  <CAN on board/>: <TPDO1 : 0>
  <Node/process data object>: <Num>
  <Num> - indicates the byte offset in the process data object.

Network specification for interconnection

For the automatic interconnection the user can specify an interface and therefore implicitly a network for the break-up of a logic connection here.

- The interface and the network connected are both shown.
- The specification can be edited by clicking the **Change network specification** button. Only interfaces/networks are shown via which interconnection for each machine application is possible.

Variable definition

Display of the variable definition for a port selected.

8.6.1 Overview: Variable types for ports

A port of an application consists of variables. The »Engineer« summarises these variables again to "Simple", "Record" or "Array" variable types:

Variable type	Information
Simple	This type only contains one variable of a basic data type like INT, WORD, etc. • Use this type if it is not known how the devices are comprehensively interconnected. A data consistency between the variables is not required.
Record	This type contains one or several variables of a basic data type like INT, WORD, etc. • Use this type e.g in an interconnection of controllers with a ready-made application and the same data structure.
Array	This type contains one or several variables of the same basic data type like INT, WORD, etc. • Use this type with simple binary systems (e.g. I/O terminals).

Note!

The identifiers of ports and the associated variables have to be definite.

The identifiers of the »Engineer« must not be identical with the IEC 61131-5 identifiers.

Tip!

In general, the variable type to be used depends on the application. The criteria given in the following subchapters can help you to find a suitable variable type.

- "Simple" variable type (164)
- "Record" variable type (165)
- "Array" variable type (166)

8.6.1.1 "Simple" variable type

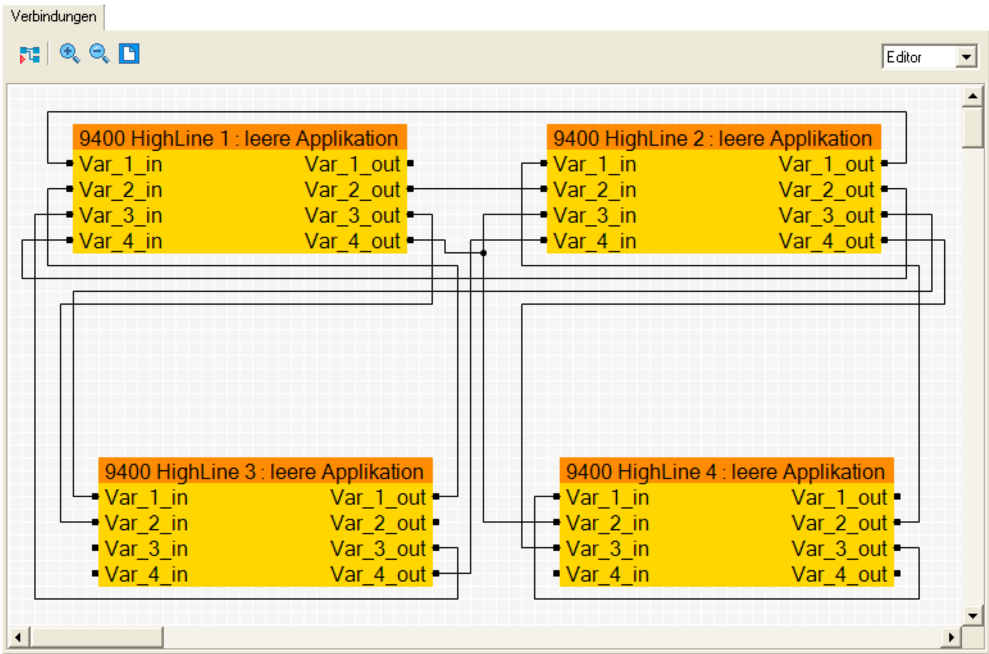
Highest flexibility

The table shows four devices with four input and output ports each of the *Simple* variable type.

- The vertically arranged variables are the output variables and the horizontally arranged ones are the input variables.
- The crosses represent the connections between the inputs and outputs.

Devices		Device A				Device B				Device C				Device D			
	Variable	Var 01	Var 02	Var 03	Var 04	Var 05	Var 06	Var 07	Var 08	Var 09	Var 10	Var 11	Var 12	Var 13	Var 14	Var 15	Var 16
Device A	Var 01																
	Var 02						×										
	Var 03										×						
	Var 04							×							×		
Device B	Var 05	×															
	Var 06				×												
	Var 07									×							
	Var 08															×	
Device C	Var 09		×														
	Var 10																
	Var 11			×													
	Var 12								×								
Device D	Var 13																
	Var 14					×											
	Var 15													×			
	Var 16																

A flexible connection in the machine application can be as follows:

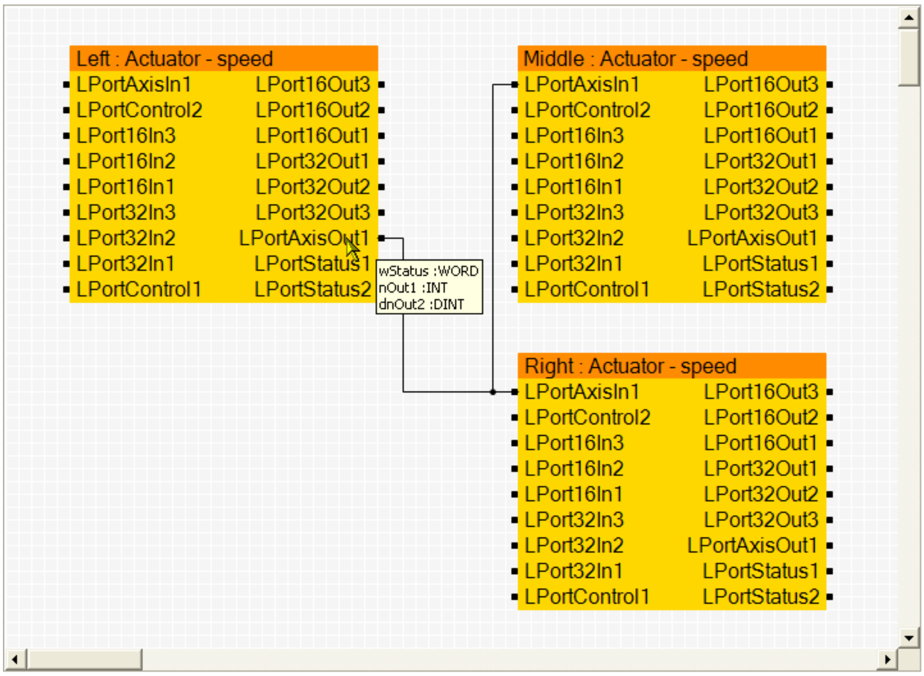


The connections can be changed subsequently here without changing the application. In the case of the "Record" variable type, the changes can only be made on the application level.

8.6.1.2 "Record" variable type

This type contains one or several variables of a basic data type like INT, WORD, etc. as data structure.

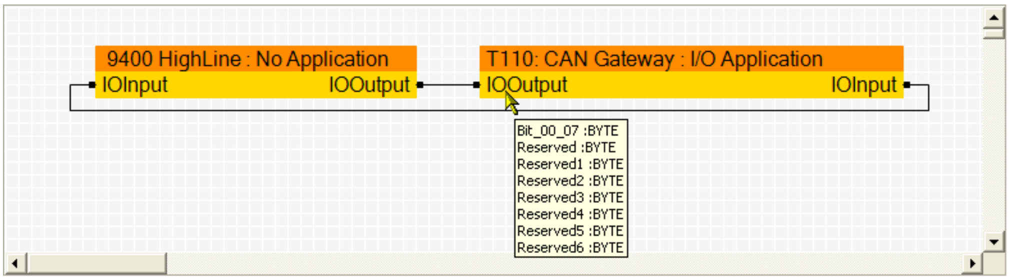
- Use this type e.g in an interconnection of controllers with a ready-made application and the same data structure.



8.6.1.3 "Array" variable type

This type contains one or several variables of the same basic data type (in the example "BYTE").

- Use this type with simple binary systems (e.g. I/O terminals).



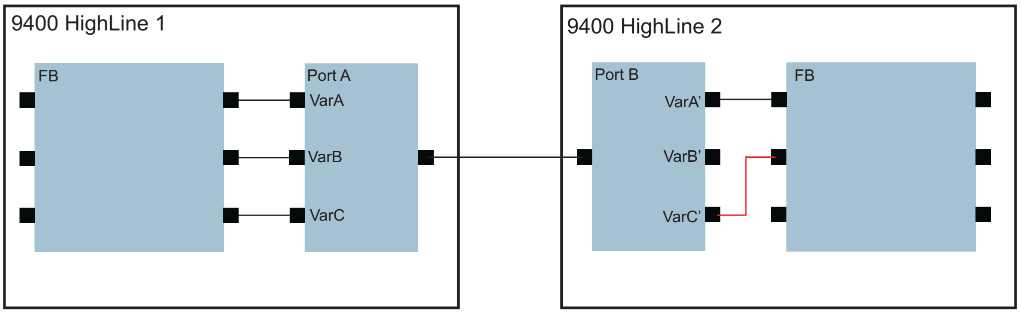
8.6.1.4 Record or Simple?

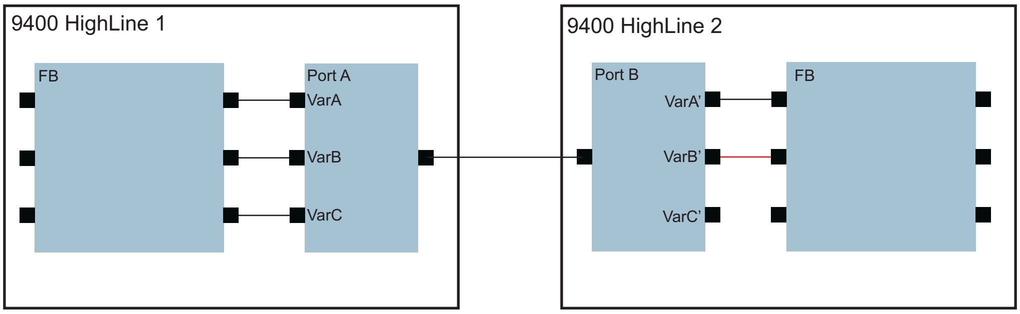
The "Simple" and "Record" variable types are described by means of the following task:

- Three variables are to be transferred from one (network) node to another. Via the port connection, the variables are transferred 1:1 from source port to target port.

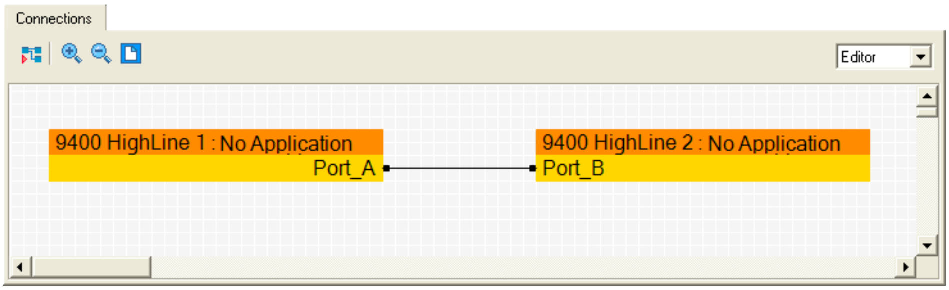
Record

For changing the interconnection, you have to switch to the application level. If the interconnection is to be changed, the applications have to be adapted accordingly.



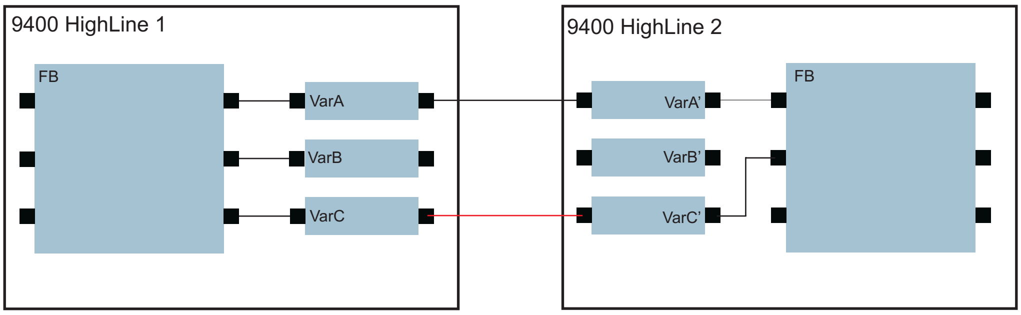


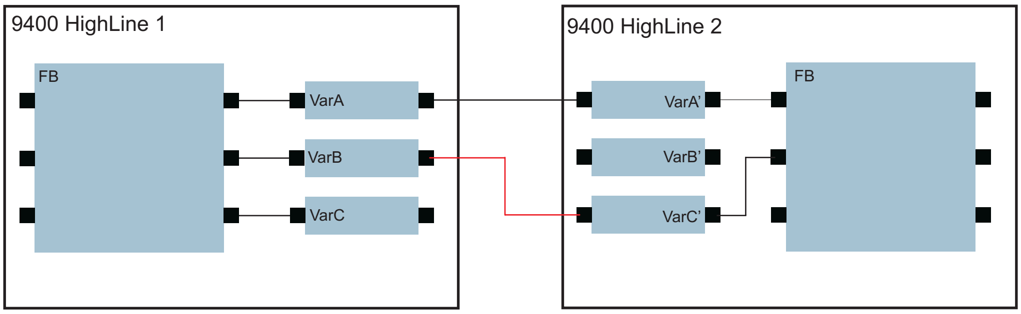
In the machine application, the connections cannot be changed.



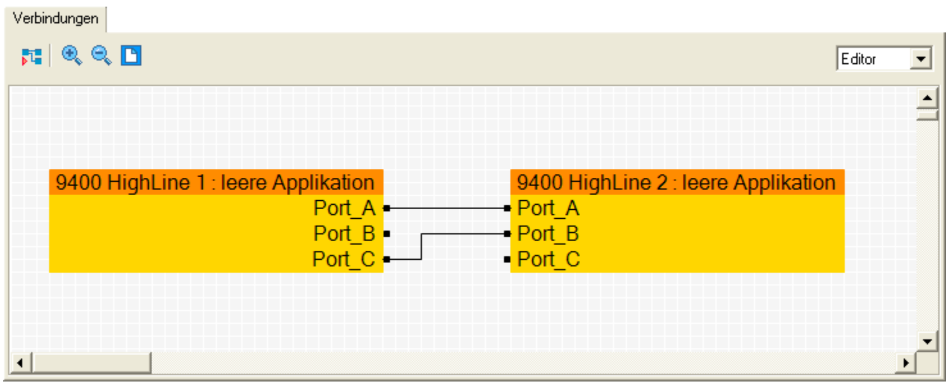
Simple

It is more reasonable to select all variables as individual ports by using the Simple variable type. In this case, the applications need not be recompiled if the interconnection is to be changed.





In the machine application, the connections can be changed quickly.



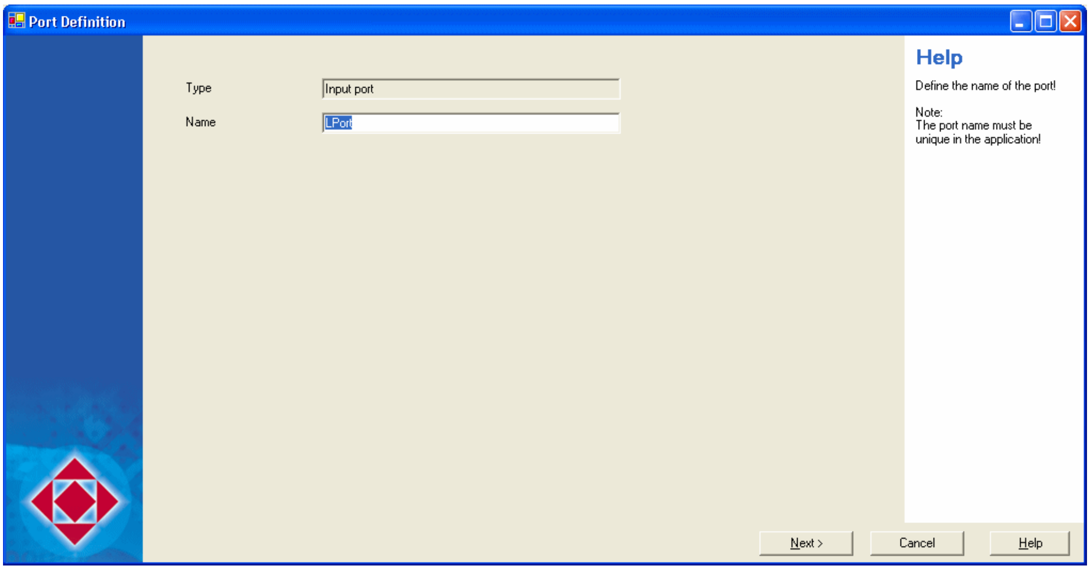
8.6.2 Adding a port

How to add a port:

1. In the *Ports toolbar*, click the icon with the option **New input** or **New output** in order to add an input port or output port.

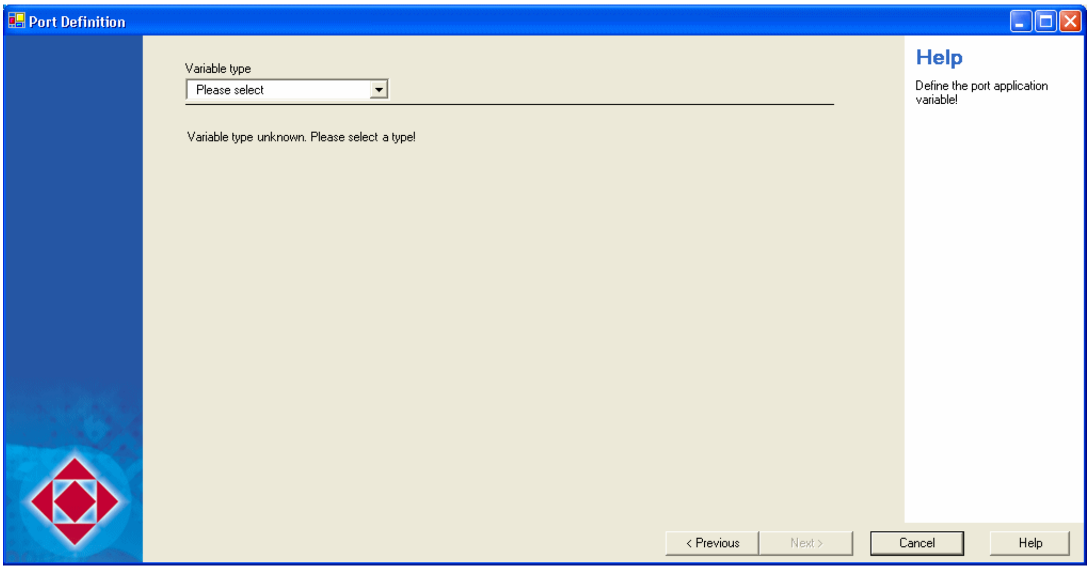
   The wizard for adding a port then appears.

   Step 1 - Port designation



2. Enter a designation for the port in the **Name** input field.
   - The identifiers of ports and the corresponding variables must be non-ambiguous. They must not be identical with the IEC 61131-5 identifiers.
3. Click the **Next** button to proceed with the next dialog step.

   Step 2 - Variable type



4. Select the required variable type ("Simple", "Record" or "Array") in the **Variable type** selection field.

Further proceeding depends on the selected variable type:

- Defining port with "Simple" variable type
- Defining a port with "Record" variable type (📖 169)
- Define a port with "Array" variable type (📖 170)

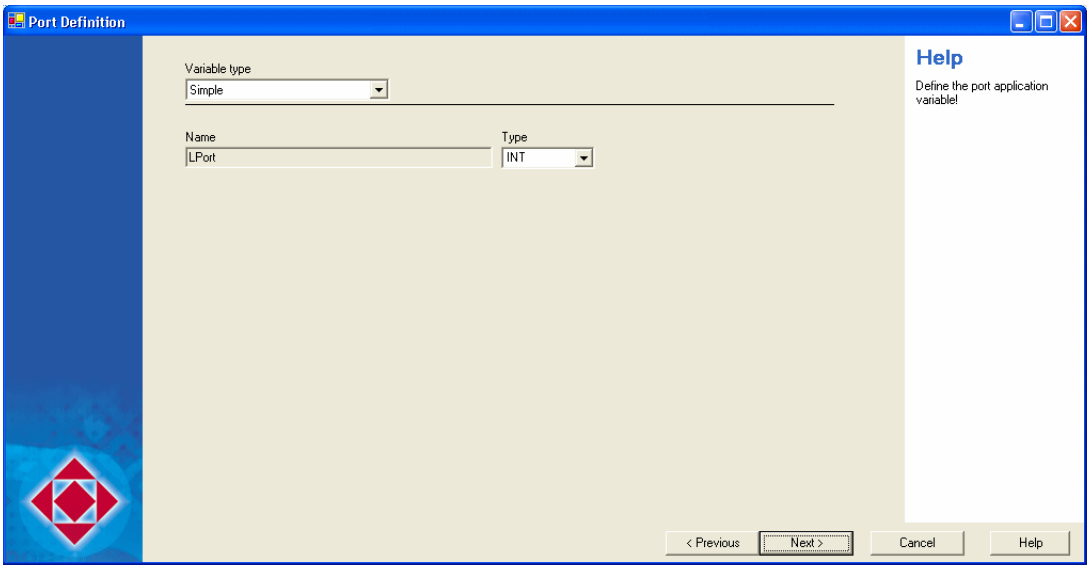
Related topics:

- Overview: Variable types for ports (📖 163)

8.6.2.1 Defining port with "Simple" variable type

How to define a port with the "Simple" variable type:

1. Carry out the steps as described in the instructions in the chapter "Adding a port (📖 168)".
2. Go to the **Variable type** selection field and select the "Simple" entry.
   - The *Port definition* dialog box is then presented as follows:



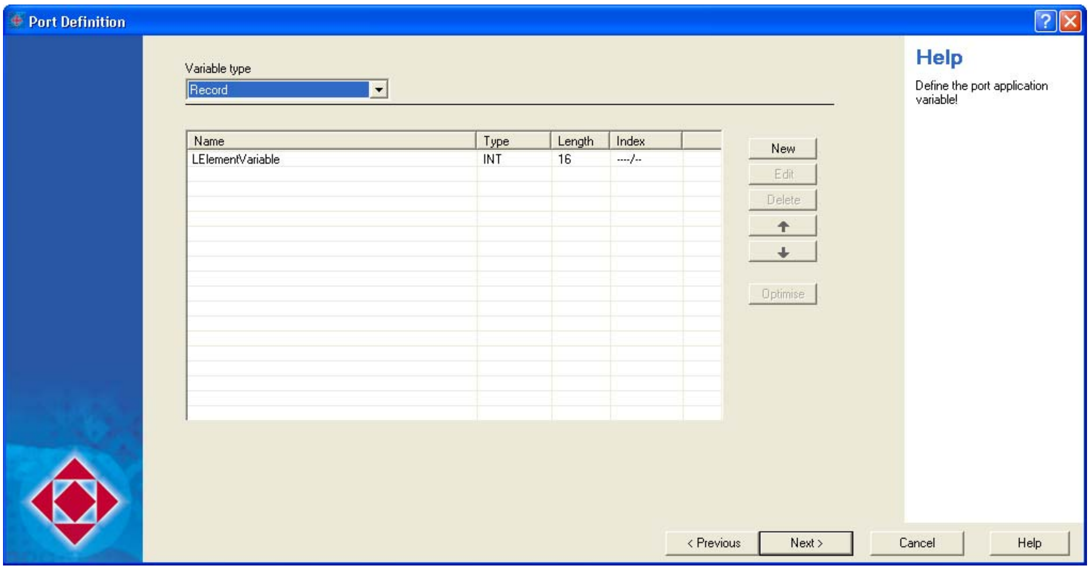
3. Select the required data type in the **Type** selection field.
4. Click the **Next** button.
5. Defining the interface and process data object (📖 174)
6. Click the **Complete** button to complete the port definition.

8.6.2.2 Defining a port with "Record" variable type

How to define a port with the "Record" variable type:

1. Carry out the steps as described in the instructions in the chapter "Adding a port (📖 168)".

2. Go to the **Variable type** selection field and select the "Record" entry.
   - The *Port definition* dialog box is then presented as follows:



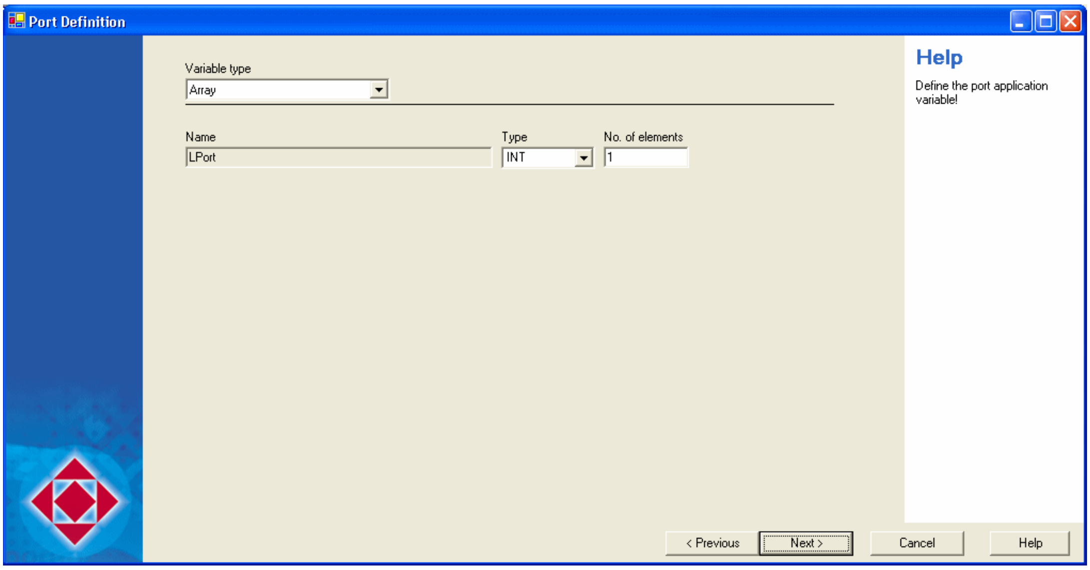
3. Define the required element variables by means of the **New**/**Edit**/**Delete** buttons.
   - The buttons ▲/▼ serve to arrange the selected element variable one position higher/lower in the list.
   - The **Optimise** button is currently out of operation.
   - The element variables can be changed/supplemented subsequently.
     ▶ Defining element variables for "Record" variable type (📖 172)
4. Click the **Next** button.
5. Defining the interface and process data object (📖 174)
6. Click the **Complete** button to complete the port definition.

8.6.2.3 Define a port with "Array" variable type

How to define a port with the "Array" variable type:

1. Carry out the steps as described in the instructions in the chapter "Adding a port (📖 168)".
2. Go to the **Variable type** selection field and select the "Array" entry.

- The *Port definition* dialog box is then presented as follows.



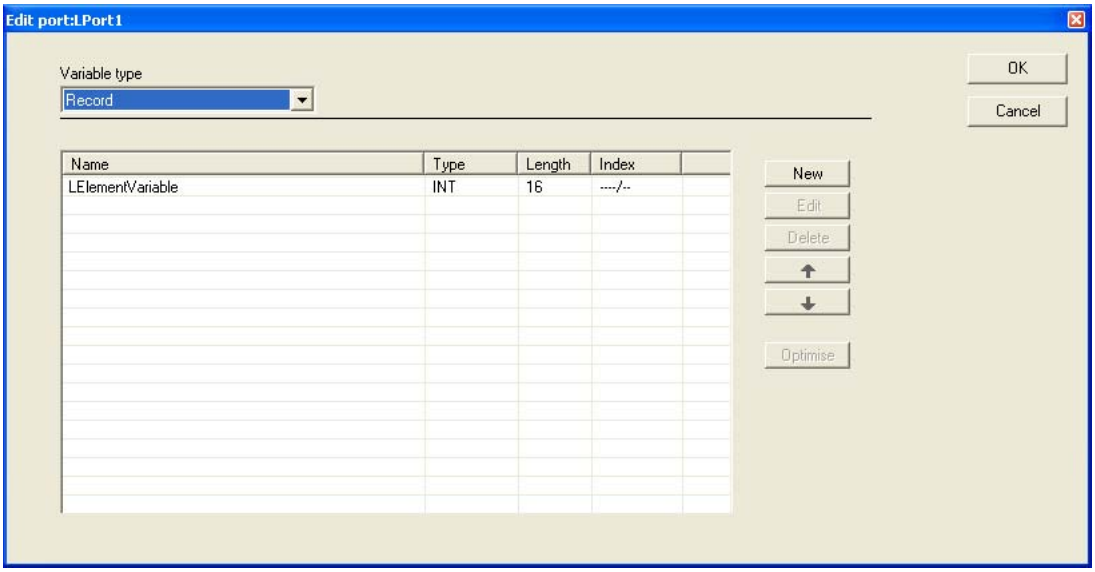
3. Select the required data type in the **Type** selection field.
4. Enter the required number in the **No. of elements** input field.
5. Click the **Next** button.
6. Defining the interface and process data object (174)
7. Click the **Complete** button to complete the port definition.

8.6.2.4 Defining element variables for "Record" variable type

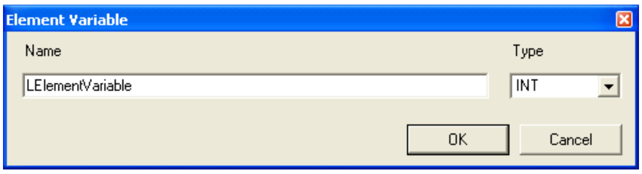
The element variables of a port of the "Record" variable type can be changed/ supplemented subsequently any time via the *Edit port* dialog box if required.

How to generate a new element variable:

1. Select the port for the associated structure of which a new element variable is to be generated in the **Ports** tab.
2. Click the **Edit port...** button.
   - The *Edit port* dialog box appears:



3. Click the **New** button.
   - The *Element variable* dialog box appears:



4. Enter a name for the element variable to be generated.
5. Select the data type for the element variable from the **Type** list field.
   - In accordance with IEC 61131-3 integer data types can be selected.
6. Click the **OK** button.
   - The dialog box is closed and the element variable is generated.

Changing/deleting existing element variables

You can, of course, change the settings of already existing element variables at any time and you can also remove element variables from the list and therefore from the structure.

How to change an element variable:

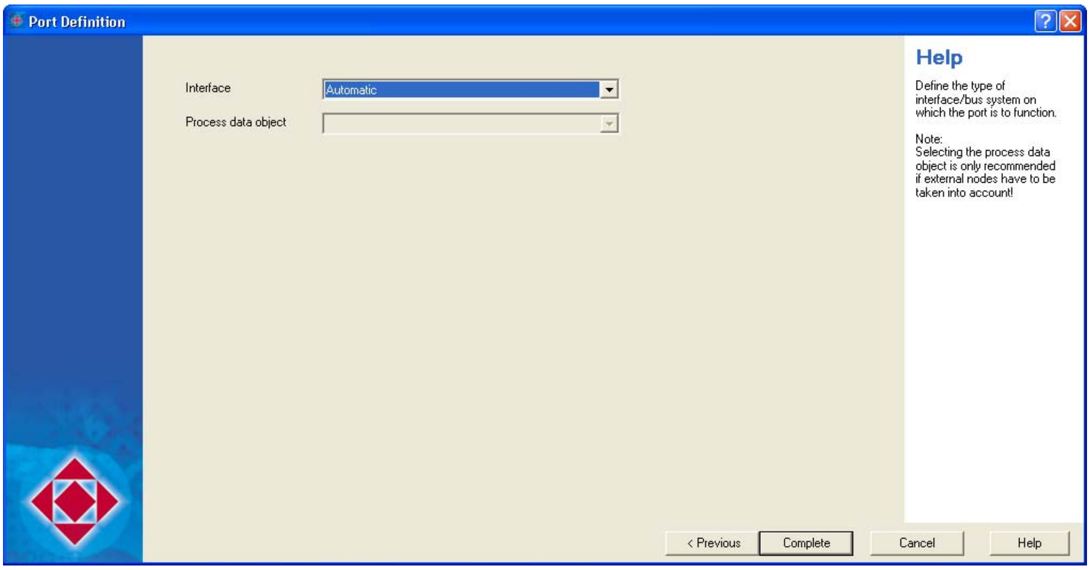
1. Select the element variable to be changed from the *Edit port* dialog box in the list field.
2. Click the **Change** button.
   - The *Element variable* dialog box appears.
3. Carry out the desired changes in the *Element variable* dialog box.
4. Click the **OK** button.
   - The dialog box is closed and the changes are accepted.

How to delete an element variable:

1. Select the element variable to be deleted from the *Edit port* dialog box in the list field.
2. Click the **Delete** button to delete the element variable selected.

8.6.2.5 Defining the interface and process data object

In the last step of the port definition, specify the interface and, if required, the process data object to be used:



- In the **Interface** selection field, only the communication interfaces that exist on the device are offered.
- When "Automatic" has been selected, the interface and thus the process data object are selected automatically by the system in the case of an interconnection.
- When an interface has been defined and the selection for the process data object is "Automatic", the process data object is defined by the system.
- A process data object can serve as a container for several ports. This means that several ports can be transferred by a process data object.
- The interface can be changed subsequently any time.

Note!

Ports can be assigned to process data objects automatically or manually. If you define a port up to the process data object level, the flexibility for automatic connection of interconnections will be reduced. ▸ Defining the type of connection (📖 185)

When the ports are assigned to the process data objects, the data width and existing mapping entries will not be checked. This will only be done when the project is updated with the **Tools→Build project** menu command. In the case of errors, error messages will be indicated and the compilation process will be cancelled.

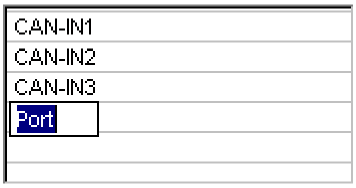
Click the **Complete** button to complete the port definition.

8.6.3 Renaming a port

Existing ports can be renamed at any time, in order to facilitate the identification of the ports within an application.

How to rename a port:

1. Select the port to be renamed in the **Ports** tab.
2. Click the icon in the *Ports toolbar*.
   - Then you can change the name of the port:



3. Press the **<input key>** to accept the new name.

8.6.4 Deleting a port

How to delete a port:

1. Select the port to be deleted in the **Ports** tab.
2. In the *Ports toolbar*, click the icon to delete the selected port.

8.7 User menu

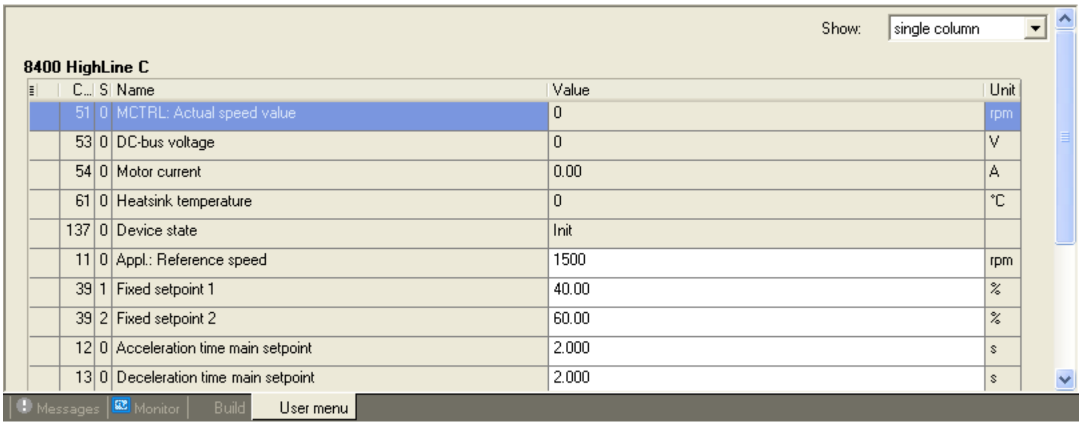
When a system is set up, parameters must be changed again and again until the system operates satisfactorily. In the *User menu* of a device, you can arrange a selection of frequently used parameters in order to be able to quickly access and change these parameters.

Note!

The *User menu* is available for controllers of the 8400 and 9400 device series!

How to show the user menu:

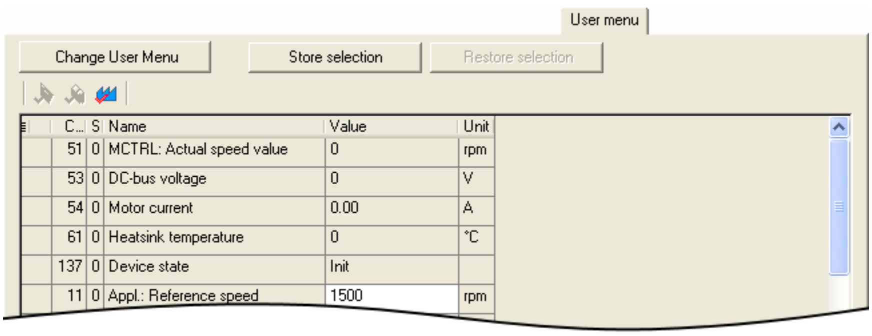
Select the **User menu** tab at the bottom of the application window to show the *User menu*:



- The pre-assignment of the *User menu* depends on the selected device (here: 8400 StateLine C).
- In the case of the Servo Drives 9400 series the *User menu* is empty at first.

Tip!

The *User menu* can also be displayed in the *Workspace* by changing to the **User menu** tab:

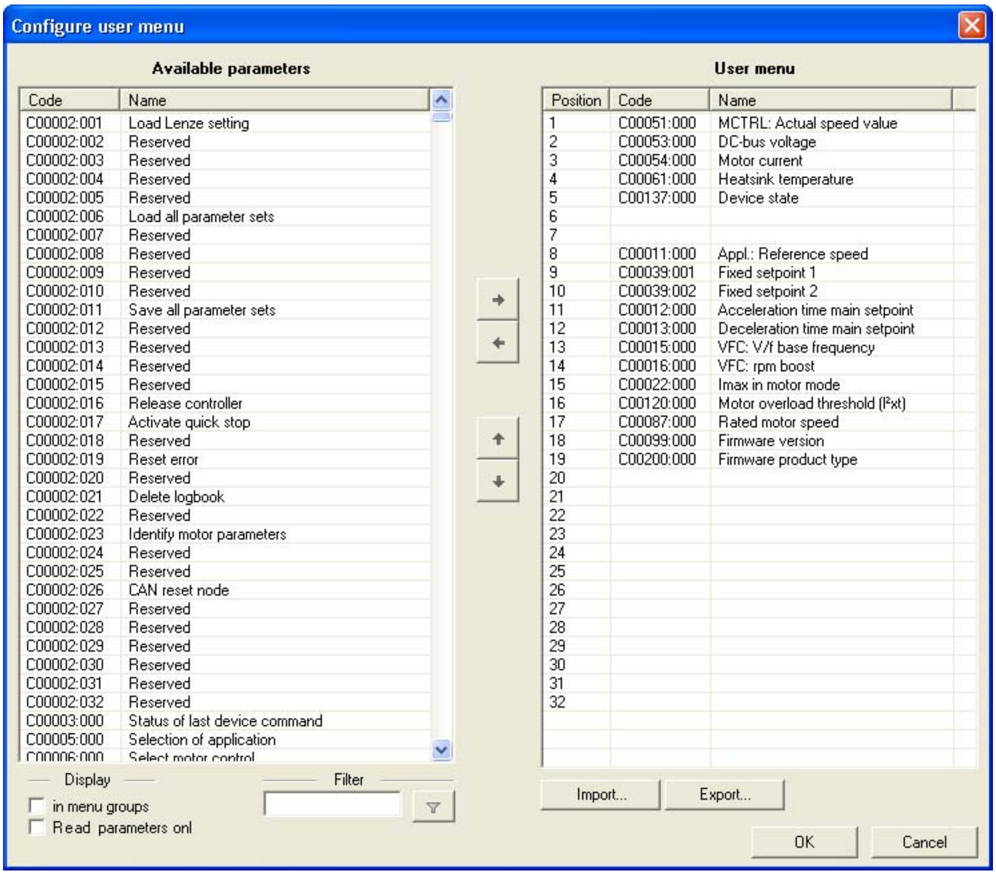


The buttons of this tab serve to configure the *User menu* and transfer the parameter selection to other controllers.

8.7.1 Configuring the user menu

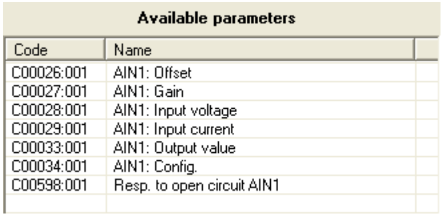
How to configure the user menu:

1. Change to the **User menu** tab in the *Workspace*.
2. Click the **Change user menu** button.
   - The *Configure user menu* dialog box appears:



- The list **Available parameters** on the left shows all parameters of the project. These parameters are also available in the **All parameters** tab.
- When the **In menu groups** option is activated, all parameters are shown as they are assigned to their functions and devices.
- When the **Read parameters only** is activated, only the display parameters of the device are shown.

- The button in the **Filter** area serves to reduce the list of available parameters. If you e.g. enter the text "ain1" and then click the button, only the parameters the name of which contain this text are displayed for selection:



Available parameters

Code	Name
C00026:001	AIN1: Offset
C00027:001	AIN1: Gain
C00028:001	AIN1: Input voltage
C00029:001	AIN1: Input current
C00033:001	AIN1: Output value
C00034:001	AIN1: Config.
C00598:001	Resp. to open circuit AIN1

3. Highlight the parameter/s in the **Available parameters** list that you want to add to the user menu.
   - For a multi-selection you can, just like in the general Windows function, use the <**Ctrl**> and <**Shift**> key.
4. Click the button to transfer the highlighted parameters into the *User menu* on the right.
   - With the and buttons you can alter the sequence of the parameters in the *User menu*.

   To delete parameters from the *User menu*:
   - Highlight the parameter/s in the **User menu** which are to be deleted from the *User menu*.
   - Click the button to delete the highlighted parameters from the *User menu*.
5. Click the **OK** button to accept the configuration and close the dialog box.
   - You can recall the configuration dialog any time in order to change or extend the *User menu* later.

Tip!

For a cross-project reuse of the *User menu* configured, you can use the **Export** and **Import** buttons in the *Configure user menu* dialog box to save the parameter selection as *.epc file and then reimport the saved *.epc file into a new »Engineer« project.

8.7.2 Transferring the parameter selection to other controllers

The **Store selection** and **Restore selection** buttons on the **User menu** tab serve to transfer the existing parameter selection to the *User menu* of another controller within the project.

How to transfer the parameter selection to another controller:

1. Go to the **User menu** tab of the controller the *User menu* of which is to be transferred and click the **Store selection**.
2. Change to the **User menu** of the controller that is to accept the memorised parameter selection in its *User menu* and click the **Restore selection** button.
   - The *User menus* of both controllers then have the same parameter selection.

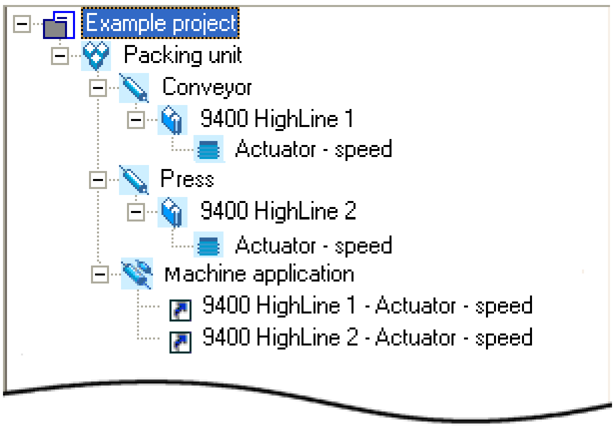
Tip!

For a cross-project reuse of a configured *User menu*, the *Configure user menu* dialog box provides the **Export** and **Import** buttons. ▶ Configuring the user menu (177)

8.8 Inserting & configuring a machine application

The machine application serves as a structuring means for the generation of system modules which already contain a predesigned interconnection.

In the *Project view* the existing system modules, axes and devices, as well as the applications subordinate to the devices, and possibly available machine applications are displayed:



- ▶ The symbols below the devices represent the respective application.
- ▶ A machine application always is required if several devices have to exchange information among each other, as the applications assigned to the devices can only be interconnected within a machine application. In the illustration this is represented by 9400 Highline 1 and 9400 Highline 2.
- ▶ In principle, not only applications but also machine applications that have already been configured can be allocated to a machine application. This makes it possible to create hierarchical application structures.

▶ A project can also contain several machine applications.

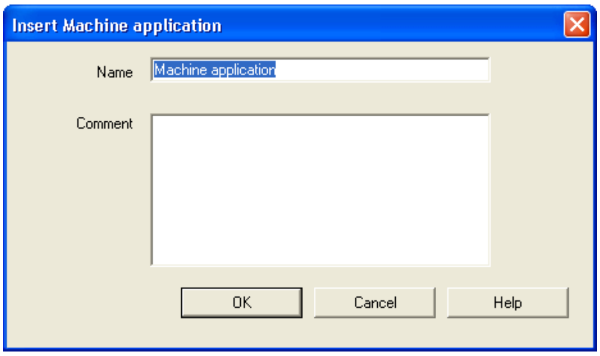
If you select a machine application in the *Project view*, different tabs are provided to you in the *Workspace* via which you can configure the machine application.

Tab	Information
Device applications	Via the **Device applications** tab you assign the respective applications to the machine application. ▸ Assigning applications (📖 181)
Connections	Via the **Connections** tab you define the applications exchanging information and the ports via which this information is exchanged within the machine application. ▸ Connecting ports within the machine application (📖 183)
Ports	Via the **Ports** tab you can add ports to the machine application to exchange information with other machine applications via these ports. ▸ Adding ports as an external interface (📖 185)
Properties	Via the **Properties** tab you can change the name of the application and add a comment to the application.
Documentation	Via the **Documentation** tab you can add notes and documents in electronic form to the application. ▸ Inserting a documentation (📖 86)

8.8.1 Inserting a machine application with a port interconnection

How to insert a machine application with port interconnection:

1. In the *Project view*, select the or axis into which the machine application is to be inserted.
2. Click the icon to insert a machine application.
   - The *Machine application* dialog box appears:
3. Select the "port connection" in the *Machine application* dialog box.
4. Confirm selection with OK.
   - The *Insert machine application* dialog box appears:



5. Enter a name for the application in the **Name** input field.
6. Optionally you can enter a comment on the application in the **Comment** input field.

7. Click the OK button.
   - The dialog box is closed and the machine application is inserted into the highlighted element.

Next worksteps

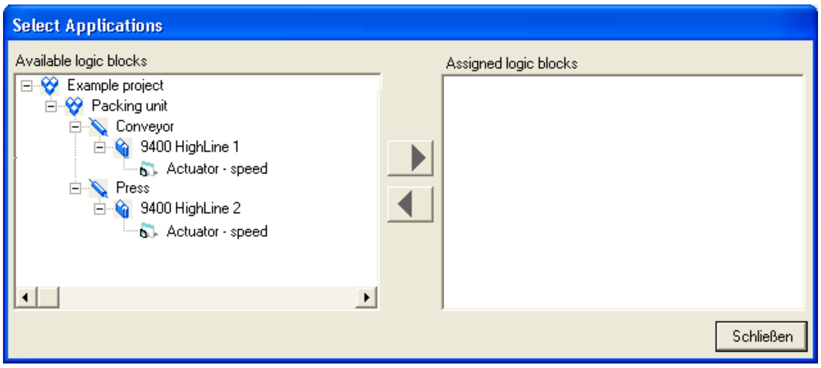
- ▶ If necessary, add ports to the machine application, which serve as an external interface and enable the exchange of information with other functions (device applications).
  ▸ Adding ports as an external interface (📖 185)
- ▶ Interconnect the ports of the assigned device applications and those of the machine application to each other to describe the applications between which information is to be exchanged within the machine application and what information is to be communicated to the outside. ▸ Connecting ports within the machine application (📖 183)
- ▶ Port interconnection
  – Connect the ports of the assigned applications and the ports of the machine application to each other in order to specify the applications (within the machine application) between which information is to be exchanged and what information is to be communicated to the outside.
  ▸ Port interconnection (📖 181)

8.8.2 Port interconnection

Assigning applications

Via the **Connections** tab of a machine application you define, by means of assignment, which applications are to exchange information within the machine application.

- ▶ Click  in the **Connections** tab to display the following dialog:

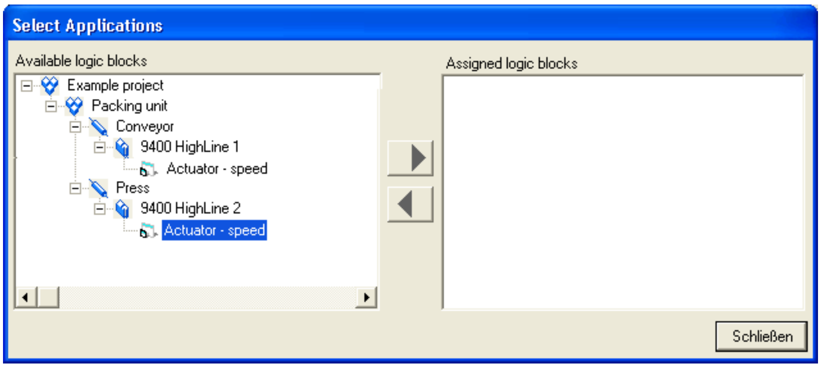


- ▶ Each device already brings along an application which can be assigned to the machine application, even if the respective application has not been fully defined.
- ▶ Not all applications of a project have to be assigned to the same machine application necessarily.
- ▶ Apart from applications, also preconfigured machine applications can be assigned to a machine application in order to set up hierarchical application structures like this.

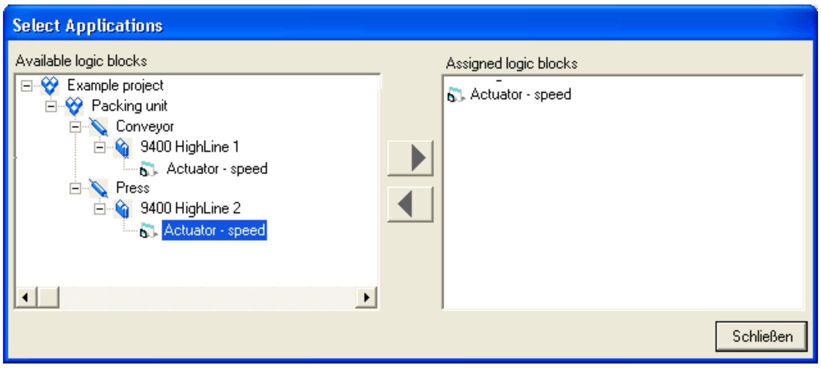
8.8.2.1 Carrying out assignments

How to assign logic modules to an application:

1. In the field on the left entitled **Available applications & machine applications**, select the application (or already existing machine application) that is to be assigned to the machine application:



2. Click the ▸ button to enter the selected application in the field on the right entitled **Selected applications & machine applications**:



   - By clicking the ◂ button, you can remove the application selected in the field entitled **Selected applications & machine applications** and thus cancel the assignment to the machine application.
   - Already assigned logic modules are shown in grey in the field on the left entitled **Available applications & machine applications** and cannot be assigned again.

3. Repeat the first two steps to assign further applications to the machine application.

8.8.2.2 Cancelling assignments

How to cancel an assignment:

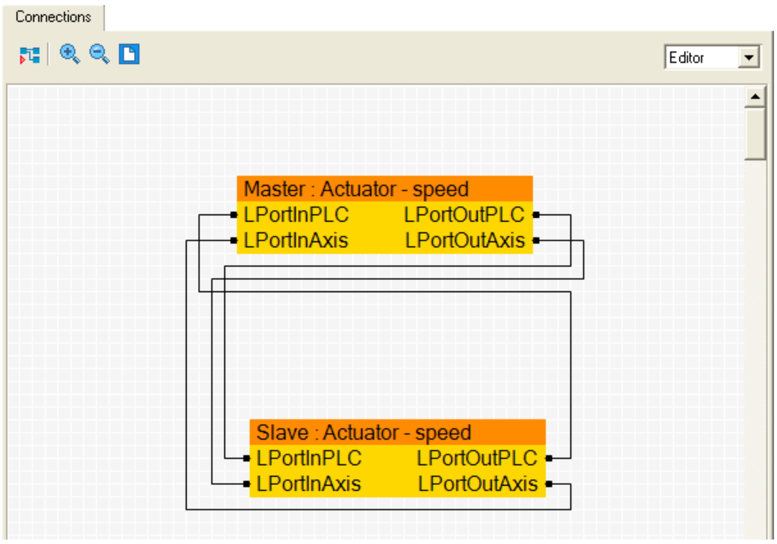
1. Select the corresponding application (or machine application) in the field on the right entitled **Selected applications & machine applications**.
2. Click the ◂ button.
   - The selected application is then removed from the field entitled **Selected applications & machine applications** and is thus no longer assigned to the machine application.

8.8.3 Connecting ports within the machine application

Interconnection of ports

You can interconnect ports of different devices to each other. Connections are only possible between ports that can be interconnected. If a connection between two ports is not possible, you cannot set a connection line.

Via the **Connections** tab of a machine application you define which applications are to exchange information via which ports within the machine application.



- If you click an application with the right-hand mouse button, you can select the **Go to ports** command to change directly to the Port editor.
- If you connect an output port of an application to an input port of another application, you express that the element variables of the output port of the first application are to be communicated to the input port of the second application.
- A connection always has a direction and therefore always has a source and a target.
- Several connections may lead from one port, but only one connection can end in a port.

Tip!

You can also add **Ports** to a machine application to enable the exchange of information between different machine applications.

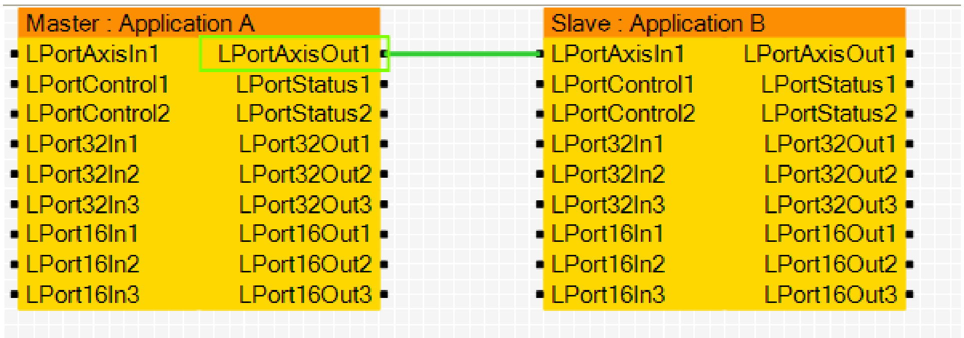
▶ Adding ports as an external interface (🕮 185)

Afterwards you can also interconnect these ports, in order to define what information is to be communicated to the outside.

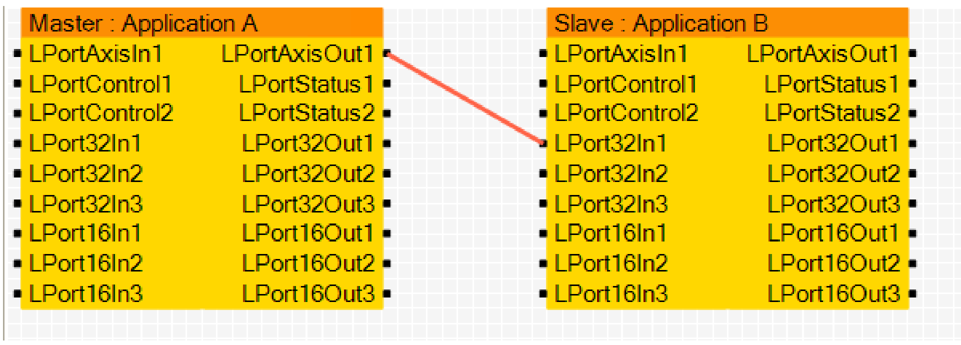
Examples of possible connection combinations

For connecting two ports of different applications, the applications must have been assigned to the same machine application.
Note: Connections are only possible if the length and the type of the application data types of the ports match each other.

- An output port of an application is connected to an input port of another application. When the ports are connected, a green line indicates that the connection is possible.
  - Example: The output port `LPortAxisOut1` (data types: WORD, INT, DINT) of *Master: Application A* is connected to the input port `LPortAxisIN1` (data types WORD, INT, DINT) of *Slave: Application B*.



- If the application data types of two ports are not the same, the ports cannot be connected to each other. A red line indicates that the connection is not possible.
  - Example: A connection between the output port `LPortAxisOut1` (data types: WORD, INT, DINT) of *Master: Application A* and the input port `LPort32In1` (data type INT) of *Slave: Application B* is not possible:

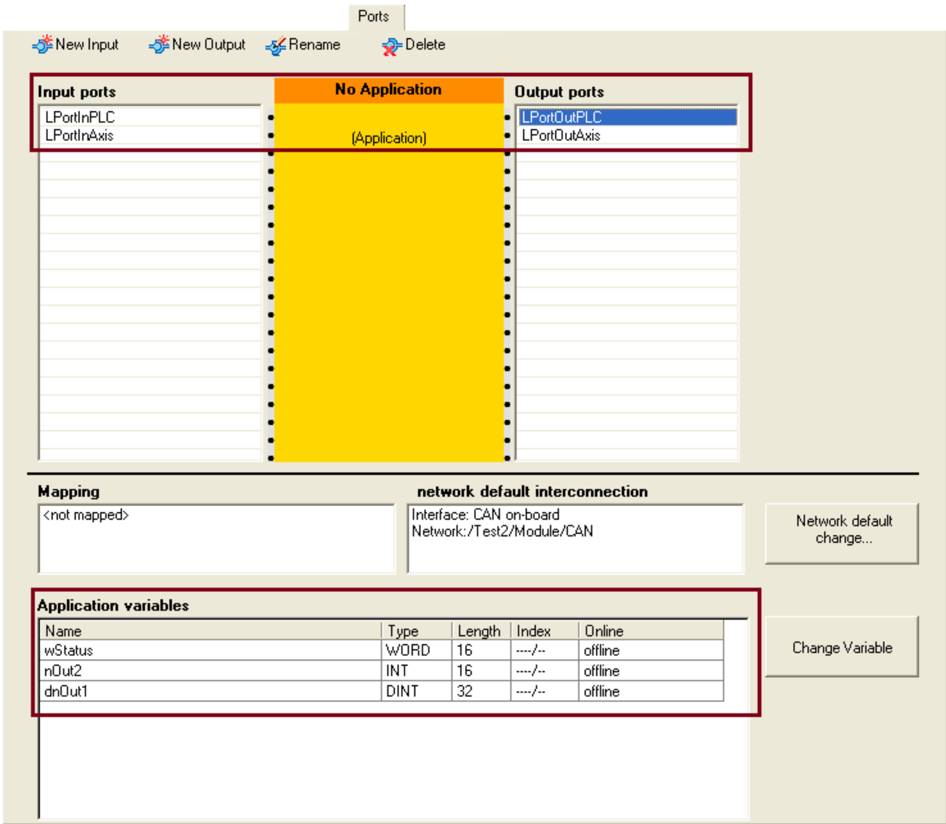


- A black line indicates connections set between two ports.

8.8.4 Adding ports as an external interface

You can also add ports to an application to realise an exchange of information between different applications like this.

Via the **Ports** tab of an application you receive an overview of the ports which are defined for this application:



Adding input/output ports

Adding ports to a device application is identical to adding ports to a machine application.

▸ Port editor (📖 162)

8.8.5 Defining the type of connection

There are basically three types of data communication between two ports via the network.

▸ Automatic connection (📖 186)

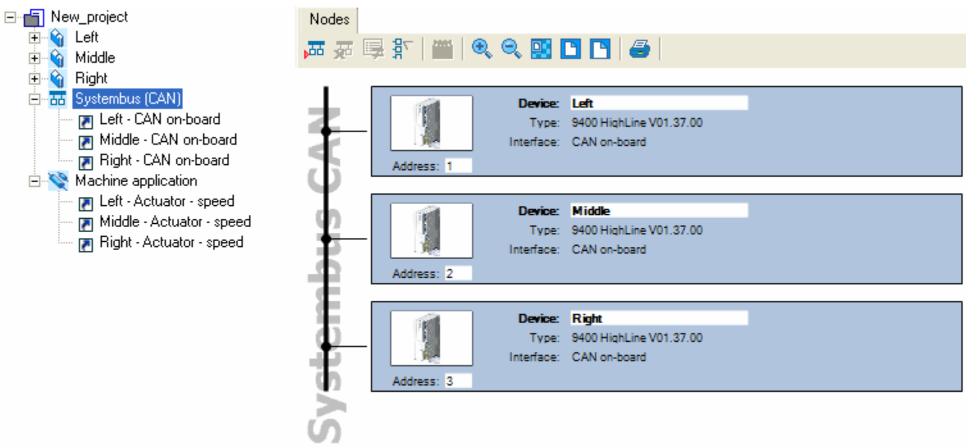
▸ Manual connection (📖 187)

▸ Specifying the procedure for assigning the COB-IDs (📖 187)

8.8.5.1 Automatic connection

For this purpose, a network object in the »Engineer« and a machine application are required.

- The nodes that are to communicate with each other have to be assigned to the network.
- The applications must be assigned to the machine application.



- It is not necessary to assign an interface or a process data object to the ports. If you nevertheless do this, your selections will be taken into account.
- The ports are packed together in process data objects for every interconnection that has a start and at least one end point as the port of an application.
- It is checked whether the end points match with regard to the data size and memory mapping.

With the specification for the creation of the individual ports and the information from the interconnection in the machine applications and the formation of networks, an attempt is made during the compilation (menu command **Tools→Build project**) to convert the information into communication objects.

- It is tried to provide for a bus load as low as possible.
- Several ports are assigned to a process data object.
- Automatic connection is supported for "System bus (CAN)" and "ETHERNET Powerlink" networks.
- If a connection can be established via both "System bus (CAN)" and "ETHERNET Powerlink", "ETHERNET Powerlink" is preferred due to the greater band width.
- If one of the interconnection end points (ports) has already been defined to an interface, this connection is represented via the network assigned. If interfaces are not connected via an identical network, an error message is output.
- If a port has been assigned to a process data object, this port is only available to this process data object. No other ports are assigned to this process data object automatically.

8.8.5.2 Manual connection

The manual connection can be effected without a network object in the »Engineer« and without a machine application.

▶ Directly assign the ports to the process data objects and set the communication parameters yourself like COB-ID for CAN.

This procedure is useful for external devices without »Engineer« catalogues and for bus systems if a network is not provided in »Engineer«.

Tip!

Make sure that the transmit and receive process data objects, the data structure and the communication parameters match each other.

8.8.5.3 Specifying the procedure for assigning the COB-IDs

Option	Function	
On the basis of port interconnection and CAN network	For this CAN interface the »Engineer« assigns the COB-IDs in accordance with the settings of the port interconnection and network. • CAN interfaces that are not connected to a CAN network remain untouched.	
In compliance with the "PreDefined Connection Set" according to CANopen CiA301	**Note: This option activates the automatic allocation for all PDOs of the interface by the »Engineer«!** If the **Pre-Defined Connection Set** control field has been selected, the COB-IDs of the CAN process data objects are derived from the node address:	
	Process data object	COB-ID
	PDO1 PDO_RX1 PDO_TX1	 0x200 + node address 0x180 + node address
	PDO2 PDO_RX2 PDO_TX2	 0x300 + node address 0x280 + node address
	PDO3 PDO_RX3 PDO_TX3	 0x400 + node address 0x380 + node address
	PDO4 PDO_RX4 PDO_TX4	 0x500 + node address 0x480 + node address
Deactivate objects	The »Engineer« deactivates all PDOs of this CAN interface. • PDOs with a deactivated automatic allocation remain untouched.	
Do not change	All PDOs of this CAN interface remain unchanged during an update.	

Tip!

Make sure that the transmit and receive process data objects, the data structure and the communication parameters match each other.

8.8.5.4 Mixed connection

A mixed form of the connections "Automatic connection" and "Manual connection" is possible. A mixed form of the connection "Predefined connection set connection" and another one is not possible.

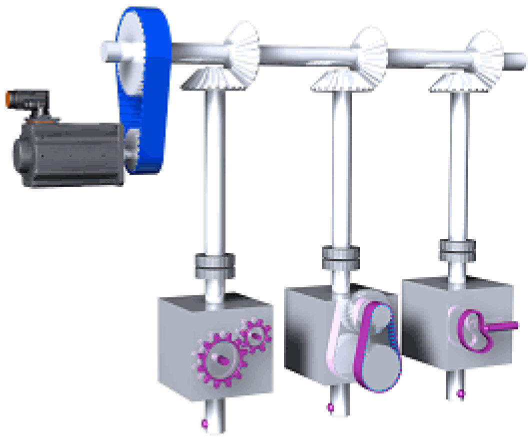
- Automatic connection (186)
- Manual connection (187)
- Specifying the procedure for assigning the COB-IDs (187)

8.9 Creating an interconnection via the electrical shaft

Note!

Only controllers with a cam functionality (e.g. 9400 HighLine) can be assigned to an electrical shaft.

The master value/master angle between the drives in the interconnection is transferred by means of the so-called "electrical shaft", which is based on the principle of the mechanical shaft ("line shaft"):



Here, a fundamental distinction is made between two ways of using cam technology:

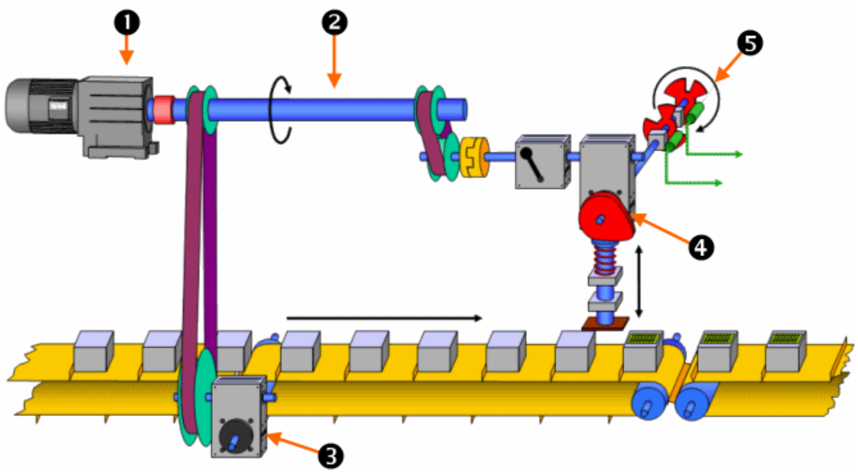
- Fixed synchronisation of the tools with regard to each other
- Synchronisation of the tools with a material

Tip!

It is not absolutely necessary that all axes of a machine belong to the electrical shaft.

8.9.1 Fixed synchronisation of the tools with regard to each other

By the absolute coupling of the drives via one master angle, the assignment of the (tool) positions to each other is "hard" as in the case of a mechanical shaft:



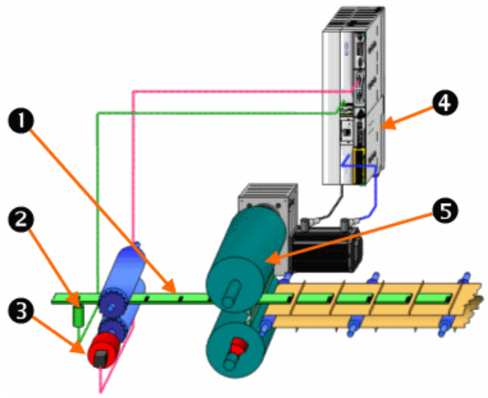
❶ Main drive (master)
❷ Line shaft (here: one revolution = 360° = one production cycle)
❸ Slave drive 1: Feed control tape (non-linear indexing unit)
❹ Slave drive 2: stamp drive (mechanical cam)
❺ Cam discs for generating control-cam signals (2 cam tracks)

[8-7] Principle of the mechanical shaft: fixed synchronisation of the tools with regard to each other

- A drive with a virtual master or a real master (encoder) can generate the master angle and transfer it to the other drives, which then comply with this master angle.
- The master angle/machine cycle is usually shown "modulo" with a cycle of 0 to 360°. All movements are exactly synchronised with this master angle.
- The tools can feature an optional measuring system ("limited", "unlimited", or "modulo" traversing range).
- For the interconnected drives, the busbar structure is used almost exclusively.

8.9.2 Synchronisation of the tools with a material

In the case of this relative coupling, the tools are not synchronised with each other but with the material path (e.g. by means of a touch probe sensor). Therefore in such applications, a master speed is needed.



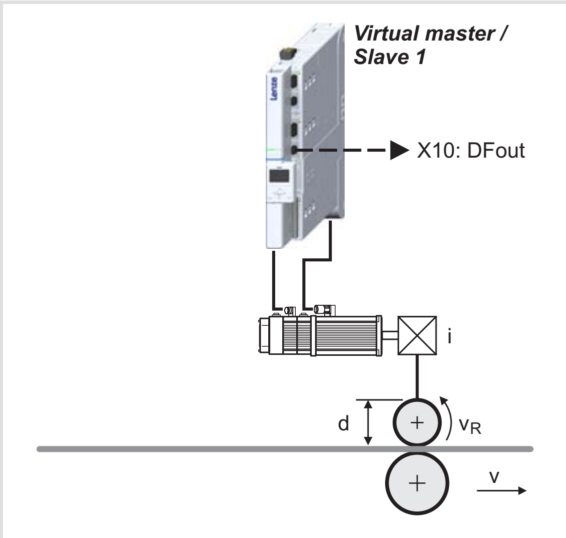
❶ Mark track on the material
❷ Mark sensor for detecting the register on the material (touch probe evaluation within the controller)
❸ Master value encoder (TTL incremental encoder; supplies speed by means of digital frequency input)
❹ Controller with electronic cam technology
❺ Orientation of the tool to the material (here: to the cutting mark)

[8-8] Principle: mark-controlled synchronisation of the tool to the material

- The master speed is either taken from the material path via an encoder or is stipulated in advance by the drive that determines the speed (virtual master).
- The tools rotate and are therefore modulo with a fixed modulo cycle.
- The material is modulo with a variable cycle (is measured if necessary, e.g. in the case of foil).
  - The curves are created for a nominal cycle/register.
  - Adaptation to the measured cycle is carried out individually for each tool in the drive by means of its own sensors during the runtime.

8.9.3 Virtual master/real master

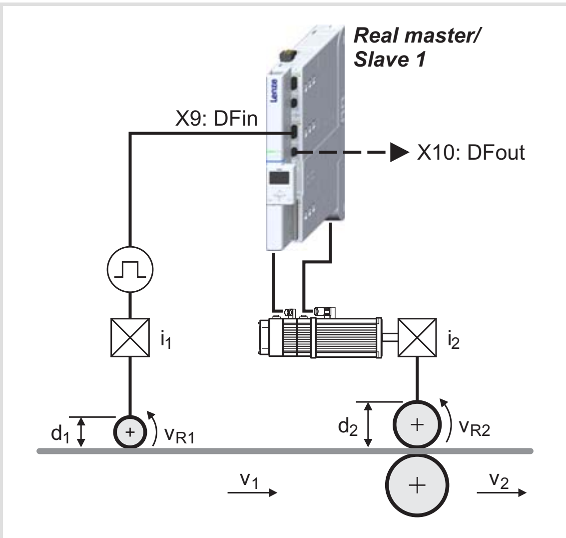
Virtual master



- A drive in the interconnection performs the tasks of the (virtual) master and is simultaneously the first slave drive.
- The master value formed by the "virtual master" function within the part the plant is transferred to the other slave drives via a bus system or the digital frequency output.

[8-9] Example of a "virtual master" (with transfer of master value via extension module master frequency)

Real master



- The master value is defined for a slave drive in the interconnection by a real master (e.g. external encoder).
- This can be done e.g. via the digital frequency input of the extension module or via a bus system.
- The master value (within the technology application; if necessary, edited) is transferred to the other slave drives via a bus system or the digital frequency output.

[8-10] Example of a "real master" (with master value transfer via extension module master frequency)

8.9.4 Establishing an interconnection via an electrical shaft

In »Engineer« the interconnection is created by means of an electrical shaft with the help of a wizard, which makes all the necessary entries step by step:

1. The specification of a definite designation.
   - As several electrical shafts can be implemented within a machine.
2. The assignment of axes to the electrical shaft.
   - Because not all axes of a machine necessarily have to be operated from the electrical shaft.
   - You can also assign non-cam-capable axes to the electrical shaft so that an interconnection can for instance be configured from a following axis and several cam axes with different device series.
3. The assignment of the measuring systems for the corresponding axis and the master value according to the x/y axis in the worksheet of the »Cam editor«.

Tip!

So-called "wildcards" can also be added to the electrical shaft. A wildcard can be used to delete real axes from the electrical shaft without the cam data and the measuring systems being lost.

▶ Adding placeholders to the interconnection (📖 197)

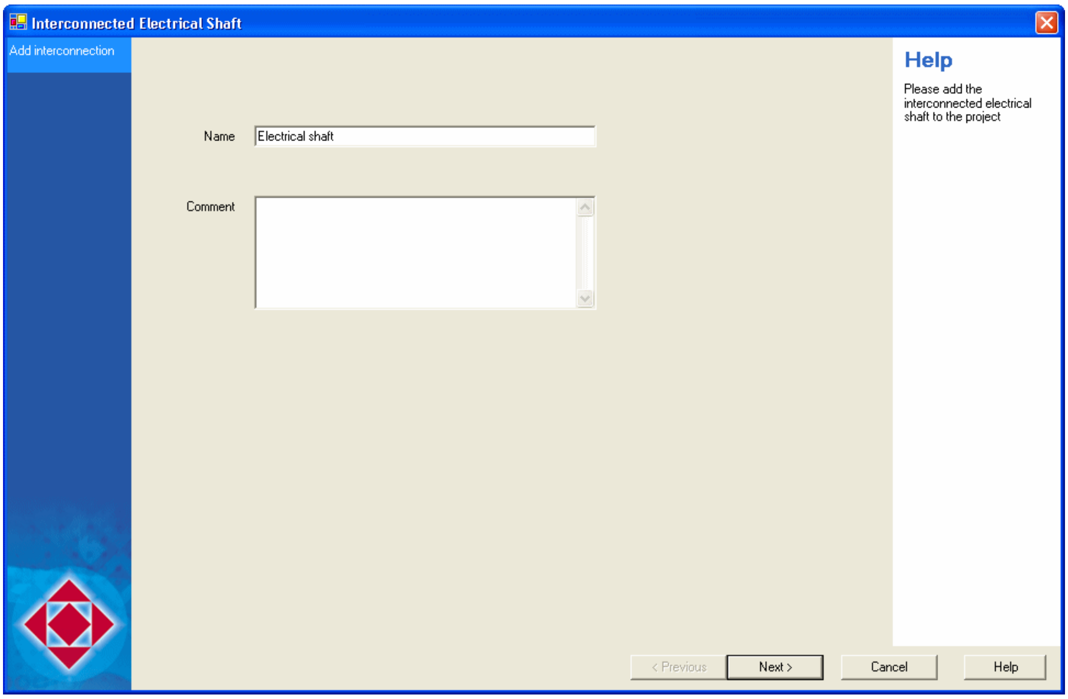
▶ Assigning an axis to a placeholder (📖 198)

▶ Cancelling existing assignments (📖 200)

How to insert an electrical shaft in the project view:

1. In the *Project view*, either select
   - the project element, or
   - select an already existing system module, into which the electrical shaft is to be inserted.
2. Click the icon to insert a machine application.
3. Select the "electrical shaft" in the *Machine application* dialog box.
4. Confirm selection with **OK**.
   - A wizard is then started which makes all the necessary entries step by step.

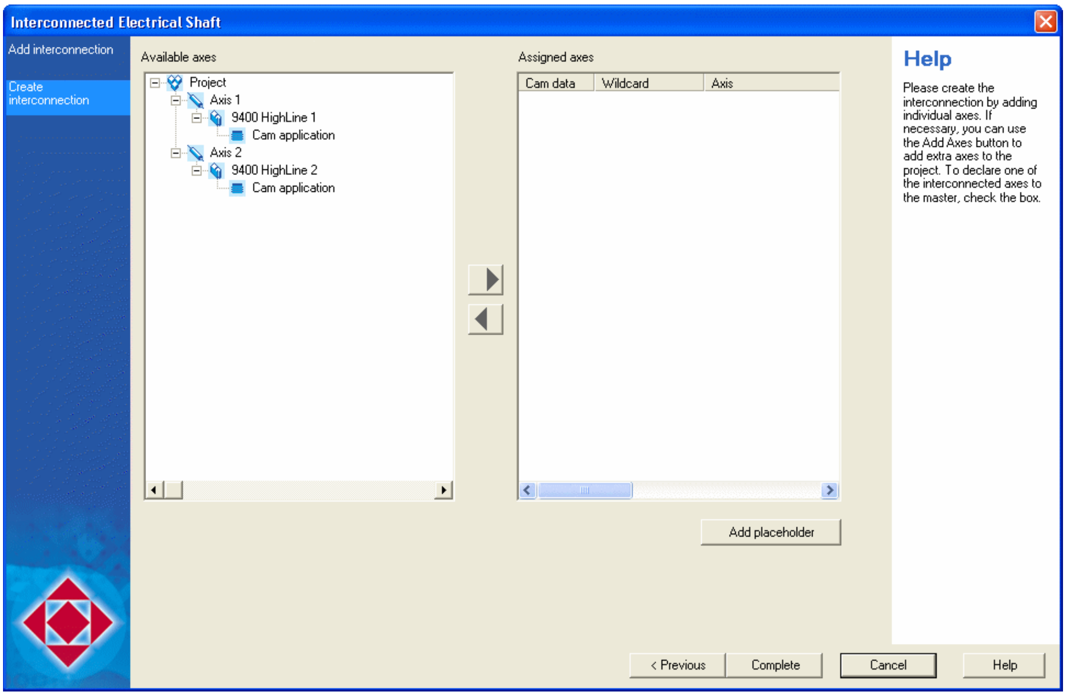
Step 1 – Adding an interconnection



5. Enter a name for the electrical shaft in the **Name** text field.
   - Optionally you can enter a comment on the electrical shaft in the **Comment** text field.
6. Click the **Next** button.

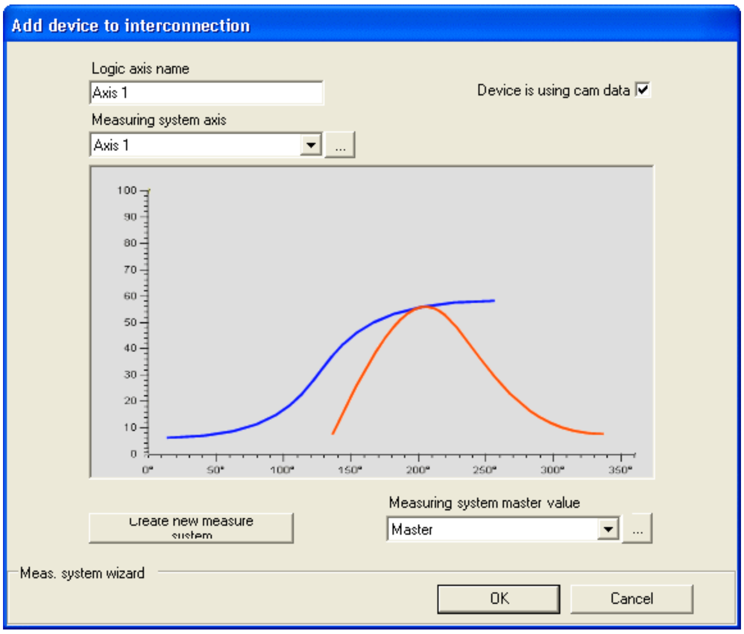
Step 2 – Creating an interconnection

Necessary because all axes of a machine do not necessarily have to be operated from the electrical shaft.



7. In the field on the left entitled **Available axes**, select the axis that is to be assigned to the interconnected (electrical shaft) system and click the ▸ button to assign the selected axis to the interconnection.

   The *Add device to interconnection* dialog box is displayed. Here, the measuring system for the master value is assigned:

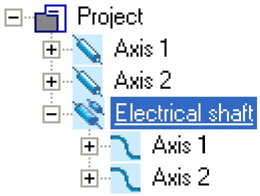


- By clicking the **Create new measuring system** button, you can also create a new measuring system if necessary in order to subsequently assign it to the master value.

8. Select a measuring system for the master value in the list field entitled **Measuring system master value**.
   - This measuring system is used as default setting for the x axis in the worksheet of the »Cam editor«.
9. Click the **Next** button to accept the settings and to close the dialog box entitled *Add device to interconnection*.
10. Repeat steps 7 to 9 for the other axes that are to belong to the interconnection via the electrical shaft.
11. Click the **Complete** button to accept the settings and close the wizard.

After inserting the electrical shaft...

...it is shown in the *Project view* with the assigned axes:



Interconnection, Measuring systems, Cam Manager & Connections

If you select an electrical shaft in the *Project view*, the *Workspace* contains the **Interconnection**, **Measuring systems**, **Cam Manager** and **Connections** tabs.

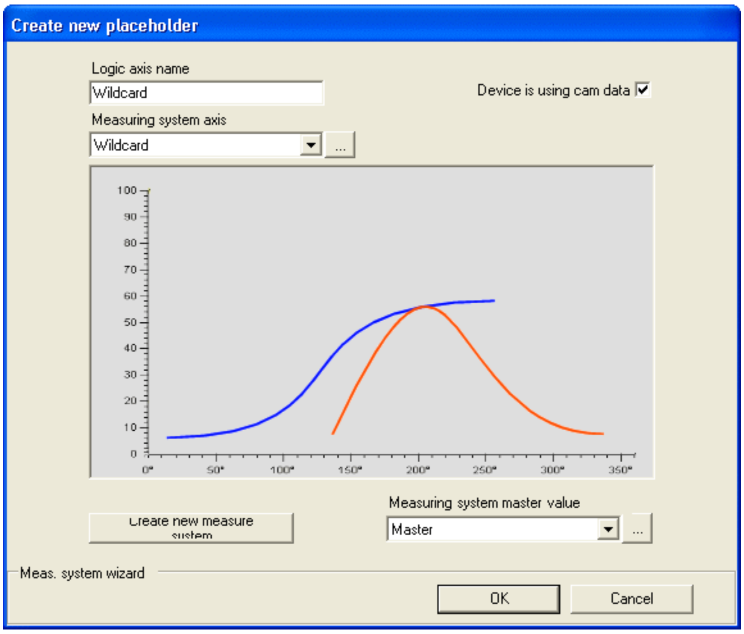
- In the **Interconnection** tab, all the axes that have been assigned to the electrical shaft are shown. In the **Interconnection** tab, you can:
  - Assign additional axes to the interconnection.
  - Adding placeholders to the interconnection (🕮 197)
  - Assigning an axis to a placeholder (🕮 198)
  - Cancelling existing assignments (🕮 200)
- In the **Measuring systems** tab all measuring systems available are shown. In the **Measuring systems** tab you can:
  - Creating/editing/deleting measuring systems (🕮 206)
- In the **Cam Manager** tab, you can:
  - Managing cam data with the »Cam Manager« (🕮 276)
  - Creating cam data with the »Cam Editor« (🕮 283)
- In the **Connections** tab, the connections of the ports which are relevant for the electrical shaft and via which the master value/master angle is transferred are shown.

8.9.4.1 Adding placeholders to the interconnection

So-called "placeholders" can be added to the interconnection via the electrical shaft. These placeholders can be used to delete real axes from the electrical shaft without the cam data and measuring systems being lost.

How to add a placeholder to the interconnection:

1. In the **Interconnection** tab, click the **Add placeholder** button.
   - The *Create new placeholder* dialog box is displayed:



2. If necessary, change the pre-assigned name of the placeholder in the text field **Logical axis name**.
3. If it is not a placeholder for a cam axis, deactivate the option "Device uses cam data".
   - As a result, devices without cam-capability can also be assigned to the placeholder.
4. Select a measuring system for the axis in the **Measuring system axis** list field.
   - This measuring system is permanently assigned to the axis or the placeholder ("axis-related measuring system") and, especially in the case of the 9400 HighLine, is mapped onto device parameters. As an alternative to the proposed measuring system, an already existing, free measuring system can be made into the axis-related measuring system if necessary.
   - The measuring system selected is used as default setting for the y axis in the worksheet of the »Cam editor«.
5. Select a measuring system for the master value in the list field entitled **Measuring system master value**.
   - This measuring system is used as default setting for the x axis in the worksheet of the »Cam editor«.

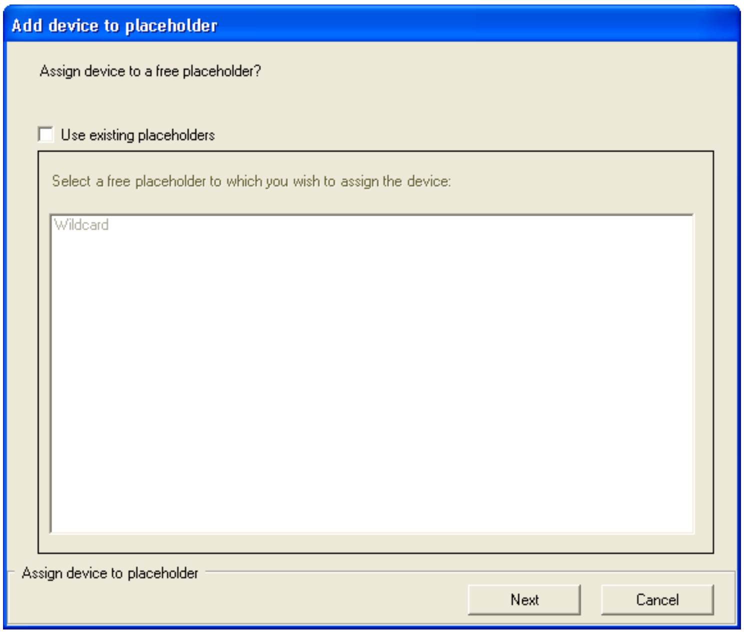
6. Click the **Next** button to add the placeholder to the interconnection and close the *Create new placeholder* dialog box.

8.9.4.2 Assigning an axis to a placeholder

You can assign a real axis to an existing placeholder at any time later on.

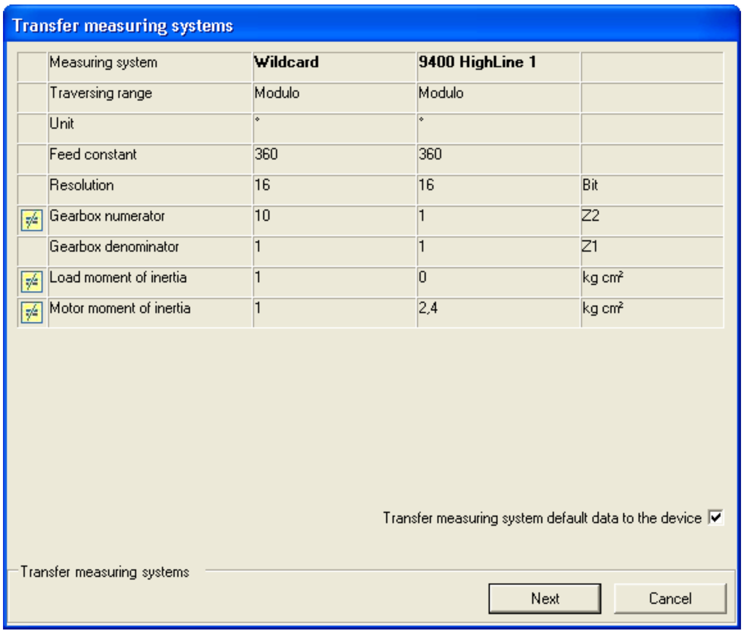
How to assign an axis to an already existing placeholder:

1. In the **Interconnection** tab, select the axis in the field on the left entitled **Available axes** and click the ▸ button.
   - If there is at least one placeholder to which an axis has not yet been assigned, the dialog box entitled *Add device to placeholder* is shown:



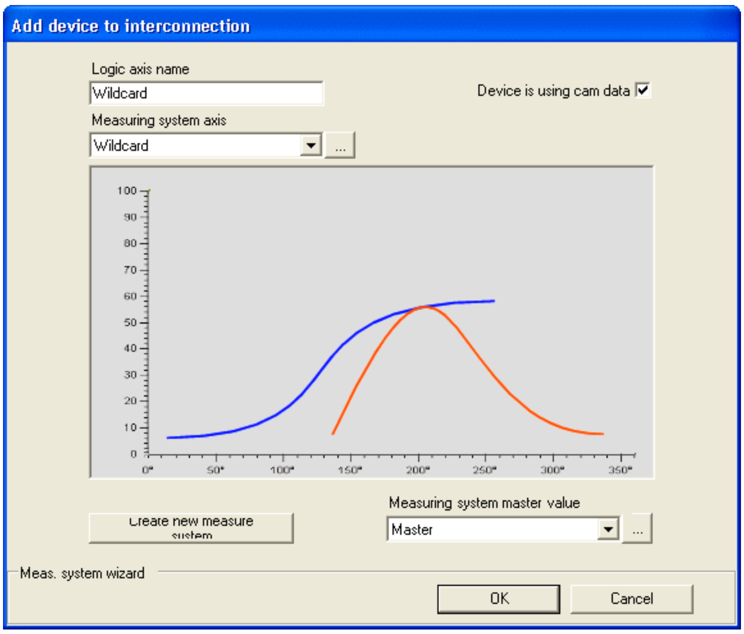
2. Activate the **Use existing placeholders** control field.
3. In the list field, select the placeholder to which the axis is to be assigned.
4. Click the **Next** button.

- The dialog box entitled *Accept measuring systems* with a comparison of the two measuring systems (placeholder and device) is then shown:



Note: If the two measuring systems have different settings, the control field **Integrate stipulated measuring system data into the device** is already activated. With this setting, the measuring system of the placeholder is integrated into the device.

5. Click the **Next** button.
   - The *Add device to interconnection* dialog box known already is displayed for selecting the measuring systems:



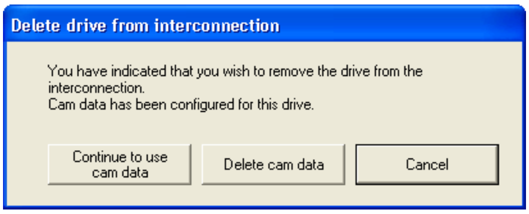
6. Click the **Next** button to assign the axis to the placeholder and close the dialog box entitled *Add device to interconnection*.

8.9.4.3 Cancelling existing assignments

You can delete an axis from the interconnection at any time without the cam data and measuring systems being lost.

How to delete an axis from the interconnection:

1. In the **Interconnection** tab, select the axis in the field on the right entitled **Assigned axes** and then click the ◂ button.
   - The *Delete drive from interconnection* dialog box is displayed:



2. Make the desired selection:
   - **Release device from the placeholder:** The axis is deleted from the interconnection. The placeholder as well as the cam data (profile data, cam data and position data) and measuring systems, however, are retained. If an axis is assigned to the placeholder again at a later time, the necessary cam file for this axis can be re-created on the basis of the existing cam data.
   - **Remove placeholder:** The placeholder and the axis are completely deleted from the interconnection.

8.9.4.4 Reusing the "Electrical shaft" object

An "electrical shaft" object that is shown in the Project view can be removed from an automation module and reused in another automation module by means of the **Copy** and **Insert** commands. Only the axes have to be reassigned to the placeholders in the copy that is created.

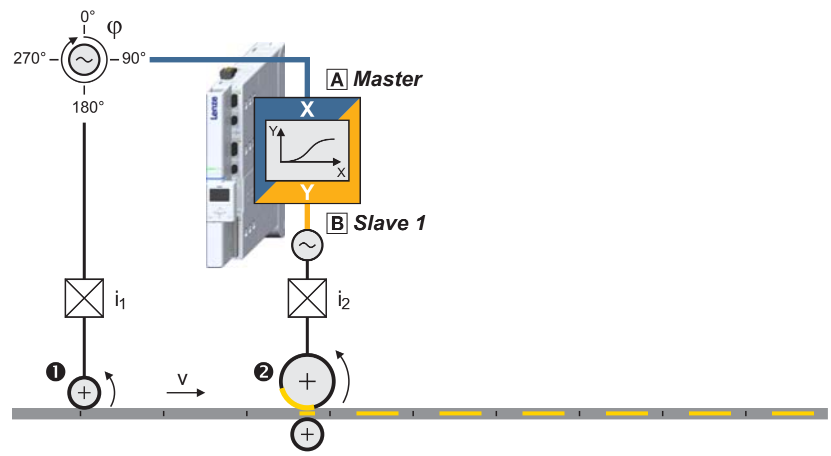
The same applies when the entire automation module including an electrical shaft contained therein is copied: After copying the automation module, you have to reassign an axis to each placeholder in the copy. The cam data (profile data, cam data, and position data) and measuring systems remain unchanged.

This allows you for instance to easily create variants of electrical shafts and to quickly exchange them.

8.9.5 Measuring systems

In a drive controller with a cam function, there are always at least two measuring systems: the measuring system for stipulation of the master values (master) and the measuring system for the drive axis (slave).

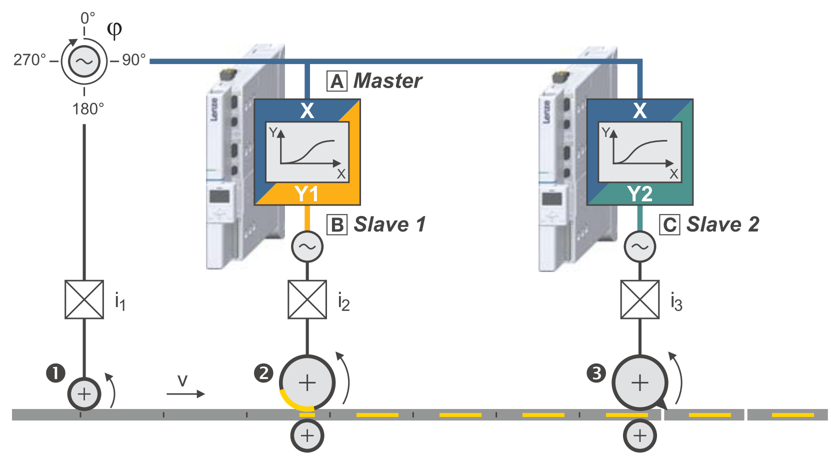
- The two measuring systems are merged with each other by means of the motion profile (curve), with account being taken of the mechanical data (machine parameters).



A Master measuring system
B Measuring system, slave 1
❶ Encoder for the master value selection (real master)
❷ Drive axis (slave 1)

[8-11] Example: Controller with cam function and two different measuring systems

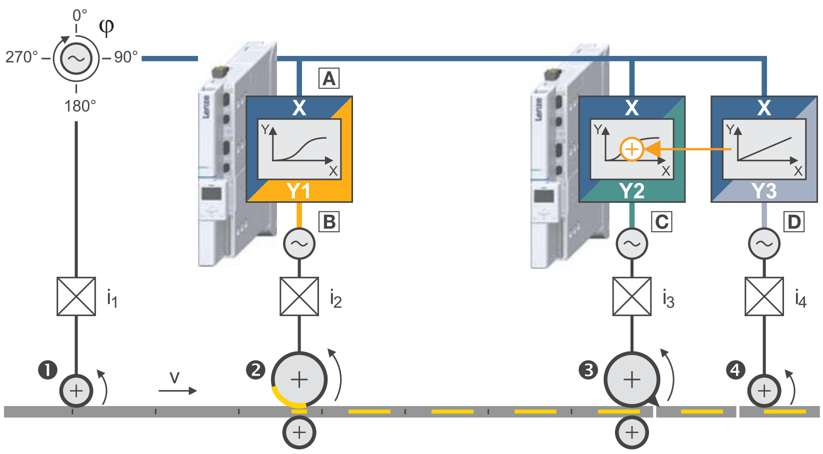
- If several drive controllers are interconnected, other measuring systems are added in accordance with the number of drive axes:



A Master measuring system
B Measuring system, slave 1
C Measuring system, slave 3
❶ Encoder for the master value selection (real master)
❷ Drive axis 1 (slave 1)
❸ Drive axis 2 (slave 2)

[8-12] Example: Controller interconnection with cam function and three different measuring systems

- Additional process encoders and characteristics also feature individual measuring systems:



A Master measuring system
B Measuring system, slave 1
C Measuring system, slave 3
D Process encoder measuring system
❶ Encoder for the master value selection (real master)
❷ Drive axis 1 (slave 1)
❸ Drive axis 2 (slave 2)
❹ Process encoder

[8-13] Example: Controller interconnection with cam function and four different measuring systems

Note!

It is important to use the correct measuring system for the interconnection of devices. The measuring systems do not represent the encoder but the tool or material. This means that rotating tools are usually represented n a modulo system, for example, whereas continuous material is represented in an unlimited measuring system.

8.9.5.1 Unlimited/limited/modulo traversing range

Motion profiles can only be described in close connection with the machine parameters. In particular, the nature of the traversing range and, in some cases, the cycle have a significant influence on the shape of the motion profile.

In principle, the different traversing ranges can be combined in any way in a motion profile but not all combinations are useful.

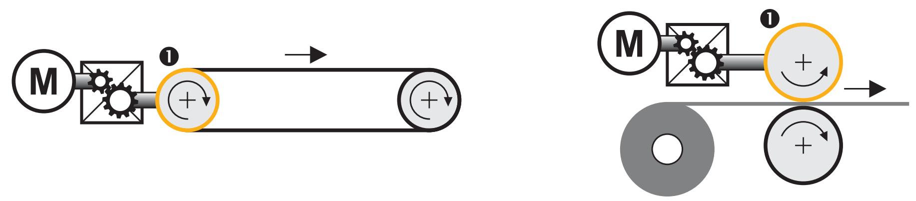
Note!

If you create a motion profile for the drive axis with the »Cam editor«, use the "Modulo" traversing range for the x axis in the »Cam editor«, as otherwise the master value/master angle is not closed by a cycle return and therefore cannot rotate.

The use of the "Unlimited" or "Limited" traversing ranges for the x axis in the »Cam editor« is only reasonable for a characteristic.

Unlimited traversing range

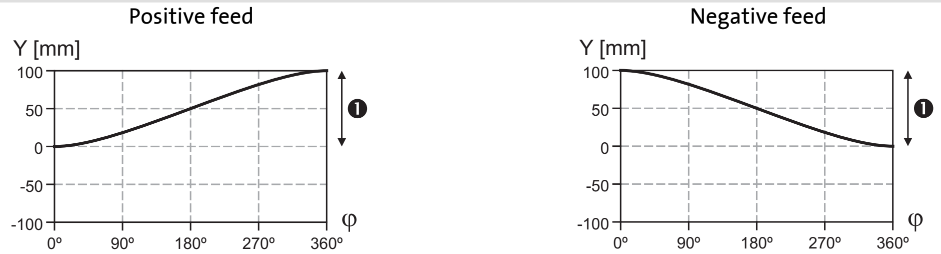
- The drive can rotate continuously in one direction.
- The tool to be driven is not divided (example: feed control tape).



❶ Drive can rotate continuously (no position reference available)

[8-14] Examples of an unlimited traversing range

- Typical curves for the unlimited traversing range:

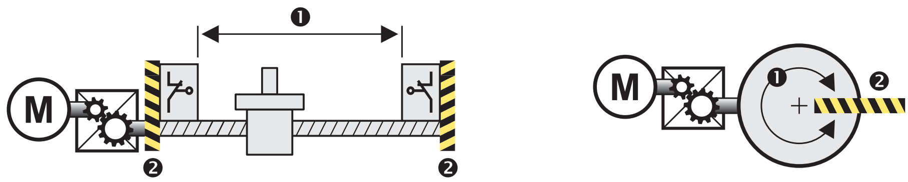


❶ Feed (lift) = cycle
Y = position of the axis
X = master value/master angle

[8-15] Example: Feed profiles

Limited traversing range

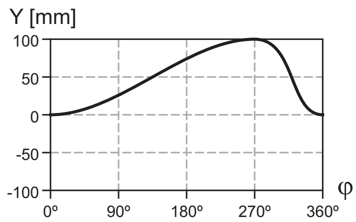
- The traversing range is limited by positive and negative position limits (mechanical limits/travel range limit switches/software limit positions).
- After a defined distance, traversing must take place in the opposite direction again (example: spindle drive/linear axis).



❶ Traversing range
❷ Mechanical limit (limit stop)

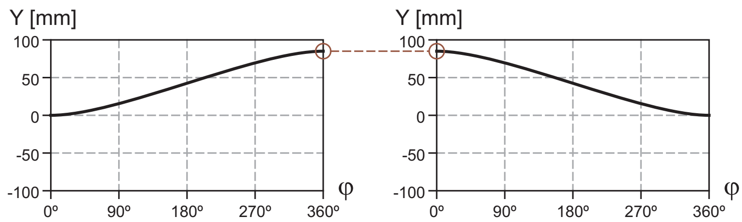
[8-16] Examples of a limited traversing range

- Typical curves for the limited traversing range:



Y = position of the axis
X = master value/master angle

[8-17] Example 1: Closed curve trace (forward-back profile)

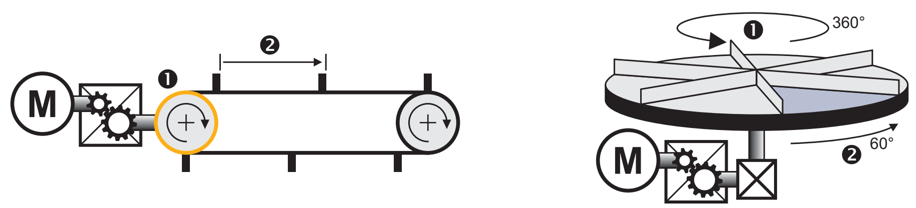


Y = position of the axis
X = master value/master angle

[8-18] Example 2: Closed curve trace (forward-back profile) as a sequence by means of two machine cycles ("weaving loom" principle)

Modulo traversing range

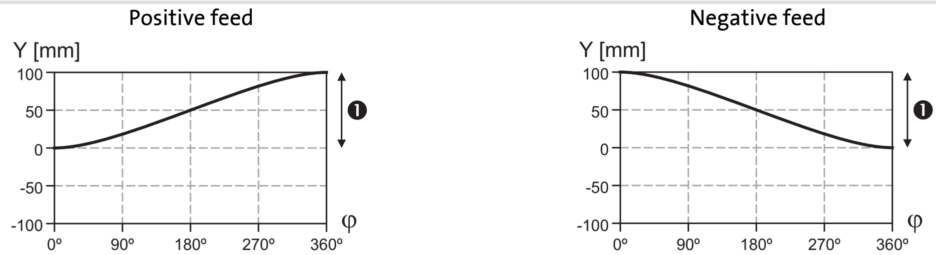
- The drive can rotate continuously in one direction.
- If the set cycle is exceeded, a defined overshoot takes place, i.e. the value range repeats itself periodically (example: rotary table).
  - In a rotating system, the cycle corresponds to a typical rotation (360°) or a distance between tools.
  - Depending on the branch of industry, the cycle is also called "register", "register length", "arc length", "arc size", "format cut length", etc.
- Absolute targets can be approached by exceeding the measuring system limit, e. g. from 10° to 350°.



❶ Drive can rotate continuously
❷ Cycle (fixedly defined division)

[8-19] Examples of a "modulo" traversing range

- Typical curves for a modulo traversing range



❶ Feed (lift) = cycle
Y = position of the axis
X = master value/master angle

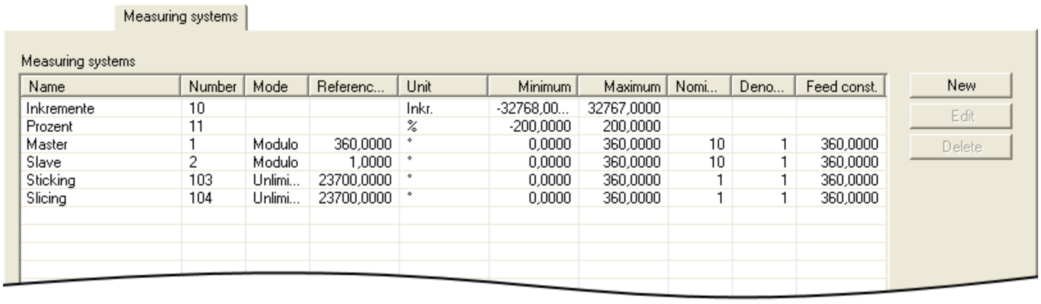
[8-20] Example 1: Feed profiles

Note!

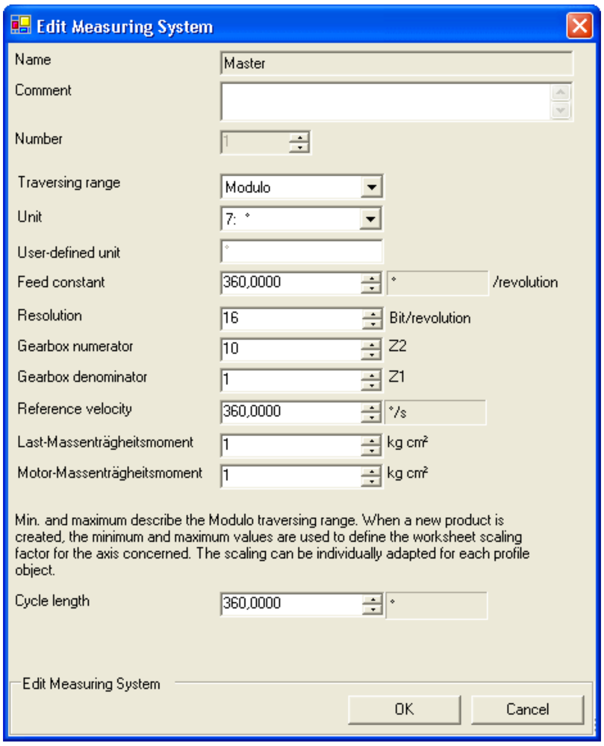
In the modulo traversing range the feed (lift) defined by the motion profile has to correspond to the cycle, i. e. the curve has to be completed with the cycle end!

8.9.5.2 Creating/editing/deleting measuring systems

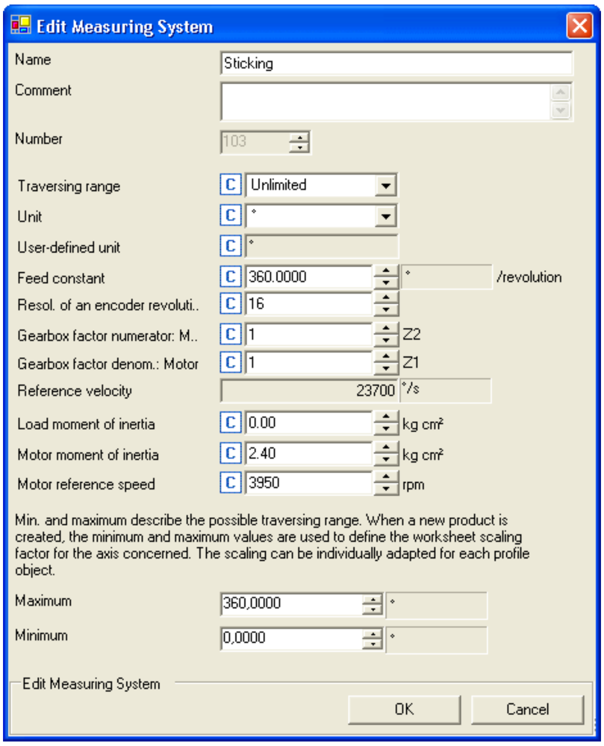
If you open the *Project view* and select an already existing electrical shaft, the *Workspace* contains the **Measuring systems** tab in which all the existing measuring systems are shown:



- In the list field all measuring systems that have already been created are shown.
- By clicking the **New** button, you can, if necessary, create additional measuring systems that cannot be directly assigned to a drive (e.g. for additional correction-value encoders in the machine).
- You can delete a measuring system that is no longer needed by selecting a measuring system in the list field and clicking the **Delete** button.
- By selecting a measuring system in the list field and clicking the **Edit** button (or simply by double-clicking the measuring system in the list field), you open the *Measuring system* dialog box in which the data of the corresponding measuring system are shown and can also be edited:



▶ If it is an axis-related measuring system, the global machine constants ("machine parameters") are shown in the *Edit measuring system* dialog box:



Note!

If you click the **Accept** button in the case of an axis-related measuring system, the changes made have a direct effect on the corresponding machine parameters of the drive interface.

Input field	Information
Name	Optional text • The first 16 characters are represented by the parameters of the function blocks in the drive.
Description	Optional text • The description entered is only provided in »Engineer«.
Number	Consecutive number that is automatically allocated by »Engineer« and is used for assigning an address to the measuring system in the drive. • If an FB (e.g. the "L_CamGetAxisData" FB) of this measuring system is to be used, the number shown in this field is to be transferred to the FB via its *dnAxisNumber* input.
Traversing range	Selection of the traversing range in accordance with the desired mechanics. • If you want to use this measuring system for the x axis in the »Cam editor«, set "Modulo" as traversing range!
Unit	Selection of the unit • With the help of the user-defined unit, informative production units such as "bottles" can be set. Select the "User-defined" entry as the unit and then enter the desired user-defined unit in the **User-defined unit** input field.
Feed constant	Information indicating how many units are traversed with a revolution at the gear-output end (e.g. 360°, 500 mm, ...). • The same applies if you have several panels on a tool within this revolution.

Input field	Information
Resolution	Resolution of an encoder revolution (shift factor) • Higher values usually lead to greater positioning accuracy and a higher dynamic performance but limit the traversing range that can be shown. • If possible, consult Lenze if you want to use a resolution different to the default setting.
Gearbox numerator/ denominator	The gearbox ratio is to be stipulated in the form of two gearbox factors (numerator/denominator) and indicates the number of motor-axis revolutions during which exactly one revolution around the load axis (e.g. spindle or drive roll) takes place. • You can obtain the necessary data from the Technical Data of the gearbox. For exact stipulation of the gearbox ratio, you should use the resulting teeth numbers indicated on the data sheet or in the catalogue instead of the information on the nameplate.
Reference speed	Indication of maximum speed at which the axis is traversed. • All acceleration and deceleration ramps, among other things, of the FBs that use this measuring system make reference to this value.
Load moment of inertia	This optional information is used to calculate the precontrol variables and usually leads to a better dynamic performance and a greater precision.
Motor moment of inertia	
Minimum / maximum	Specification of the unlimited/limited traversing range • Example 1: 0,0000 mm (minimum) to 500,0000 mm (maximum) in the "Unlimited" traversing range. • Example 2: -10,0000 mm (minimum) to -100,0000 mm (maximum) in the "Limited" traversing range. **PLEASE NOTE:** Changes in the **Minimum** and **Maximum** input fields have an effect on the worksheet in the »Cam editor«. By this, motion profiles, cams, or position marks already entered may be deleted.
Cycle	Specification of the cycle for the "Modulo" traversing range. • Example: Cycle 180,0000° for a double use. **PLEASE NOTE:** Changes in the **Cycle** input field have an effect on the worksheet in the »Cam editor«. By this, motion profiles, cams, or position marks already entered may be deleted.

9 Inserting & configuring a network

In this part of the project creation you add networks to the project, define the communication nodes and configure the networks inserted and the nodes assigned. It is the objective to enable the exchange of information between the devices of the system.

- The basis of all worksteps is a logical view to networks.
- Physical connections, topologies, bus connections, and also contents and the structure of the variables communicated within a network are not important here.
- The *Project view* only presents the assignment between the system structure consisting of system modules and axes, and the networks integrated.
- If you select a network in the *Project view*, the *Workspace* shows you various tabs that you can use to configure the corresponding network. The setting possibilities depend on the type of network and are described in more detail in the section of this document relevant to the network in question.

Note!

- Configurations that have been carried out are **not immediately** accepted (online) in device-specific parameter assignments (codes)!
  - The acceptance of changes is started by the compilation process (menu command **Tools→Build project** or **<F11>**) for the whole project after you have defined the interconnections.
  - During the compilation process the »Engineer« generates the required parameter assignments and applications.
  - Afterwards transfer the parameter set to the corresponding device. (Menu command **Online→Download parameter set** or **<F5>**).
- The »Engineer« provides for the establishment and the configuration of a network (CAN and ETHERNET Powerlink).
- A project can contain several networks of the same or of a different type. In each case, the devices of a project can communicate with each other in different networks!

9.1 Separation of the application and the network

In the »Engineer«, communication between the controllers can be effected via the application level or the network level.

- In the Application level, the interfaces (ports) of devices for an application are defined and interconnected.
- In the Network level, transfer-specific parameters are defined. This includes the creation of networks, the addition of nodes to networks, and the parameter setting of the process data objects. (📖 212)
- By separating the two levels you can generate an application and decide later on via which communication medium the information is to be exchanged during the runtime.
- »Engineer« enables you to concentrate on the application.
- The creation of process data objects and the assignment of interfaces (ports) are carried out by the »Engineer«.
- If you have created an application, you may have to make some minimum settings. This is referred to in another part of the documentation.

9.1.1 Application level

In the application level, the interfaces of an application, the ports, are defined. The application can be a program or a permanent application.

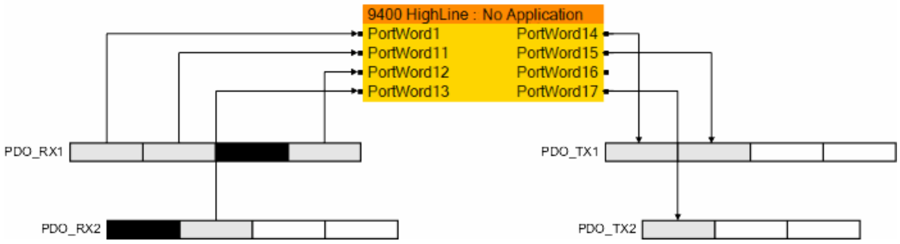
- The application can send process data to the outside or receive them from the outside via the ports.
- The ports are defined by the port editor. ▶ Port editor (📖 162)
- The port editor can be called for both an application on a device and for a cross-machine application, the "machine application".

Tip!

The machine application serves as a structuring means for the generation of system modules which already contain a predesigned interconnection.

Process data objects (PDOs)

In order to transfer the data of the port via a communication medium, e.g. system bus (CAN), they have to be assigned to a process data object.



- The assignment of the interface/process data object via which a date is sent or received can be made automatically or manually. The assignment is defined in the port editor when the port is created.
- A process data object can serve as a container for several ports. Several ports can thus be transferred by a process data object.
- The **Process data objects** tab serves to create and parameterise process data objects (PDOs). ▶ Process data objects (📖 234)

Related topics:

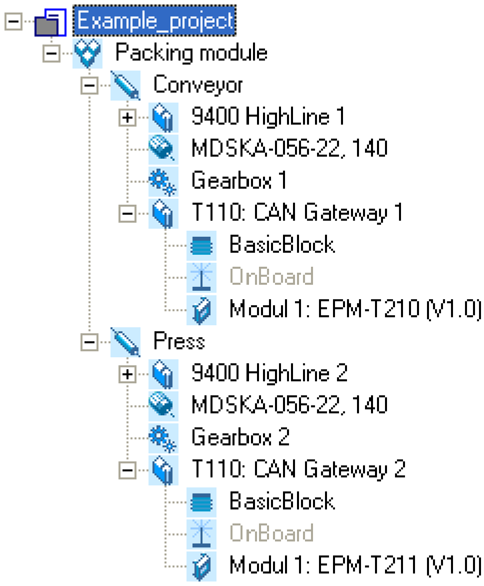
▶ Defining the system functionality (📖 138)
▶ Parameterising & configuring the devices (📖 142)
▶ Inserting & configuring a machine application (📖 179)

9.1.2 Network level

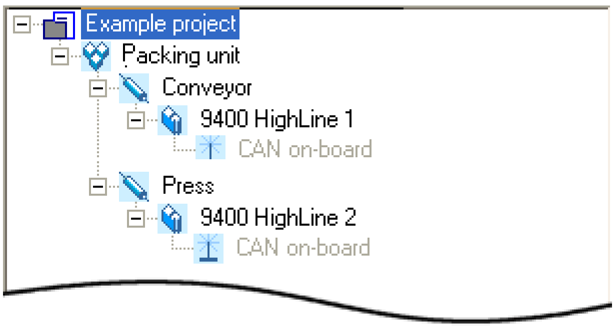
On the network level, you can assign a network to the nodes created and parameterise it. If a network object, e.g. the system bus (CAN), has been selected in the project tree, the tabs displayed can be used to make general settings.

Layout of the communication structure

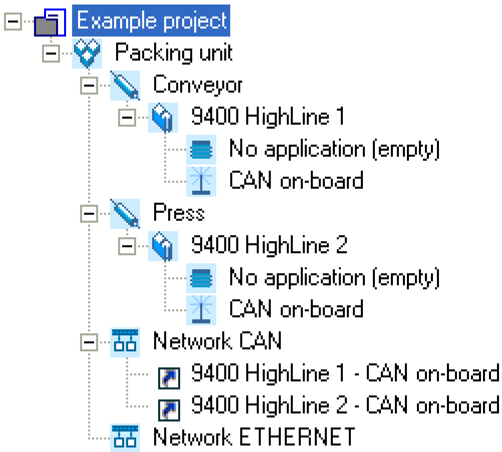
If you create a new project, in the first step you describe the system structure by means of system modules and axes and then add the corresponding devices to these structuring elements:



If you then change to the "Network" project view, only the existing structuring elements (system modules and axes) as well as the included network-relevant components are shown in the *Project view*:



Starting from this situation, you can now add a communication structure to the project by adding the networks in the system at a corresponding position:



Inserting a network (214)

More information about the network

ETHERNET Powerlink network (217)

CAN network (223)

Next steps

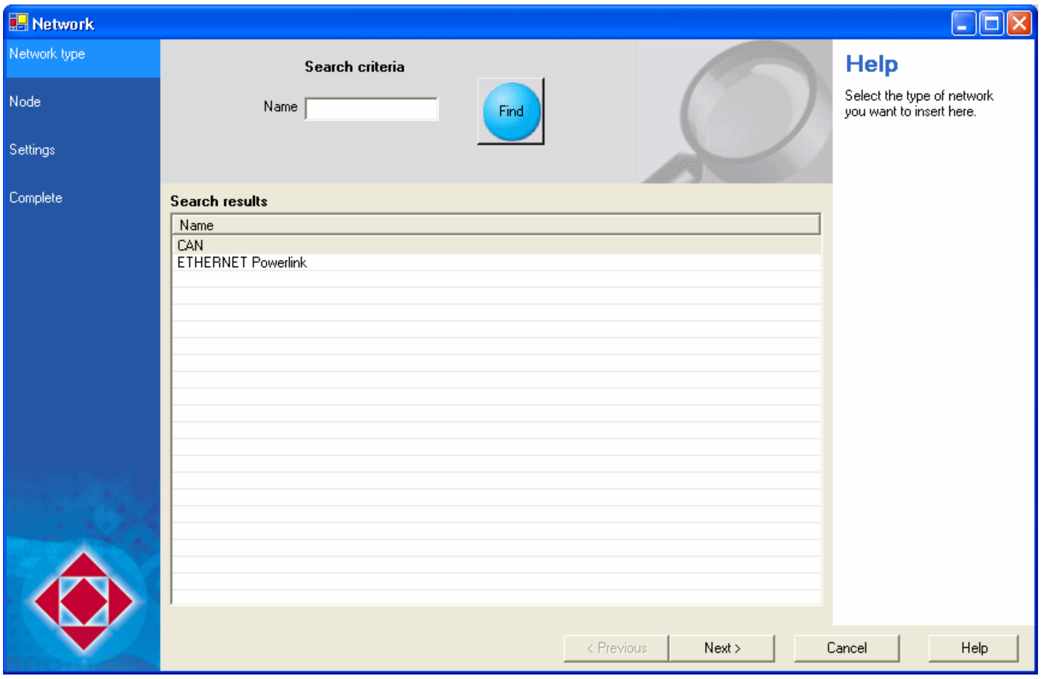
If you have added all networks to your project and have defined and parameterised the associated nodes, the project is completely established from the view of the networks.

- Now you can define the functions of your entire system.
- You can change to other areas of the »Engineer« anytime to view certain settings or to alter settings.

9.2 Inserting a network

How to insert a network:

1. Select the system module or the axis which a network is to be inserted in from the *Project view*.
2. Click the icon.
   - The *Network* dialog box appears:

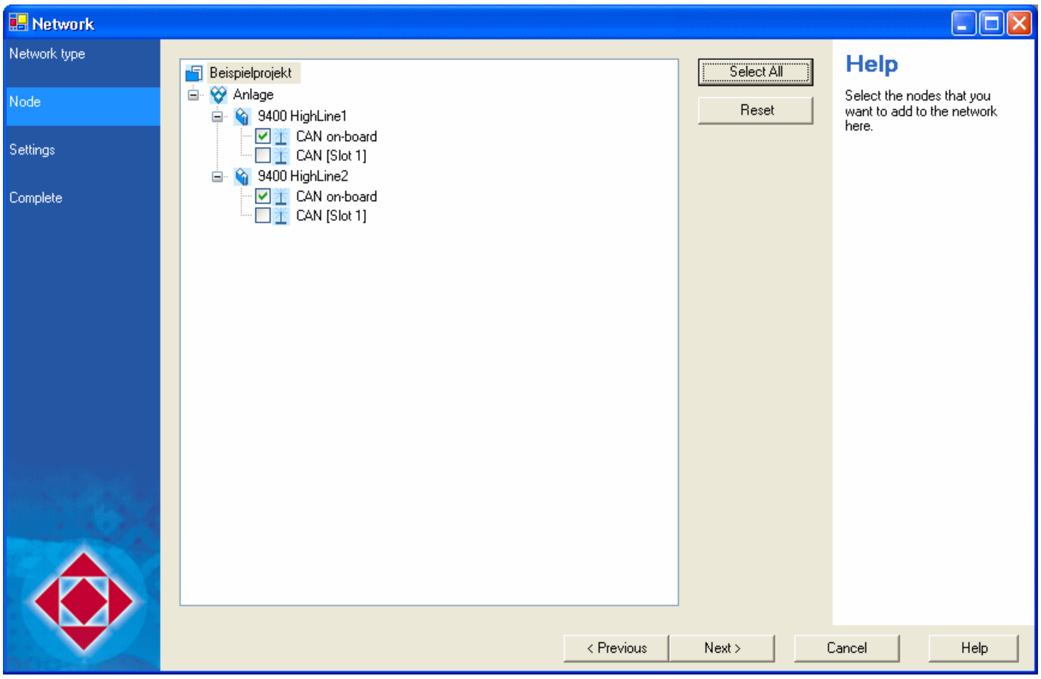


Step 1 - Network type
- All networks available are displayed in the **Search results** list field.
- The »Engineer« supports "CAN" and "ETHERNET Powerlink" by Lenze.

3. Select the network to be inserted in the **Search results** list field.

4. Click the **Next** button.

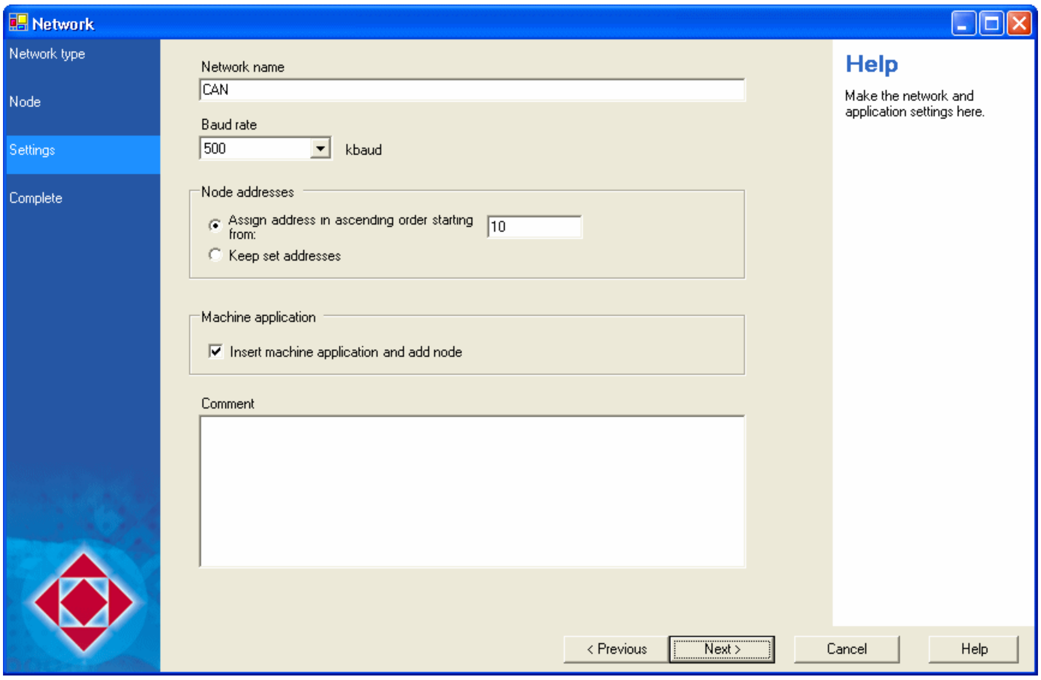
Step 2 - Nodes



5. Highlight the corresponding nodes.
   - The nodes that are not connected are displayed.
   - If you click the **Select all** and **Reset** buttons, all the control fields are highlighted or the highlighting is removed.
6. Click the **Next** button.

Step 3 - Settings

In the case of an ETHERNET Powerlink network, the **Baud rate** selection field is not available.



7. Highlight the control field entitled **Insert machine application and add nodes** if all existing devices are to be automatically added to the network as nodes.
   - If the control field has been highlighted, a machine application that is shown in the project tree is also added to the project. The selected applications are already integrated in the machine application.
   - The indicated default values for Lenze devices do not need to be changed in the settings area.
   - All compatible network nodes which are below the network system module are added to the network. If a device has several node interfaces of the same type, a selection dialog appears.
   - All assigned network nodes are pre-assigned addresses in ascending order. In the case of CAN, the minimum address is taken from the settings.
8. Click the **Next** button.
   - An information text appears.
     You can either alter the node addresses in the »Engineer« project or at the hardware switches.
9. Click the **Complete** button.
   - The selected network is inserted into the highlighted element.

9.3 ETHERNET Powerlink network

If you select a network of the type "ETHERNET Powerlink" in the *Project view*, various tabs are shown in the *Workspace* and you can use them to configure the inserted network.

Tip!

You can find detailed information on the subject of the "ETHERNET Powerlink" in the communication manual of the same name "ETHERNET Powerlink".

- You can use the **Nodes** tab to add nodes to the network or remove already existing nodes from the network.
  Nodes (223)
- Via the **Settings** tab you can carry out settings concerning the network as a whole. Settings (228)
- Via the **Properties** tab you can change the name of the network and add a comment to the network.
- Via the **Diagnostics** tab you can read out the status of the network via the codes specified. Diagnostics (222)

Tip!

It is advisable to first specify and configure all the nodes of a network by means of the **Nodes** tab and to only then enter the global settings of the network by means of the **Settings** tab.

9.3.1 Nodes

On the **Nodes** tab of the "ETHERNET Powerlink", you set up nodes that are to communicate with each other via the network.

- You can build a network out of nodes that you have inserted into the project by means of the *Insert device module* dialog box.

Tip!

If during inserting the network in the *Insert network* dialog box the control field entitled **Insert machine application and add nodes** was highlighted, all existing devices have automatically been inserted into the network as nodes.

Working in the network view

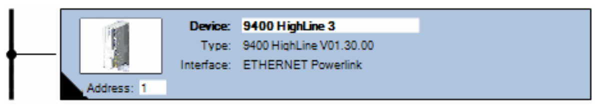
In the upper position, the network view is provided with an individual toolbar.

▶ Click on an icon to execute the corresponding function.

Icon	Menu command	Function
	**Network→Insert node**	Inserting nodes (📖 225)
	**Network→Remove node**	Removing nodes (📖 227)
	**Network→Node settings**	Node settings (📖 227)
	-	Sort the nodes according to address
	**Network→Zoom in view**	Increase the size of the information shown in the **Nodes** tab
	**Network→Zoom out view**	Reduce the size of the information shown in the **Nodes** tab
	**Network→Overview**	Show overview window
	**Network→Whole worksheet**	Adapt the information shown to the whole worksheet
	**Network→Page width**	Adapt view to the width of the worksheet
	**Network→Print**	Print worksheet

Context menu in the network view

The *Network view* furthermore provides you with a *Context menu* for each node, featuring the following commands:

Command	Function
Removing nodes	Delete selected node from the network.
Set master (MN)	Define node as Managing Node (MN). • The master initialises the Ethernet Powerlink and carries out the associated change of status from *Pre-Operational* to *Operational*. • The node taking over the role of the Managing Node (MN) in the network view is identified by a black triangle in the left corner at the bottom: 

9.3.1.1 Inserting nodes

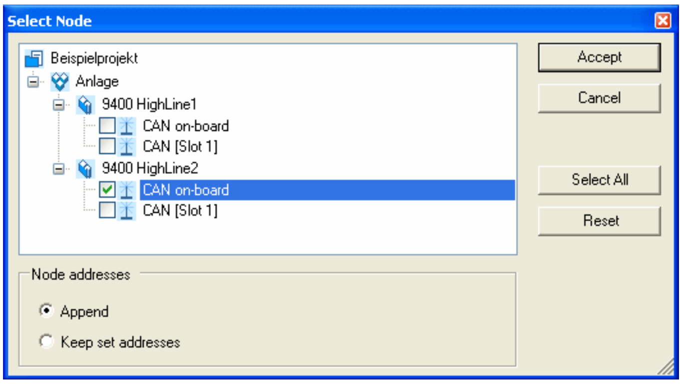
Tip!

Instead of manually inserting nodes into the network, you can insert the network in the *Insert network* dialog box and at the same time highlight the control field entitled **Insert machine application and add nodes** in order to automatically insert all existing devices into the network as nodes.

▸ Inserting a network (214)

The (manual) selection of a node is effected via the *Node selection* dialog box, where all components of the system structure containing communication-capable devices (e. g. controllers with a system bus interface) are specified again in a tree structure:

In the Node selection dialog box only those nodes are available that have not yet been inserted.



- You can construct a network only out of nodes that also exist in your project as devices capable of communication.
- The element below a communication-capable device in this connection represents an individual, independently configurable node interface (not to confuse with the physical bus connection).
- If a device is provided with several node interfaces which can be configured independently from each other, it can appear in several networks or in the same network as a multiple node.

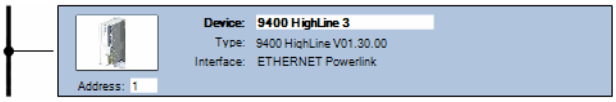
Note!

In the tree view in the *Node selection* dialog box, only those devices are shown that can be inserted into the network as nodes.

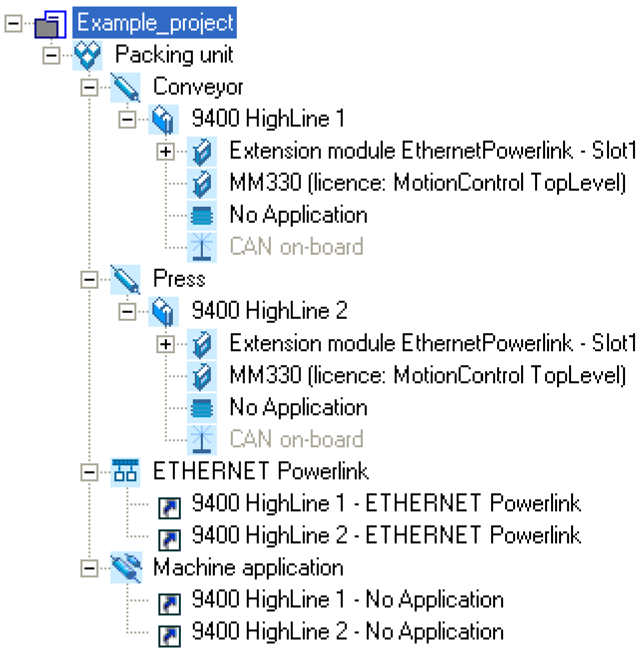
How to insert a node into the network:

1. In the *Network toolbar*, click the icon.
   - The *Node selection* dialog box is shown.
2. Select the node interface in the tree structure, the higher-level device of which is to be inserted in the network as node.
   - Devices containing only one node interface can be selected without opening them further to the node interface in the tree structure.
3. Click the **OK** button.
4. The dialog box then closes and the selection is accepted.

▶ The node inserted is then displayed in the *Network view* as follows:



▶ In the Project view additionally all nodes of the network are listed as a "linkage" below the network element:



▶ Repeat the command **Add node** if you want to insert further nodes into the network.

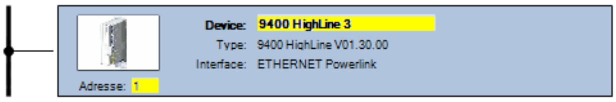
9.3.1.2 Node settings

Configuration options in the network view

You can change the address of a node, its name and the designation of the device directly in the *Network view*.

How to change a setting in the network view:

1. Click into the corresponding text field to change the respective setting:



2. Press **<Input key>** to accept the change.

Further configuration options

Further settings with regard to a node can be carried out via the **Properties**, **Settings** and **Diagnostics** tabs.

How to define the further settings of a node:

1. Select the node to be configured in the *Network view*.
   - In the network view a selected node is highlighted by a green frame.
2. In the *Network toolbar*, click the icon.
   - The »Engineer« switches to the network view
3. Carry out the corresponding node settings in the **Settings, Properties**, **Monitoring**, **Diagnostics** and **Process data objects** tabs.
   - The information can be found in the "ETHERNET Powerlink" Communication Manual.
   - Via the icon in the *Toolbar* you can go back to the settings of the network.

9.3.1.3 Removing nodes

Click the icon in the *Network toolbar* to remove the selected node from the network.

9.3.2 Settings

In the **Settings** tab, you specify the global settings that are applicable to the whole network. You specify the EPL cycle time and check the level of EPL cycle utilisation. With additional settings, you can optimise the network.

9.3.3 Properties

In the **Name** text field you can enter a name for the system module.

Optionally you can enter a comment on the system module in the **Comment** text field.

The Version and Protocol fields cannot be edited.

9.3.4 Diagnostics

In the **Diagnostics** tab you can check the quality state of the network.

9.4 CAN network

If you select a network of the type "CAN" in the *Project view*, the *Workspace* provides you with various tabs that you can use to configure the network.

Tip!

Detailed information about the topic "CAN" can be found in the "System bus (CAN)" Communication Manual.

- You can use the **Nodes** tab to add nodes to the network or remove already existing nodes from the network. ▸ Nodes (📖 223)
- Via the **Settings** tab you can carry out settings concerning the network as a whole. ▸ Settings (📖 228)
- Via the **Synchronisation** tab you can carry out settings with regard to the synchronisation of the nodes among each other. ▸ Synchronisation (📖 230)
- Via the **CAN objects** tab you can have a list displayed, showing the CAN process data objects to be transferred on this network, which have been generated during the course of the compilation process. ▸ CAN objects (📖 232)
- Via the **Properties** tab you can change the name of the network and add a comment to the network.

Tip!

It is advisable to first specify and configure all the nodes of a network by means of the **Nodes** tab and to only then enter the global settings of the network by means of the **Settings** tab.

9.4.1 Nodes

In the **Nodes** tab, you set up the nodes that are to communicate with each other via the network.

- In the **Nodes** tab, the nodes are shown in the form of a network.
- You can construct a network only from nodes that you have also inserted into the project as devices.

Tip!

If during inserting a network in the Network dialog box the control field entitled **Insert machine application and add nodes** was highlighted, all existing devices have already been inserted automatically into the network as nodes.

Working in the network view

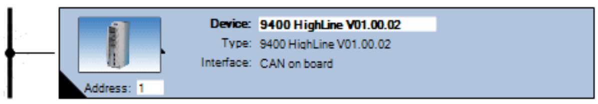
In the upper position, the network view is provided with an individual toolbar.

▶ Click on an icon to execute the corresponding function.

Icon	Menu command	Function
	Network→Insert node	Inserting nodes (📖 225)
	Network→Remove node	Removing nodes (📖 227)
	Network→Node settings	Node settings (📖 227)
	-	Sort the nodes according to address
	Network→Zoom in view	Increase the size of the information shown in the **Nodes** tab
	Network→Zoom out view	Reduce the size of the information shown in the **Nodes** tab
	Network→Overview	Show overview window
	Network→Whole worksheet	Adapt the information shown to the whole worksheet
	Network→Page width	Adapt view to the width of the worksheet
	Network→Print	Print worksheet

Context menu in the network view

The *Network view* furthermore provides you with a *Context menu* for each node, featuring the following commands:

Command	Function
Removing nodes	Remove node from the network.
Reset node	Changes to the node are accepted
Set NMT master/slave	Define node as master or slave. • The master initialises the CAN and carries out the associated change of status from *Pre-Operational* to *Operational*. • The node taking over the role of the master in the network view is identified by a black triangle in the left corner at the bottom: 

9.4.1.1 Inserting nodes

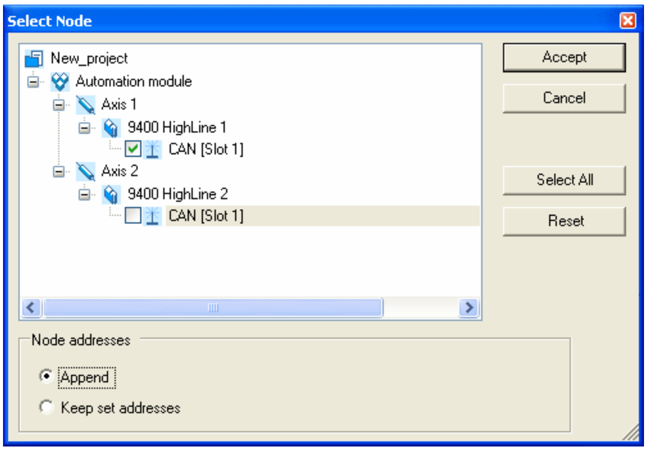
Tip!

Instead of manually inserting nodes into the network, you can insert a network in the Network dialog box and, at the same time, highlight the control field entitled **Insert machine application and add nodes** in order to insert all the existing devices into the network as nodes automatically.

▶ Inserting a network (214)

The (manual) selection of a node is effected via the *Node selection* dialog box, where all components of the system structure containing communication-capable devices (e. g. controllers with a system bus interface) are specified again in a tree structure:

In the Node selection dialog box only those nodes are available that have not yet been inserted.



- You can construct a network only out of nodes that also exist in your project as devices capable of communication.
- The element below a communication-capable device in this connection represents an individual, independently configurable node interface (not to confuse with the physical bus connection).
- If a device is provided with several node interfaces which can be configured independently from each other, it can appear in several networks or in the same network as a multiple node.

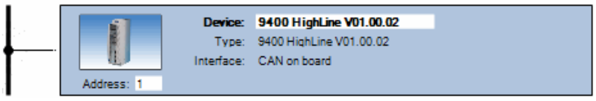
Note!

In the tree view in the *Node selection* dialog box, only those devices are shown that can be inserted into the network as nodes.

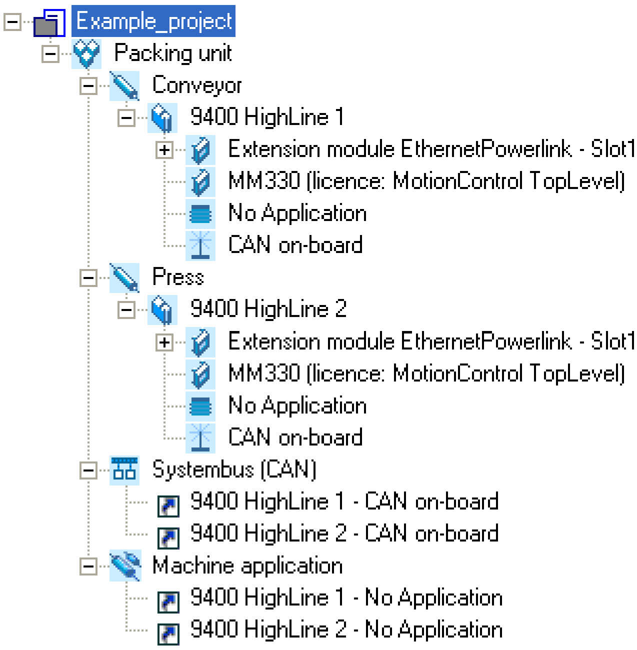
How to insert a node into the network:

1. Click the icon in the *Network toolbar*.
   - The *Node selection* dialog box is shown.
2. Select the node interface in the tree structure, the higher-level device of which is to be inserted in the network as node.
   - Devices containing only one node interface can be selected without opening them further to the node interface in the tree structure.
3. Click the **OK** button.
4. The dialog box then closes and the selection is accepted.

▶ The node inserted is then displayed in the *Network view* as follows:



▶ In the Project view additionally all nodes of the network are listed as a "linkage" below the network element:



▶ Repeat the command **Add node** if you want to insert further nodes in the network.

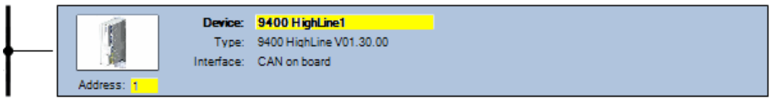
9.4.1.2 Node settings

Configuration options in the network view

You can change the address of a node, its name and the designation of the device directly in the *Network view*.

How to change a setting in the network view:

1. Click into the corresponding text field to change the respective setting:



2. Press **<Input key>** to accept the change.

Further configuration options

Further settings with regard to a node can be carried out via the **Properties**, **Settings** and **Monitoring** tabs.

Tip!

Detailed information on the CAN for controllers of the Servo Drives 9400 device series can be found in the "9400 CAN on board" Communication Manual.

How to define the further settings of a node:

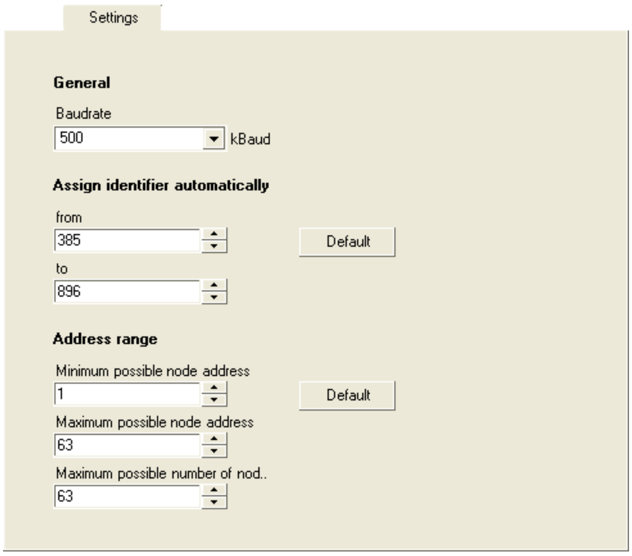
1. Select the node to be configured in the *Network view*.
   • In the network view a selected node is highlighted by a green frame.
2. In the *Network toolbar*, click the icon.
3. Carry out the corresponding node settings in the **Properties**, **Settings** and **Monitoring** tabs.
   • Via the icon in the *Toolbar* you can go back to the settings of the network.

9.4.1.3 Removing nodes

Click the icon in the *Network toolbar* to remove the selected node from the network again.

9.4.2 Settings

In the **Settings** tab you define the global settings applying to the entire network.



General

In order to enable communication via CAN, all nodes must use the same data transfer rate.

▶ Via the **Baud rate** list field you can centrally define the data transfer rate for the entire network:

Possible settings	Information
20 kbps	• If you change the baud rate setting for a node, you must then execute the command Reset node to make the change effective. • Lenze devices are preset with a data transfer rate of 500 kbps.
50 kbps	
125 kbps	
250 kbps	
500 kbps	
1000 kbps	

Automatic allocation of identifiers

Process data objects have a definite identifier.

▶ You can use the **from** / **to** input fields to specify a range for the automatic allocation of identifiers for all process data objects parameterised within »Engineer«.

Tip!

Specifying such a range can be useful if process data objects are also to be communicated within the actual network in your plant and their identifiers cannot be determined with the help of »Engineer«. This situation exists when there are external devices in a system that cannot be configured within »Engineer« but can nevertheless participate actively in communication.

- In such a case, you can separately determine these external devices and the identifiers of the process data objects sent by these devices.
- In »Engineer«, you then set the permissible range to ensure that identifiers which have already been allocated externally are not used or allocated again.

Address range

A so-called node address, also called "Node ID", is to be assigned to each node within the system bus network as a definite identification.

- ▶ For the nodes, node addresses in the range of 1 ... 63 can be allocated.
- ▶ You can use the **Minimum node address** and **Maximum node address** input fields to further restrict this range.
- ▶ You can use the **Maximum number of nodes** input field to limit the maximum number of possible nodes.

Restoring standard settings

Click the **Standard** button to restore the standard settings for the identifier range or the address range.

9.4.3 Synchronisation

You can use the **Synchronisation** tab to configure the necessary parameters in order to synchronise the internal time base of selectable network nodes with the arrival of a so-called SYNC telegram. You can also specify the node that is to send a SYNC object. The nodes that are to adapt their internal control cycle to the sync object.

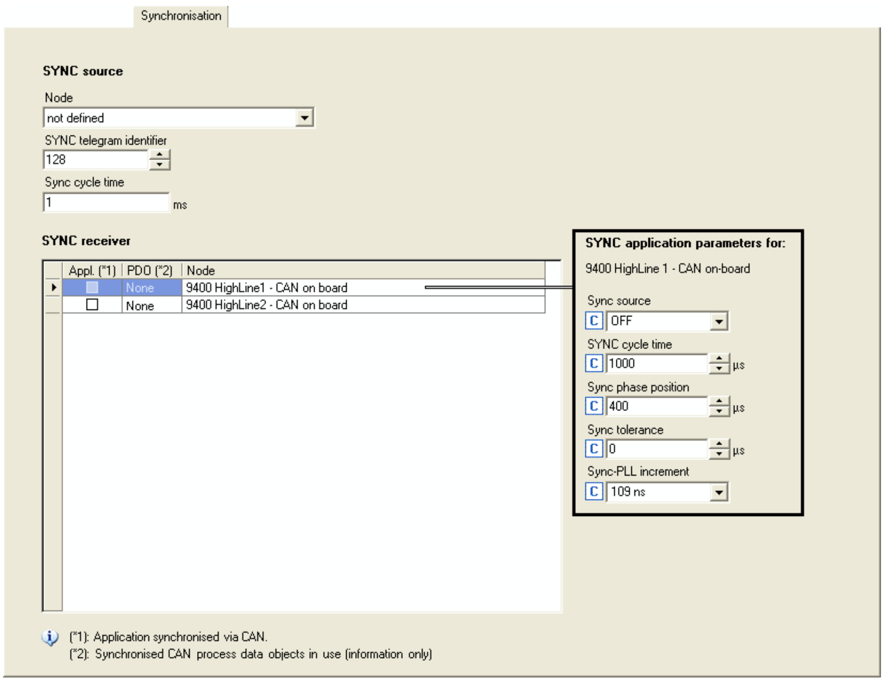
By this, the internal calculation processes (e. g. control-oriented processes) of a node can be synchronised with the calculation processes of other nodes which can also process the SYNC telegram.

SYNC source

Setting	Information
Nodes	Selection of the node that cyclically sends the SYNC telegram.
Sync telegram identifier	Transmit identifier of the SYNC telegram. • Setting range: 1 ... 256 • Default setting: 128
Sync cycle time	Transmission cycle for the SYNC telegram • Setting range: 0 ... 65000 ms • Default setting: 0 ms (= Off)

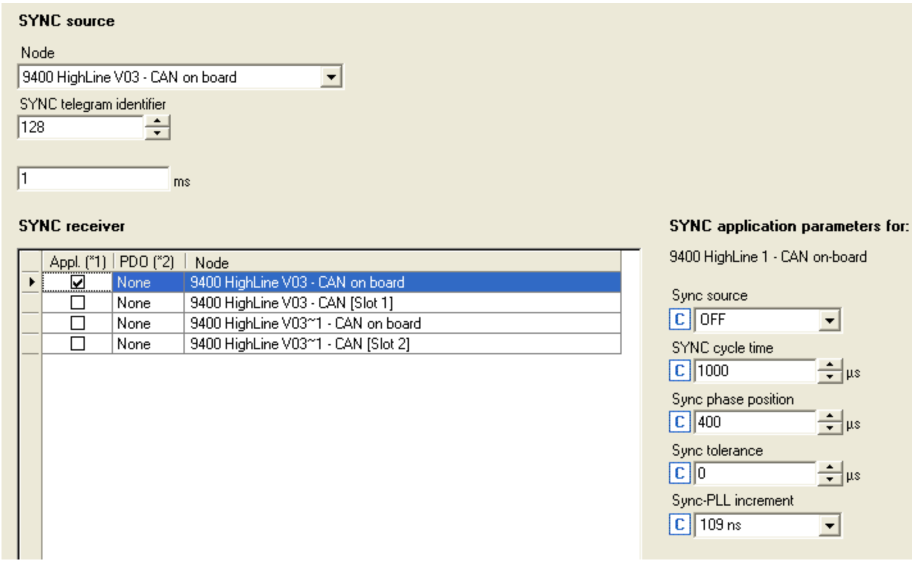
SYNC receiver

In this list field select the nodes which are to synchronise to the SYNC telegram in the first column by clicking the corresponding control fields.



▶ In the **SYNC source** group field the SYNC source with COB-ID and time interval is determined.

- In the **SYNC receiver** group field all nodes of the network are displayed in tabular form.
  - The **Appl. (*1)** column indicates whether the process is to be synchronised to the SYNC object on the corresponding device. If no process can be synchronised to the SYNC object on the device, the respective cell will be inhibited.
  - The **PDO (*2)** column indicates whether the "Synchronised" transfer mode is available for a process data object of this node.
- In the **SYNC application parameters for:** group field, further parameters of the SYNC receivers selected are shown. These parameters are device-specific and, except for the SYNC source, are not set automatically.
- Exception
  - If the parameter that indicates SYNC source C1120/0 has been set for a 9400 field device and if the **Appl. (*1)** control field has been highlighted for a node in the SYNC receiver table, C1120 is set to CAN OnBoard or CAN Module.



9.4.4 CAN objects

This tab shows you a list of the CAN process data objects (PDOs) to be transferred on the network, which have been generated in the course of the compilation process.

Objects that have been created by means of a general circuit interconnection of devices, and objects that have been constrained through deselection of the **Automatic allocation** control field are displayed.

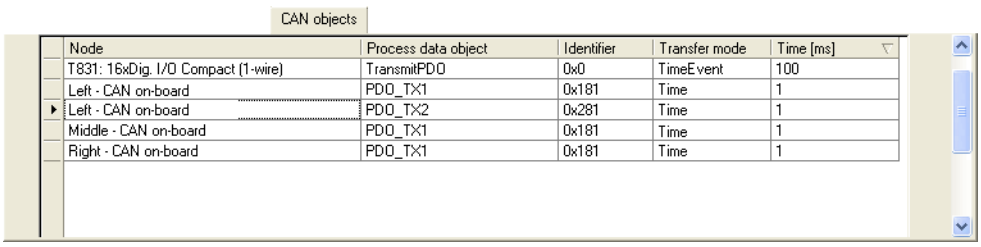
The list contains the following information:

Column	Information
Nodes	Objects of the interconnected circuit.
Process data object	Application for which the CAN process data object has been created.
Identifier	COD-IDs allocated to the CAN process data object. • This setting can also be altered in the list.
Transfer mode	Transfer mode with which the CAN process data object is sent via the system bus.
Time [ms]	The time is set to 100 ms by default. **Note:** To ensure that an electrical shaft functions optimally, the transmission time of the send objects (TPDOs) must have been set to **1 ms**. • You can find further details on the processing of transmission parameters in the following section: ▸ Process data objects (📖 234)

Note!

You can find detailed information on CAN process data objects in the "CAN on board 9400" communication manual .

The **CAN objects** tab provides an overview of the process data objects that can be sent via a network:


CAN objects

Node	Process data object	Identifier	Transfer mode	Time [ms]
T831: 16xDig. I/O Compact (1-wire)	TransmitPDO	0x0	TimeEvent	100
Left - CAN on-board	PDO_TX1	0x181	Time	1
Left - CAN on-board	PDO_TX2	0x281	Time	1
Middle - CAN on-board	PDO_TX1	0x181	Time	1
Right - CAN on-board	PDO_TX1	0x181	Time	1

Note!

The **CAN objects** tab cannot be edited.

- The information displayed is only valid for a completely updated project.
  ▸ Build project (📖 89)

Click the **Linking of send and receive objects...** button to open a dialog box that displays the linkage of the sent and received process data objects in the tree structure. For purposes of a better orientation, the transmission process data objects are sorted according to nodes.

9.4.5 Properties

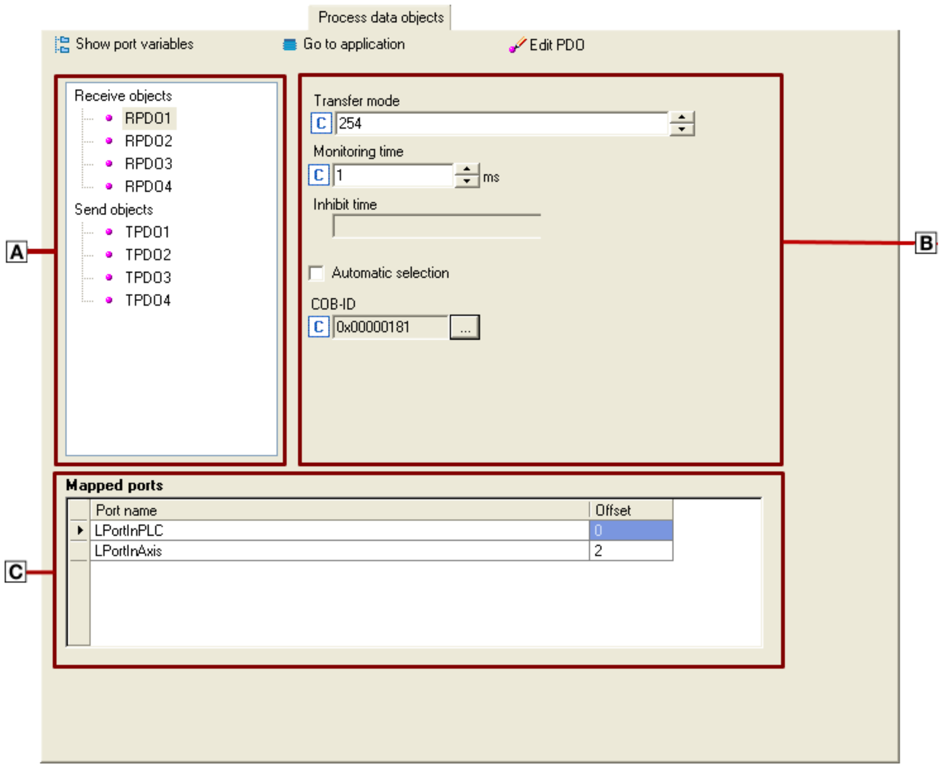
In the **Name** text field you can enter a name for the system module.

Optionally you can enter a comment on the system module in the **Comment** text field.

The **Version** and **Protocol** fields cannot be edited.

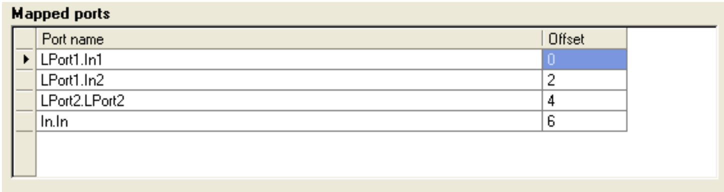
9.5 Process data objects

The **Process data objects** tab shows the current available process data objects for a node.

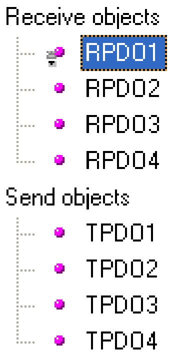


Range	Information
A Process data objects	Display of all process data objects for the node selected, divided into send and receive process data objects. The number and name of each process data object depends on the device in question. If a process data object has been marked as "manual", a lock is shown in the icon next to the corresponding process data object. Manual or automatic is indicated by means of the **Automatic allocation** control field in the **Transfer parameters** area. The network generator is only available for establishing a connection if the **Automatic allocation** control field has been highlighted ✓.
B Transfer parameters	Depending on the process data object selected, the associated transfer parameters are displayed here. The selection and editing of the fields depends on the send and receive process data objects as well as on the support for this function provided by the node itself. **COB-ID** selection field Normally, the COB-ID for an interconnection is allocated by means of a generation run **Tools→Build project**. If a process data object is required for an interconnection, a valid COB-ID is entered for the sender and all receivers. If a process data object is not used, it can be inhibited by setting bit[31]. **Automatic allocation** selection field If you want to force sending or receiving of a process data object, you can do so by deselecting the **Automatic allocation** control field and specifying the desired COB-ID.
C Mapped ports	Here all mapped ports are shown. The **Offset** column reflects the byte offset within the process data object.

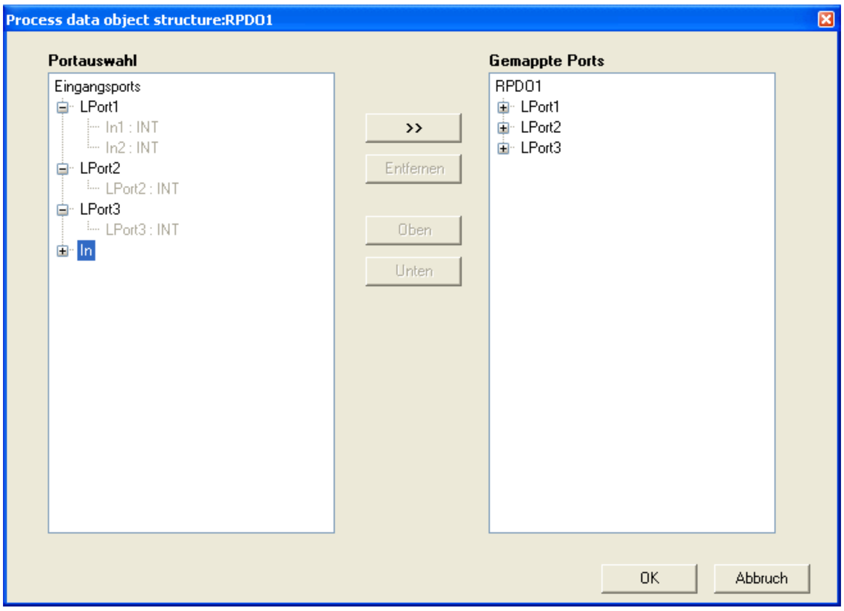
- If you click the **Display port variables** button, the variables of the ports are displayed in the **Mapped ports** area.



- Click the **Edit PDO** button to open the *Process data object structure* dialog box of the selected process data object.



- In this dialog box the process data structure (mapping) can be changed.
  - The dialog box is device- and interface-dependent.



Note!

You are responsible for the correct setting and effects on the system!

9.5.1 Packing ports into process data objects

The mechanism for packing ports into process data objects works in the same way for all networks. The **Network** button in the *Project view bar* in »Engineer« enables a filtered view of the network configuration.

If the **Automatic allocation** control field in the **Process data objects** tab has been highlighted ✓, implementation of the mapping information relating to device-specific information is adopted by the device-specific generators.

The aim is to send as few process data objects as possible via the bus system.

10 Application examples

In this chapter some examples are used to illustrate the cooperation between applications and network in the »Engineer«. The examples focus on the connection between process data objects and ports.

- ▶ The examples can be reproduced in offline operation.

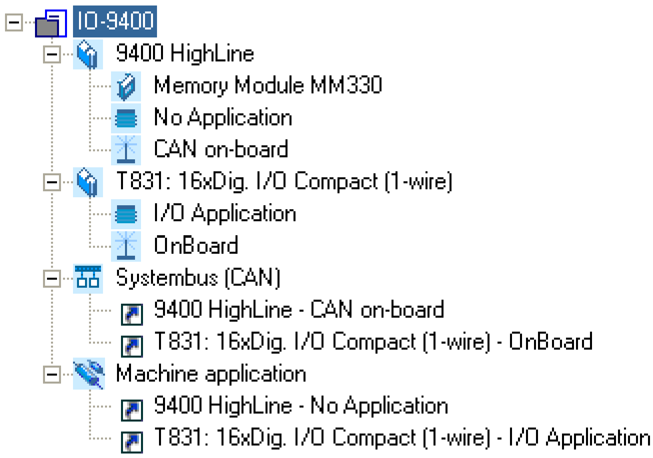
10.1 Interconnection of an I/O terminal with a 9400 HighLine

A terminal **16xdig. I/O compact (single-wire conductor)** is interconnected to a **9400 HighLine**.

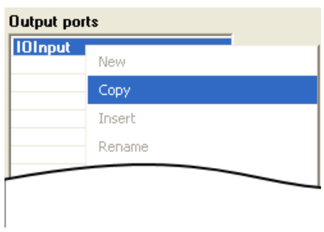
- ▶ In the *FB Editor* of the **9400 HighLine** the inputs and outputs of the I/O module are provided.

How to interconnect an I/O terminal with the 9400 HighLine:

1. Create the following project tree in the project view:

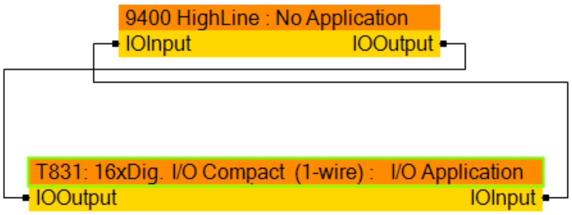


2. In the *Project tree*, select the project element **T831: 16xdig. I/O compact (single-wire conductor)** and change to the **Ports** tab.
3. Open the context menu (left-hand mouse button) and use it to copy the output port of the terminal:

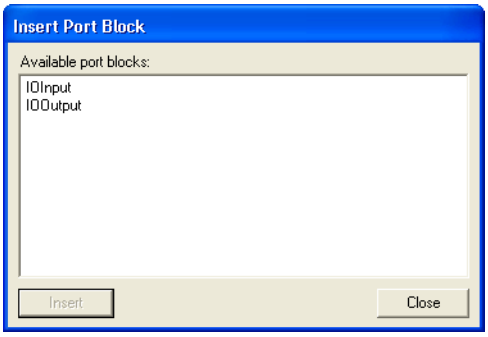


4. Insert the copied output port as the input port into the port editor (**Ports**) tab of the **9400 HighLine**.
5. In the same way, insert the input port of the terminal as the output port into the port editor of the **9400 HighLine**.

6. Select the project element **Machine application** in the project tree and change to the **Connections** tab.
7. Interconnect the two ports as follows:



8. Select the project element **9400 Highline** in the project tree and change to the **FB Editor** tab.
9. Click the icon to insert the two ports into the FB Editor and connect them to other function blocks:



10. Mark the uppermost project element in the project tree and execute the menu command
Tools→Build project.

Result

Two CAN Tx process data objects are created.

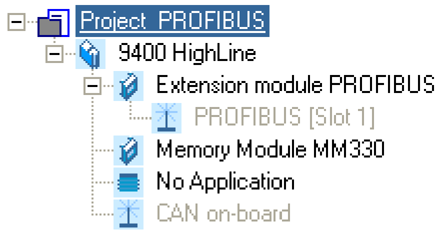
10.2 PROFIBUS nodes

Four data words are to be received from a PLC and processed in the FB Editor.

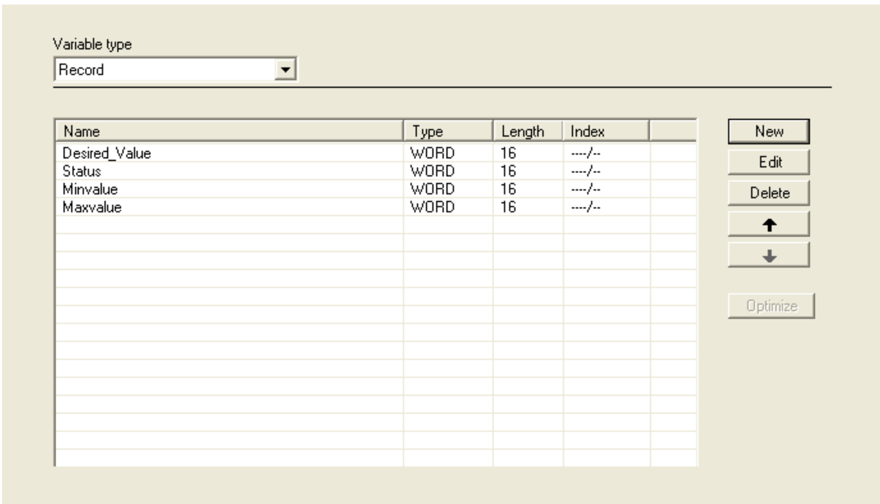
- Data structure:
  – PW 0: Setpoint
  – PW 2: Status
  – PW 4: Max. value
  – PW 6: Min. value
  – Station address: 3

How to process the received data words in the FB editor:

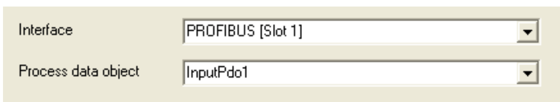
1. Create the following project tree in the project view:



2. Select the **9400 HighLine** project element in the project tree, change to the **Ports** tab and create a "PROFIBUSPort" input port of the type "Record".
   - Click the **New** button in the Port Definition to create the following element variables.



3. Select the following interface and process data object for the port definition.



4. Select the project element **PROFIBUS [Slot 1]** in the project tree and change to the **Settings** tab.
5. Select **Station address** 3 from the selection field.

6. Select 9400 HighLine in the project tree and execute the menu command **Tools→Build project**.

Result

The PROFIBUS data sent for station 3 are copied into the process image and are available as a "PROFIBUSPort" in the FB editor.

11 Handling of catalogues in the »Engineer«

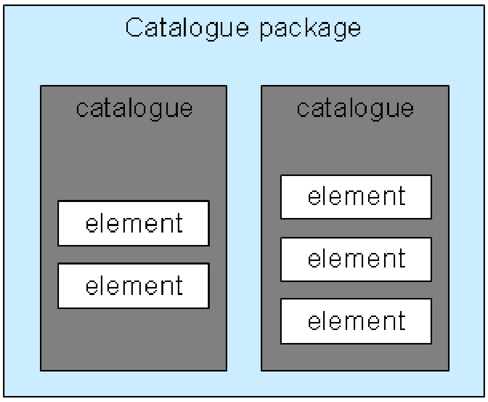
11.1 General information about catalogues

»Engineer« catalogues contain information about all types of elements for setting up »Engineer« projects. The »Engineer« uses different catalogues which provide the types of information listed in the below table.

Catalogue type	Information contained
Device catalogue	Descriptive information for the device types. A device catalogue defines the standard device codes with code numbers and permissible value ranges for every device type (example: *9400 HighLine V04*). The device catalogue can also be used to store rules for module equipment, data on existing on-board communication interfaces and additional information about the respective device type.
Device module catalogue	Descriptive information for types of device module (example: *communication module PROFIBUS 1.00*). A device module catalogue defines the module codes with code numbers and the permissible value range for active device modules. A device module catalogue can also contain details about communication interfaces and additional functions of the respective device module type.
Application catalogue	Technology applications (example: *Speed actuating drive 3.0.3*). Technology applications can be integrated into »Engineer« projects and used as a basis for own applications. Depending on the device series for which the application catalogue is intended, an application catalogue, for instance, can contain ready-to-use programs, function block interconnections and initial values for standard device codes.
Function block (FB) catalogue	Descriptive information about the function block types used in the FB Editor. The function block catalogues are the basis for insertions into the FB interconnections of the 9400 device series.
Lenze motor catalogue	Descriptive information for the motor types produced by Lenze. The Lenze motor catalogue defines the initial values to be set in the codes of the different controller types for the operation of the respective motor type.
User motor catalogue	The user motor catalogue contains information similar to that of the Lenze motor catalogue. The contents, however, can be defined individually by the user. Therefore the handling of this catalogues differs in some points from the handling of the other catalogues. For further information, please see the following section: ▸ User motors (📖 298)
Further catalogues	Further catalogues contain information about networks, axes and additional basic elements upon which the above-mentioned catalogues are based and/or which can be used in »Engineer« projects.

11.2 Catalogue packages

A catalogue package combines several catalogues and thus unites them for the distribution, installation and use of catalogues. The catalogue package contains several catalogues which each contain several elements.



[11-1] Schematic structure of a catalogue package

Examples of catalogue packages available in »Engineer« are the *Engineer* and *EngineerFB* catalogue packages.

- The *Engineer* catalogue package comprises:
  - all basic catalogues of the »Engineer«,
  - all device and device module catalogues.
- The *EngineerFB* catalogue package comprises:
  - catalogues with function blocks (FBs) and technology applications for the 9400 device series.

11.3 Installation of catalogues

»Engineer« catalogues can only be installed by executing an installation program:

Installation	Installable catalogues (The availability of the catalogues depends on the respective installation.)
»Engineer« full version	• Addition of a catalogue package
»Engineer« upgrade/update **»Engineer« service pack** **»Engineer« device data update**	• Addition of a catalogue package • Replacement of a catalogue package • Addition of a further catalogue package version • Addition of individual catalogues to an existing catalogue package • Replacement of individual catalogues in an existing catalogue package

If several »Engineer« versions are installed on your computer, each »Engineer« installation provides its own catalogues. To find out which catalogues are provided by the installed »Engineer«, select the menu command **Tools→Catalogues**.

11.4 Use of catalogues in projects

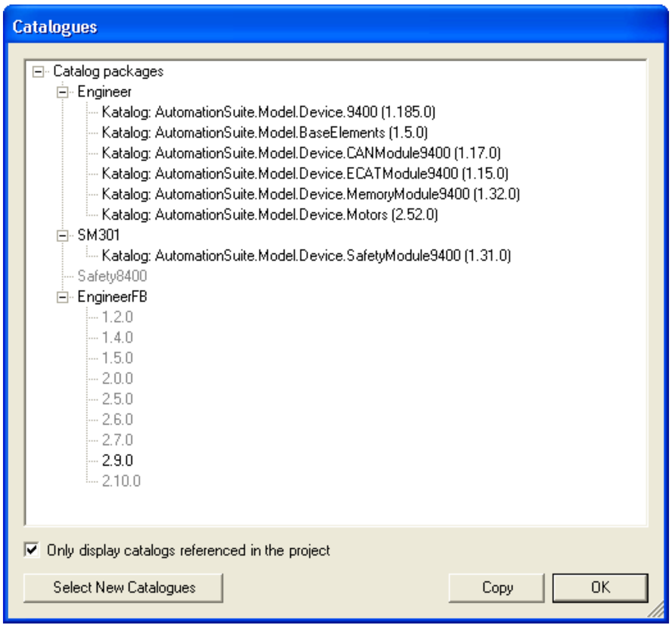
11.4.1 Relationship between project and catalogues

Every project element is based on one or more catalogue elements.

Application examples:

1. You want to integrate a controller into a project in the offline mode. The corresponding insertion dialog offers a selection list made up from the installed device catalogues.
2. You select the required device type from the list. When clicking the **Complete** button, a device permanently based on the device type in the catalogue is added to the project tree.
3. You would like to insert a device detected online. For this purpose, the »Engineer« identifies the device by reading out an online type coding and selecting the corresponding device type from the device catalogue. A device is inserted into the project tree which is sustainably based on the device type given in the catalogue. The »Engineer« project will sustainably depend on the catalogues the elements were selected from.

An »Engineer« project always uses just one version of a catalogue package. The menu command **Tools→Catalogues** can be used to display the catalogue packages and catalogues:



[11-2] *Catalogues* dialog box

The *Catalogues* dialog box displays the catalogue packages in hierarchical order. Like this you can see which catalogues are contained in which catalogue package.

Tip!

If the *Only display catalogues referenced in the project* checkbox is unticked, all installed catalogue packages and catalogues are displayed.

11.4.2 Characteristics of the elements

When a project is opened in an installation environment where the required catalogues are missing, the »Engineer« cannot display the project elements referring to these missing catalogues. Due to this, the corresponding elements cannot be edited.

Display of the elements

The elements are represented as damaged. For the damaged elements, a *Profile* tab is visible displaying the original information and indicating which catalogue is missing.

If a project is opened which contains damaged elements, a reference dialog box will pop up: "*The following project elements cannot be opened because the required catalogues have not been installed:...*"

After you have clicked the **Details** button for the corresponding project element, the *Element profile* tab appears. ▶ Properties tab (📖 245)

Button	Function
Next	Open project: Changes to the project: Damaged elements are removed from the project. Instead, damaged elements are displayed for which only the Properties dialog boxes are visible. References to damaged elements existing in other project elements are also removed. If a damaged element is, for instance, a device, this device now no longer is a node in the network. The application of the node is removed from the machine application.
Cancel	Cancel the opening of the project The saved project is not changed. You can install the missing catalogue subsequently and open the project again without losing information.

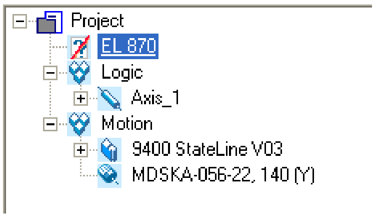
Note!

Damaged elements are permanently removed from the project. To avoid unintended information loss, you can save the project subsequently via the menu command **File→Save as**.

If you install the missing catalogues later, you can then reopen the original project.

- Damaged elements appear with a symbol and the original designation in the project tree.
- Damaged elements cannot be opened in the project view.

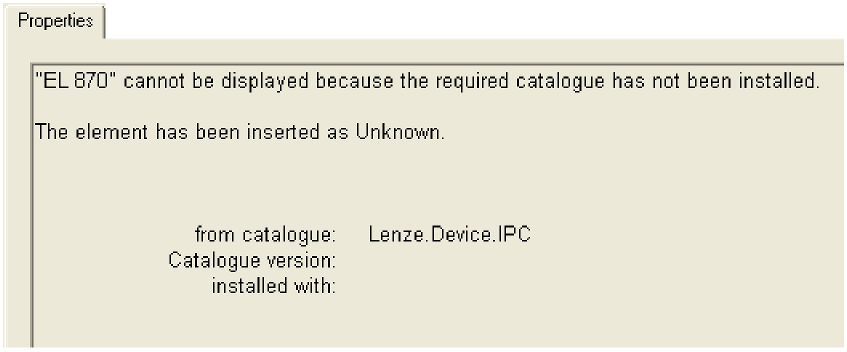
- Damaged elements can be deleted in the same way as regular elements:
  – Select the element, delete it with **<Del>** or execute the **Delete** command via the context menu.



[11-3] Damaged element

Properties **tab**

The properties of a damaged element are indicated in the *Properties* tab:



[11-4] Information about a damaged element

11.5 Management of catalogue versions

11.5.1 Objects of versioning

The contents of the »Engineer« catalogues are provided by Lenze in a maintained and versioned manner. Versioning takes place on three levels:

1. Each element contained in a catalogue has a version. The version of a catalogue element is displayed in the insertion dialog and - for existing project elements - in the *Properties* tab.
2. Every catalogue provided has a version. A catalogue contains several elements each of which has a certain version. The unchanged version of an element can be contained in several successive catalogue versions. The versions of the existing / used catalogues are displayed in the **Tools→Catalogues** dialog.
3. Every catalogue package has a version. A catalogue package contains several catalogues each of which has a certain version. The unchanged version of a catalogue can be contained in several successive catalogue packages.

11.5.2 Procedure for the provision of new versions

There are two procedures for the provision of new element versions. The difference is that if multiple catalogue versions exist, you must select the catalogue you want to use.

Element version	Function
Single-existing catalogues	• In the case of **single-existing catalogues**, each catalogue version supplied contains all element versions. Thus, the latest catalogue version can be used. • The catalogue version remains downwards compatible to existing projects and devices. • Catalogue packages which contain these type of catalogues are only installed in one version. • This procedure is used for device and device module catalogues.
Multiple-existing catalogues	• In the case of **multiple-existing catalogues** each catalogue version supplied only contains the latest element versions. In order to ensure compatibility to existing projects, catalogue packages which contain such catalogues, are installed in parallel in several versions. Multiple-existing catalogues are used for application and function block catalogues. Such catalogues affect existing »Engineer« projects if you change them to a new catalogue version. ▸ Building projects while opening them (📖 46)

11.6 Particularities of the user motor catalogue

The contents of the user motor catalogue can be defined individually. The user motor catalogue can be compared with an empty folder in which self-defined motor types can be saved. These self-defined motor types are suitable for **cross-project** purposes.

When a user motor is integrated in the »Engineer« project, a complete copy of the catalogue element is created. Therefore, the project is not dependent on the user motor catalogue. If the project is passed on to another user, this user can open it without the necessity of passing on the user motor from the user motor catalogue as well.

Versioning

The user motor catalogue is not versioned.

The user motor catalogue is only available once on the computer. If several »Engineer« versions are installed in parallel on the computer, the user motor catalogue can be used by all users.

Note!

In the case of an »Engineer« deinstallation, the user motor catalogue is not deinstalled.

For further information, please see the following section:

▸ User motors (📖 298)

12 Error messages

This chapter describes the generators and their error messages that are called during the "Create" process (Build project). The error messages are visible in the Create tab and are divided into different categories: *Error*, *warning*, *information*.

- Application Connection Generator (📖 247)
- PortLogic generator (📖 250)
- System bus (CAN) generator (📖 252)
- Communication entity generator (📖 258)

12.1 Application Connection Generator

Checking the connection between the port and the process data object

Dynamic creation of a PDO [AC0001]

Response (Lenze setting printed in bold)	
☐ Error ☒ **Warning** ☐ Information	
Cause	**Remedy**
A port has not been specified by the user but has been interconnected with another device. An attempt is made to create a dynamic PDO for this port.	Check transfer parameters with the settings in the application. ▸ Process data objects (📖 234)

Dynamic PDO for a port cannot be created [AC0002]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Communication entity not found A port has not been specified but has been interconnected with another device. An attempt is made to create a dynamic PDO for this port. However, this attempt fails because the device has no or several communication interfaces.	Apply the port to a specific interface in the port editor. ▸ Port editor (📖 162)

Dynamic ProcessDataObject for port cannot be created [AC0003]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Communication entity not found A port has not been specified but has been interconnected with another device. An attempt is made to create a dynamic PDO for this port. However, this attempt fails because the device has no or several communication interfaces.	Device is not provided with an interface enabling the dynamic creation of a PDO, or the supply is used up. • Apply port to a fixed PDO (8200 and 9300), or • convert unused, unconnected ports to automatic ports.

Assignment of port to ProcessDataObject is missing [AC0004]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Internal error There is no connection between a port and a PDO.	

Definition of the network by means of port has failed [AC0005]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Internal error For an interconnected port, an attempt is made to find a network by means of which the connection can be established.	

Connection beyond network limits cannot be closed [AC0006]

Response (Lenze setting printed in bold)	
☐ Error ☐ Warning ☒ **Information**	
Cause	**Remedy**
An attempt is made to interconnect ports of various devices that are not in a network. For this purpose a gateway function is required, which is not supported at present.	Add the nodes to be interconnected to a network.

Connection cannot be closed [AC0007]

Response (Lenze setting printed in bold)	
☐ Error ☐ Warning ☒ **Information**	
Cause	**Remedy**
Node is not connected to the network. An attempt is made to interconnect ports of various devices that are not in a network. A gateway function is necessary for this but is not supported at the moment.	Add the nodes to be interconnected to a network.

Data width of the target port differs from the source port [AC0008]

Response (Lenze setting printed in bold)	
☐ Error ☐ Warning ☒ **Information**	
Cause	**Remedy**
Ports of a different data width are tried to be connected.	Adapt the sum of the element variable data widths of the source and target ports in the port editor. Only the unequivocal source port is indicated. The target ports must be taken from the Port editor (application interconnection editor). ▶ Port editor (🕮 162)

Storage arrangement of the target port differs from the source port [AC0009]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	

Cause	Remedy
Ports with a different storage layout are tried to be connected. **Example** Source: WORD, DWORD (6 bytes) Target: BYTE, DWORD (6 bytes) Only a differentiation with regard to the data width of the element variable is made, but not with regard to the type itself (sign/no sign or ANY_BIT types).	Only the unequivocal source port is indicated. The target ports must be taken from the Port editor (application interconnection editor). ▶ Port editor (📖 162)

12.2 PortLogic generator

Checking the ports created

Direction of transfer is not supported {0} [PL0001]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Direction of transfer for the indicated port is invalid.	▶ Port editor (📖 162)

Data length exceeds CAN-PDO length of 64 bits [PL0002]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The data width of the port specified exceeds the permissible data width for a CAN PDO.	Reduce the data width of the element variables of the port to a maximum of 8 bytes. ▶ Defining element variables for "Record" variable type (📖 172)

Port name not definite [PL0003]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The ports of an application have to differ with regard to their display names.	Allocate definite port names in the PortEditor. Among other things, port names are used in IEC 61131 programs for enabling the access to ports via IEC 61131 variables. Adding a port (📖 168)

Invalid task context: task {0} on runtime system not available [PL0004]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
An attempt is made to assign a port to a task that is not available on the device or in the PLC Designer project.	• Open the port editor for the device application specified. • Select the task button down on the right in the application variable field for the port specified. – A list with available tasks is displayed. • Select a task from the selection list • Close the dialog with OK. If no task is defined in the task configuration of a 9400 PLC Designer program, the operating system automatically generates a task with the designation "DefaultTask".

Invalid task context: port is associated with task {0} [PL0005]

Response (Lenze setting printed in bold)
☐ Error ☒ **Warning** ☐ Information

Cause	Remedy
An attempt is made to assign a port to a task that is not available on the device or in the PLC Designer project. Due to the fact that the FB Editor has been activated/enabled for the associated application, the ports are automatically assigned to the user task and this warning is output.	

12.3 System bus (CAN) generator

12.3.1 Addresses

Invalid value range for addresses (min and max inverted?) [NWCAN0001]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
In the CAN network, **Settings** tab, the minimum and maximum addresses of the possible address range have been inverted.	Accordingly alter the range, so that the minimum address is smaller than the maximum address.

Number of nodes for the network exceeded [NWCAN0002]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
More nodes than permitted in the "Settings" tab of the CAN network are assigned to the CAN network.	• Remove nodes that are not required from the network or • Increase the maximum permissible number of nodes in the "Network/settings" tab.

Node address for nodes beyond the value range [NWCAN0003]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
An invalid node address has been entered for the node specified.	Change the node address so that it is within the permissible value range.

Node address for node already exists [NWCAN0004]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
An already existing node address has been entered for the node specified.	Change the node address so that a number is selected that has not been allocated before.

Error during reading the address of nodes [NWCAN0005]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**

12.3.2 Baud rate and MMT master

Error during reading of node addresses [NWCAN0006]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
A baud rate which is not supported has been set for the node defined.	Set a different baud rate in the "*Settings*" tab of the associated network.

Error during processing baud rate of object {0} [NWCAN0007]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The access to the baud rate parameter has failed.	

No NMT master defined in the network! [NWCAN0008]

Response (Lenze setting printed in bold)	
☐ Error ☒ **Warning** ☐ Information	
Cause	**Remedy**
In the indicated network no NMT master which transfers the nodes to the *Operational Mode* has been defined.	Ignore warning if an external device takes over this function.

More than one NMT master defined in the network! [NWCAN0009]

Response (Lenze setting printed in bold)	
☐ Error ☒ **Warning** ☐ Information	
Cause	**Remedy**
In the indicated network, several nodes have been defined as NMT master. They switch the nodes to Operational mode.	Ignore warning if this function is desired.

Error during reading of the NMT master settings [NWCAN0010]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The access to the NMT master settings has failed.	

12.3.3 Synchronisation

SYNC master not defined [NWCAN0011]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
In the specified network either process data objects or processes (tasks) are connected to the synchronisation object. However, no synchronisation object generator is defined.	• Change to the **Synchronisation** tab of the network specified. • Under **SYNC source**, select the node the synchronisation object is to send cyclically.

SYNC transmission identifier {0} is not supported by node [NWCAN0012]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The indicated SYNC source does not support the indicated COB-ID.	Select a COB-ID under SYNC source in the **Synchronisation** tab of the network specified which supports all nodes. (E. g: 128).

SYNC transmission cycle time {0} ms is not supported by node [NWCAN0013]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The indicated SYNC source does not support the specified cycle time for sending the synchronisation object.	Select a cycle time under SYNC source in the **Synchronisation** tab of the network specified which supports all nodes.

SYNC reception identifier {0} is not supported by the nodes [NWCAN0014]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The SYNC receiver specified does not support the defined COB-ID.	Select a COB-ID under SYNC source in the **Synchronisation** tab of the network specified which supports all nodes. (E. g: 128).

Node does not support any SYNC slave functions [NWCAN0015]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Node does not support a sync slave function.	

Node does not support any SYNC master function [NWCAN0016]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Node does not support a *SYNC master* function.	

Node is SYNC sender and receiver at the same time [NWCAN0017]

Response (Lenze setting printed in bold)	
☐ Error ☐ Warning ☒ **Information**	
Cause	**Remedy**
Reserved	

Object cannot be transferred. Node not a SYNC slave [NWCAN0026]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The node specified either operates with synchronised process data objects or processes (tasks). However, the node has not been declared as synchronisation object receiver.	Make the following choice for the node in the **Synchronisation** tab of the indicated network under SYNC receivers: • Transfer/receive synchronised process data objects • Synchronise processes (tasks)

12.3.4 COB-ID

Stock of CAN IDs exhausted [NWCAN0018]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Too many communication objects are transferred in the indicated network. Available COB-IDs are no longer provided.	• Reduce number of port connections • Extend the COB-ID identifier range in the **Settings** tab of the network specified. **Caution**: The default range is designed in a manner that also enables old Lenze devices like 9300 and 8200 to operate with it.

Invalid value range for COB-ID (min and max inverted?) [NWCAN0019]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The data for the automatically allocated COB-ID range are incorrect.	• Change to the **Settings** tab of the network specified. • Set a range in the **Automatically allocate identifier** group field supporting all devices connected to the network. • Set **from** < **to**.

COB-ID beyond the limits. Generate new COB-ID for PDO [NWCAN0020]

Response (Lenze setting printed in bold)	
☐ Error ☒ **Warning** ☐ Information	
Cause	**Remedy**
During checking the COB-IDs it was observed that the COB-ID of the process data object specified (associated port) is beyond the COB-ID range defined under the network settings. A new COB-ID is generated for the process data object specified.	Ignore warning. In the case of time-critical processes, however, the COB-IDs allocated in the **CAN objects** tab of the network should be checked and possibly adjusted.

COB-ID is used more than once [NWCAN0021]

Response (Lenze setting printed in bold)	
☐ Error ☒ **Warning** ☐ Information	
Cause	**Remedy**
Generate new COB-ID for PDO During checking the COB-IDs it was observed that the COB-ID of the process data object specified (associated port) has already been allocated. A new COB-ID is generated for the process data object specified.	Ignore warning. In the case of time-critical processes, however, the COB-IDs allocated in the **CAN objects** tab of the network should be checked and possibly adjusted.

COB-ID {0} outside the value range [NWCAN0028]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
An attempt is made to transfer the COB-ID of the sender to the receiver of project data objects. When this was done, an error occurred. It is possible that the COB-ID is outside the valid value range.	Check value range of the COB-ID.

12.3.5 Ports and PDO

Error in the analysis of the port interconnection [NWCAN0022]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Port-PDO assignment is missing There is no connection between a port and a process data object.	

Data width for port exceeded [NWCAN0023]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy
Maximum 64 bits possible The data width of the port specified exceeds the permissible data width for a CAN PDO.	Reduce data width of the element variables of the port to a maximum of 8 bytes.

Catalogue of templates for CAN communication object not found [NWCAN0024]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy
Catalogue not recorded?	

Error during creation of CAN communication object [NWCAN0025]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy

Assignment of port to PDO is missing [NWCAN0027]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy
No connection between a port and a process data object.	

12.4 Communication entity generator

12.4.1 Standard (9300 servo + 9300 ServoPLC)

Unexpected error [CESTD0001]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**

Baud rate of {0}k is not supported by the nodes [CESTD0002]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The baud rate cannot be transferred to the associated code.	

COB-ID {0} is assigned to several nodes [CESTD0003]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
It is not permissible for a 9300 to assign the same COB-ID several times to fixed process data objects.	Ensure that no ports of a 9300 device are connected to each other in the function block editor. By this, the ports receive the same COB-IDs.

Error during writing on object [CESTD0004]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Object could not be written.	

Error during writing of parameter value {0} [CESTD0005]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy
Parameter value could not be written to the code.	

Transfer mode {0} is not supported [CESTD0006]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy
The indicated transfer mode is not supported.	

Error during writing of the SYNC master settings [CESTD0007]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy
The sync master settings could not be transferred to the associated codes.	

Error during writing of the SYNC slave settings [CESTD0008]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy
The sync slave settings could not be transferred to the associated codes.	

PlugIn could not be found {0}[CEPLC0001]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy
A plugin (PlugIn_DrivePlcDeveloperStudio) is needed for generation of program code. This plugin has probably not been registered or there are version conflicts in respect of catalogues and plugin.	Install PlugIn.

PlugIn method could not be found {0} [CEPLC0002]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy
A plugin (PlugIn_Drive PLC Developer Studio) is needed for the generation of program code. This plugin evidently does not have the necessary method. There are clearly version conflicts in respect of catalogues and plugin.	Install PlugIn.

PlugIn method not executable {0} [CEPLC0003]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	

Cause	Remedy
A plugin (PlugIn_Drive PLC Developer Studio) is needed for the generation of program code. The necessary method cannot be executed at the present time.	Close all DDS or PLC Designer processes on the PC.

PlugIn method, error in execution {0} [CEPLC0004]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	

Cause	Remedy
A plugin (PlugIn_DrivePlcDeveloperStudio) is needed for the generation of program code. An error has occurred during execution of the indicated method.	

12.4.2 Compact (8200)

Unexpected error [CECOMP0001]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**

Different transfer modes for CAN1 IN/OUT [CECOMP0002]

Response (Lenze setting printed in bold)		
☒ **Error** ☐ Warning ☐ Information		
Cause	**Remedy**	
The transfer modes have been coupled for the CAN1 objects of the controller.	CAN1-IN and CAN1-OUT have to be transferred in a synchronised manner or asynchronously. The following combinations are permissible:	
	CAN1-IN	**CAN1-OUT**
	Synchronous	Synchronous
	Asynchronous	Time or event

COB-ID {0} has been assigned several times for nodes [CECOMP0003]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Assigning the same COB-ID several times for fixed process data objects is not allowed for a 9300.	Ensure that no ports of a 9300 device are connected to each other in the function block editor. By this, the ports would receive the same COB-IDs.

Baud rate of {0}k is not supported by node [CECOMP0004]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The baud rate cannot be transferred to the associated code.	

Error during writing on object [CECOMP0005]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Object could not be written.	

Error during writing of parameter value {0} [CECOMP0006]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Parameter value could not be written to the code.	

Transfer mode {0} is not supported [CECOMP0007]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The indicated transfer mode is not supported.	

Direction of transfer is not supported [CECOMP0008]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The indicated direction of transfer (input, output) is not supported.	

12.4.3 9400 On board

Node cannot be SYNC source and receiver at the same time [CE94CAN0001]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Reserved	

Deviating target version - This can bring about problems with regard to the compilation and the download (expected: {0} [CE94CAN0002]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The target version stored in the PLC Designer project of the device specified does not comply with the version expected by the generator. This can bring about problems in particular if older PLC Designer projects are imported. This error message only is output in developer mode.	Change to the **PLC programming** tab and open the PLC Designer project. In PLC Designer, choose and purge the target system and compile the project again. The project must be saved before exiting PLC Designer.

Error during writing of parameter value {0} [CE94CAN0003]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Parameter value could not be written to the code.	

Node with SYNC source property must be NMT master [CE94CAN0004]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
A special feature of the 9400 is that, when it is to send a synchronisation object, it must be the NMT master at the same time.	• Go to the network which is assigned to the device. • Highlight the corresponding node in the **Node** tab. –The node is enclosed in green. • Select **Set NMT master** from the context menu of the right mouse button. –The master node has a black triangle in the right corner at the bottom. Nodes (🕮 223)

Predefined connection set active [CE94CAN0005]

Response (Lenze setting printed in bold)	
☐ Error ☐ Warning ☒ **Information**	
Cause	**Remedy**
Node is not connected to a CAN network. In the **Settings** tab of the node, the control field **Use Predefined Connection Set** was selected. During the compilation, the settings for COB-IDs, SYNC, etc. were assigned in accordance with CANopen. This message is information for the user.	

12.4.4 I-O system IP20 (modular and compact)

Unexpected error [CEEPMT0001]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**

Error during writing of parameter value {0} [CEEPMT0002]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
Parameter value could not be written to the code.	

Transfer mode {0} is not supported [CEEPMT0003]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
The indicated transfer mode is not supported.	

12.4.5 9400 PROFIBUS module

EXTENSION_BOARD_SLOT could not be entered in the control configuration [CE94PRF0001]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
For the indicated PROFIBUS module, a control configuration module cannot be entered in the control configuration.	

Error during creation of the EXTENSION_BOARD_SLOT Mappings/Code [CE94PRF0002]

Response (Lenze setting printed in bold)	
☒ **Error** ☐ Warning ☐ Information	
Cause	**Remedy**
No mapping code can be generated for the PROFIBUS module between the control configuration module and the port variables.	

Error during creation of the EXTENSION_BOARD_SLOT Mappings/Task Context [CE94PRF0003]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy
For the indicated PROFIBUS module, the mapping code between the control configuration module and the port variables cannot be entered in the task configuration.	

Error during creation of the EXTENSION_BOARD_SLOT Mappings. Task {0} does not exist on runtime system [CE94PRF0004]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy
Internal error. For the indicated PROFIBUS module, the mapping code between the control configuration module and the port variables cannot be entered in the task configuration because the task indicated for the port does not exist on the runtime system.	

Invalid data width [CE94PRF0005]

Response (Lenze setting printed in bold)
☒ **Error** ☐ Warning ☐ Information

Cause	Remedy
Internal error. The data type of an element variable is not supported for the indicated port.	

13 Short menu reference

In this chapter you'll find a list of all menu commands with references to further information.

13.1 "File" menu"

Icon	Command	Shortcut	Information
	New	**<Ctrl>+<N>**	▸ Creating a new project (🕮 37)
	Open	**<Ctrl>+<O>**	▸ Opening the project file (🕮 45)
	Save as	-	
	Save	**<Ctrl>+<S>**	▸ Saving the project (🕮 49)
	Close	-	▸ Closing the project (🕮 51)
	Opening an archive	-	▸ Opening an archive (🕮 53)
	Saving an archive	-	▸ Saving an archive (🕮 52)
"Import" submenu			
	Import parameter values to the project	-	Import parameter set for the selected device from a GDC parameter set file.
"Export" submenu			
	Export device parameters	-	Export parameter set of the selected device to a GDC parameter set file. ▸ Exporting device parameters to a GDC / CSV file (🕮 274)
	Page setup	-	Define output format for printing the parameter list.
	Print preview	-	Select contents for printing the parameter list
	Print	**<Ctrl>+<P>**	Print the parameter list with the following information (can be selected separately): • Project properties • Code values of the individual projected devices
	Exit	**<Alt>+<F4>**	▸ Exiting the program (🕮 35)

13.2 "Edit" menu

Icon	Command	Shortcut	Information
	Cut	<Ctrl>+<X>	▸ General editing functions in the project view (📖 23)
	Copy	<Ctrl>+<C>	
	Insert	<Ctrl>+<V>	
	Delete	<Del>	
	Rename	<F2>	

13.3 "Insert" menu

Icon	Command	Shortcut	Information
	Insert device detected online	-	Insert a device detected online into the project. ▸ Creating a new project (starting the search for devices connected) (📖 40)
	Insert from reference project	-	Insert axis or controller component from an existing project.
	Machine application	-	▸ Inserting a machine application with a port interconnection (📖 180)
	Network	-	▸ Inserting a network (📖 214)
	Application	-	▸ Assigning an application to a device (📖 65)
	Device module	-	▸ Inserting device modules into a device (📖 66)
	Gearboxes	-	▸ Inserting a gearbox (📖 81)
	Component	-	▸ Inserting components (📖 62)
	Axis	-	▸ Inserting axes (📖 59)
	System module	-	▸ Inserting system modules (📖 57)

13.4 "View" menu

Icon	Command	Shortcut	Information
	Clear message window	-	▸ Messages (📖 27)
	Zoom in workspace	-	Minimise view list to enlarge the workspace
	Represent values in the hex format	<Ctrl>+<H>	Display code values as hexadecimal values.

13.5 "Online" menu

Icon	Command	Shortcut	Information
	Set communication path and go online	-	▸ Go online (📖 90)
	Go online	**<F4>**	
	Going offline	**<Shift>+<F4>**	▸ Going offline (📖 103)
	Optical location (only available if the respective device supports this function!)		Device search function for the specific identification by triggering the device LEDs. ▸ Optical location - device identification (📖 103)
	Enable controller (observe controller inhibit via terminal)	**<F8>**	▸ Enable controller (📖 108) (Observe controller inhibit via terminal!)
	⚠ ▸ Safety instructions (📖 15)		
	Inhibit controller	**<F9>**	▸ Inhibit controller (📖 108)
	Start application	-	▸ Start application (📖 109)
	⚠ ▸ Safety instructions (📖 15)		
	Stop application	-	▸ Stop application (📖 109)
	Download program	-	▸ Download program (📖 111)
	Download parameter set	**<F5>**	▸ Download parameter set (📖 114)
	Upload parameter set	**<F7>**	▸ Upload parameter set (📖 116)
	Store parameter set	-	▸ Store parameter set (📖 118)
	System bus configurator	-	Start system bus configurator ▸ System bus configurator (📖 104)
	Configurator PROFINET addresses		Display and change IP settings of PROFINET nodes on the local Ethernet segment ▸ PROFINET address configurator (📖 104)
	Status of the diagnostic adapters		Display operating status of the diagnostic adapters that are connected via the USB interface. ▸ Diagnostic adapter

13.6 "Application data" menu

Icon	Command	Shortcut	Information
	Comparing parameter sets	-	▸ Comparing parameter sets (📖 149)
	Copying parameter sets	-	▸ Copying parameter sets (📖 153)
	Compare function block interconnection	-	Detailed information on the FB Editor for the Inverter Drives 8400 and Servo Drives 9400 series can be found in the documentation of the function library for the corresponding device series.
	Copy function block interconnection	-	
	Insert function block interconnection	-	
	Compare ENP parameters	-	This function is only available when a controller of the Servo Drives 9400 series has been inserted into the project.

13.7 "Tools" menu

Icon	Command	Shortcut	Information
	Options	-	Optional settings: • *Online* • *Connections* • *Environment* ▸ Options for the representation/project memory location (📖 34) ▸ Options (📖 106)
	Languages	-	Select the *User interface language* of the dialog boxes. **Note:** Changing the language only has an effect on the texts of the dialog boxes. Texts that can be manually edited by the user remain in the respective language when a project is opened.
	Catalogues	-	Displays the catalogue packages available and the catalogues included therein. • *Only display the catalogues used in the project:* Only the catalogues used in the respective project will be listed when the control field is activated.
	User motor catalogue	-	User motors • Delete • Export • Import ▸ User motors (📖 298)
	Build project	<F11>	Starts the generation of data in the format that can be transferred to the devices. ▸ Build project (📖 89)

13.8 "?" menu

Icon	Command	Shortcut	Information
	Engineer help	**<F1>**	Show online help
	Context help	**<F1>**	Show online help in the context of the device selected
	Direct help	**<Shift>+<F1>**	Display direct help for an element
	Support in the web (AKB)	-	Reference to the Lenze Application Knowledge Base (AKB)
	Search in the AKB	-	Search for specific topics in the Lenze Application Knowledge Base (AKB)
	Subscribe to newsletter	-	Register for the newsletter to obtain Lenze information
	Software download	-	Download of Lenze software in the Lenze Application Knowledge Base (AKB)
	Lenze in the web	-	Reference to the Lenze internet presence
	Generate Engineer service report	-	Call diagnostic program which generates a report file. The file can then be sent as an attachment via e-mail.
	Information	-	Show information on the »Engineer« • **Mail**: Use this button to create an e-mail and send it to the Lenze service address. • **System configuration:** Use this button to display details on the system configuration.

13.9 "Project tree/project element" context menu

The commands described in this section are available depending on the project and device context.

Icon	Command	Shortcut	Information
	Library management	-	Open library management: • Show the libraries used by a device and their versioning • Update libraries that are out-of-date (if available)
	Insert electrical shaft	-	▶ Establishing an interconnection via an electrical shaft (📖 193)
	Replace component	-	▶ Replace component (📖 85)
Data export/import			
	Export device parameters	-	Export all parameters of the devices inserted in the project. ▶ Exporting device parameters to a GDC / CSV file (📖 274)
	Export parameter values		Export parameters of an individual device. ▶ Exporting device parameters to a GDC / CSV file (📖 274)
	Import parameter values to the project	-	Import GDC parameter file (.gdc format) of the Lenze Global Drive Control
	Export L-force Loader file	-	▶ Exporting parameters to an »L-force Loader« file (📖 273)
	Export error texts	-	Export error texts of the device selected into a text file (* .txt)
Manage parameter sets			
	Comparing parameter sets	-	▶ Comparing parameter sets (📖 149)
	Copying parameter sets	-	▶ Copying parameter sets (📖 153)

14 Appendix

14.1 Exporting parameters

The parameters of a device can be exported to different file formats in the »Engineer«:

- Exporting parameters to an »L-force Loader« file (🕮 273)
- Exporting device parameters to a GDC / CSV file (🕮 274)

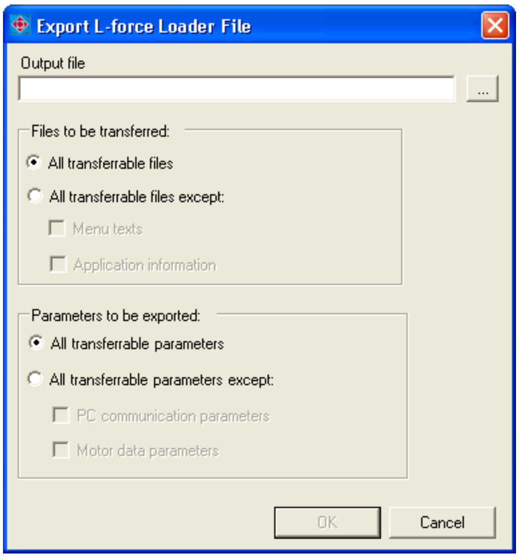
14.1.1 Exporting parameters to an »L-force Loader« file

The »Engineer« makes it possible to export the parameters of a controller to a file for use in the »L-force Loader«.

- The export function is available for controllers of the 9400 and 8400 device series.

How to export parameters to an »L-force Loader« file:

1. Select the required controller in the *Project view*.
2. Execute the *Export L-force Loader file* command in the *Context menu* of the controller.
   - First the »Engineer« checks whether the whole project is up to date. If not, a note appears. Here you can cancel the export and update the project before you recall the export function. Build project (89)
3. Specify the following options in the *Export L-force Loader file* dialog box:
   - Output file and memory location
   - Files to be transferred
   - Parameters to be exported



The parameters exported include the same data as in the transfer of a parameter set and an application download.

Download parameter set (114)

Download program (111)

The »L-force Loader« export writes all application data to an *.lfl file. This file includes all data of an application transfer the »Engineer« will write to the respective device.

14.1.2 Exporting device parameters to a GDC / CSV file

The »Engineer« makes it possible to export the parameters of the projected devices to a file for use in the »Global Drive Control« (GDC) and into the CSV format (Comma-Separated Values).

Tip!

In the context menu of a device the direct parameter export of an individual device is possible!

In the context menu of a device code it is possible to copy into CSV format in the clipboard. This option is also available if the device is connected online.

14.1.2.1 Exporting device parameters (all parameters of one device or of all devices)

▶ The parameter export can be carried out for an individual or for several devices at the same time. For this, either select the desired device, or click the **Select all** button.

Note!

In order to be able to export the parameters of a device, the device has to be "offline". When an online connection has been established, an information dialog suggests to close the online connection.

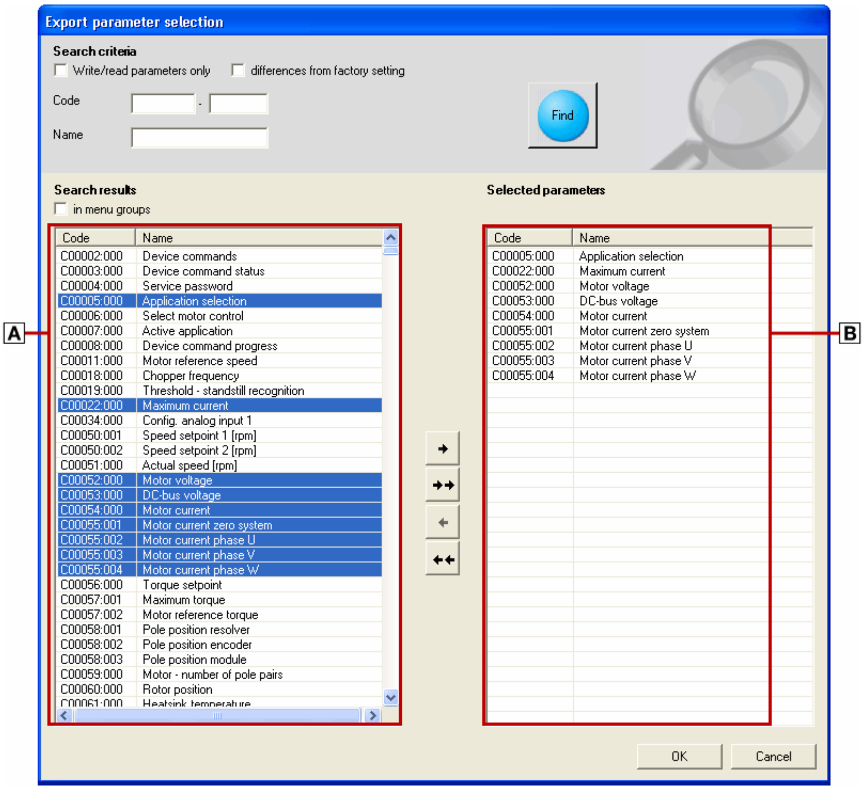
How to export all parameters of one device/all devices of a project:

1. Select the project node
2. In the context menu, execute **Export device parameters** or the menu command **File→Export→Export device parameters** .
   - Select the device selection for the parameter export by highlighting the corresponding selection field
   - Select file format (GDC or CSV)
   - Click the OK button
3. Select memory location
   - Select target directory
   - Save file

14.1.2.2 Export parameter values (specific selection of individual parameters)

How to export the parameters:

1. Select desired device in the project tree
2. In the context menu, execute **Export parameters** or the menu command **File➞Export➞Export parameter values** .
   - Select the desired parameters in field A:



3. Select the parameters to be exported by clicking the arrow key ➜/undo the selection by arrow key 🡐
   - Select/undo all visible parameters by clicking the double arrow keys ➜➜/🡐🡐.
   - Multi-selection of parameters shown one above the other: Hold down the **<CTRL>** key and highlight the parameters.
   - Multi-selection of individual parameters: Hold down the **<SHIFT>** key and highlight the desired parameters individually.
   - Field B displays the parameters to be exported.
   - Click the OK button
4. Select memory location/file type
   - Select file format (GDC or CSV)
   - Save file

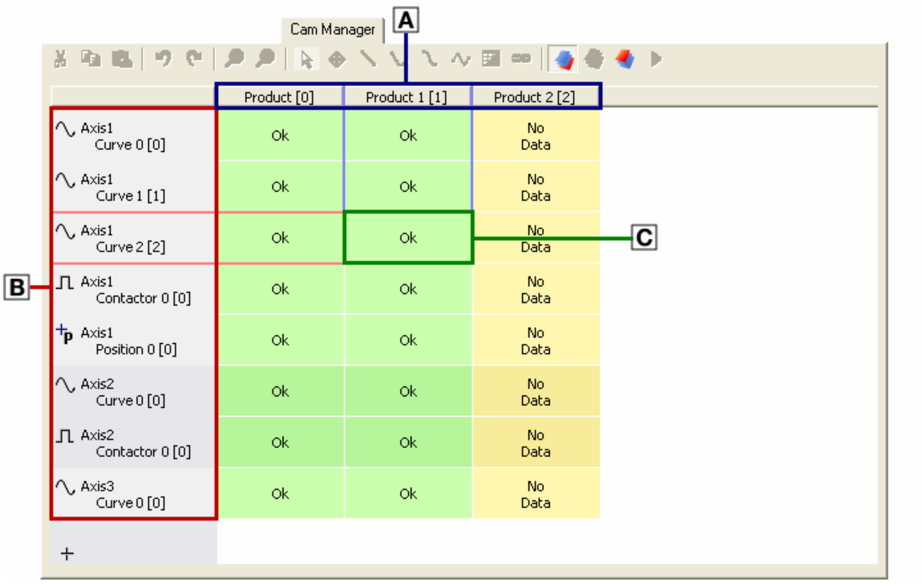
14.2 Managing cam data with the »Cam Manager«

In an interconnection via the electrical shaft, a large number of CAM data is necessary. These data are easy to manage with the »CAM Manager«.

Tip!

You can find detailed information on the electrical shaft in the chapter
▸ Creating an interconnection via the electrical shaft (📖 189)

If you go to the *Project view* and select an electrical shaft, the *Workspace* provides the **Cam Manager** tab where all available cam data (profile data, cam data, and position data) are shown in the form of a product/track matrix for purposes of clarity:



A Products B Tracks C Data (profile data, cam data, or position data)

- Each column represents a different product to be manufactured.
- The lines of the matrix can be assigned with optional tracks:
  - Curve tracks for motion profiles or characteristics
  - Cam tracks for cams
  - Position tracks for position markers
- Each track has been assigned to a particular axis in the interconnection.
- The cam data displayed can be edited in a product-oriented/track-oriented manner, or individually using the »Cam Editor«:

Processing of cam data	Required action
Product-oriented	Simple click on the corresponding product (A).
Track-oriented	Double-click on the corresponding track (B).
Individual data field	Double-click on the corresponding data field (C).

Tip!

Before the cam data are created, consideration of the following factors and aspects has proven to be useful:

Motion profiles:

- Number of interpolation points for each motion profile
- Cycle for each motion profile (in preparation)

Cams:

- Type of cam track
- Number of cams per track (maximally 16 cams)
- Parameters of each cam

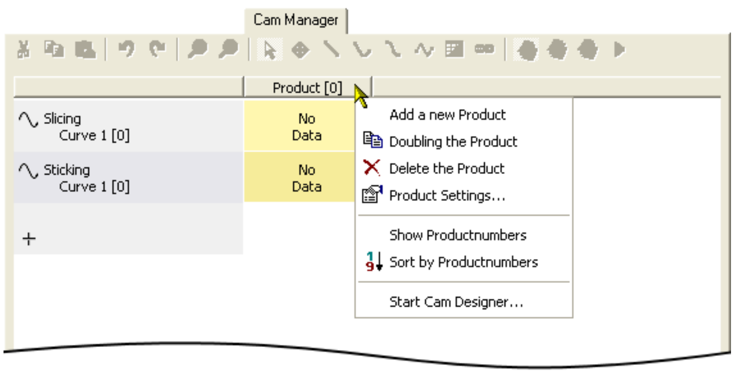
Position markers:

- Number of position tracks
- Number of position markers per track (maximally eight position markers)

14.2.1 Adding/editing/deleting products

After inserting an electrical shaft into the *Project view* there is only one product [0] in the »Cam Manager« initially.

If you right-click on a product in the »Cam Manager«, a *Context menu* appears, by means of which you can add further products, among other things, and delete existing products or edit their properties:



Tip!

You can use the  button next to the *Product* column to insert further products.

Altering properties of a product

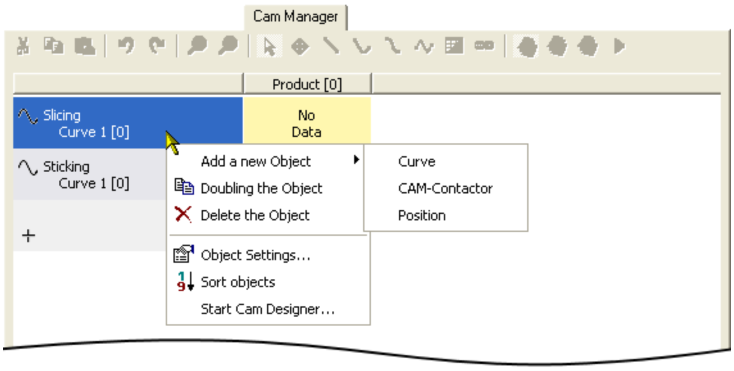
With the command **Properties of the product**, you can open the *Properties* dialog box, in which the properties of the product can be displayed and edited:

Property	Information
Name	Name of the product
Product number	Definite product number • Is shown in the »Cam Manager« in the squared brackets after the product name. • For a global product changeover, this number is to be transferred to the **LS_CamInterface** SB in the application via the input *CAM_dnProductNumber* and this is to be carried out synchronously for all drives in the interconnection.
Cycle	Cycle of the master measuring system • Defines the scaling of the x axis in the *Worksheet* of the »Cam Editor«. • Default setting: 0° .... 360°

14.2.2 Adding/editing/deleting tracks

After inserting an electrical shaft in the *Project view*, the »Cam Manager« contains a curve track with the track number [0] for each axis in the interconnection.

If you right-click on a track in the »Cam Manager«, a *Context menu* opens by means of which you can add further curve tracks, cam tracks and position tracks, etc., and delete existing tracks or edit their properties:



Tip!

By clicking the button under the Tracks column, you can insert further curves, cams and positions.

Changing properties of a track

With the command **Properties of the object**, you open the *Properties* dialog box in which the properties of the track can be displayed and also edited:

Property	Information
Axis	Selection of the axis in the interconnection for the track
Name	Name of the track
Number	Definite track number • Is shown in the »Cam Manager« in the squared brackets after the track name. • This number is to be transferred to the corresponding cam FB (**L_CamProfiler**, **L_CamContactor** or **L_CamPosMarker**) in the application via the input *dnTrackNumber* so that the FB uses the corresponding cam data.
Default measuring system X	Specification of the measuring system for the x axis in the *Worksheet* of the »Cam Editor«
Default measuring system Y	Specification of the measuring system for the y axis in the *Worksheet* of the »Cam Editor« • Does not exist in the case of one cam track.

Tip!

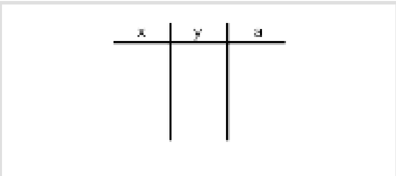
Several tracks for an axis can be used if:

- several motion profiles, cams or position markers are to be processed at the same time in the application.
- a change of the cam data is individually required at a cam FB (triggered by the product changeover).

14.2.3 Importing existing data

You can import already existing grid-point data into a data field in the »Cam Manager«, such data having been created with a CAD system or other software, for example.

To do this, the data to be imported must exist in the form of an ASCII file with grid-point tables in accordance with VDI guideline VDI 2143 "Motion rules for cam mechanisms":

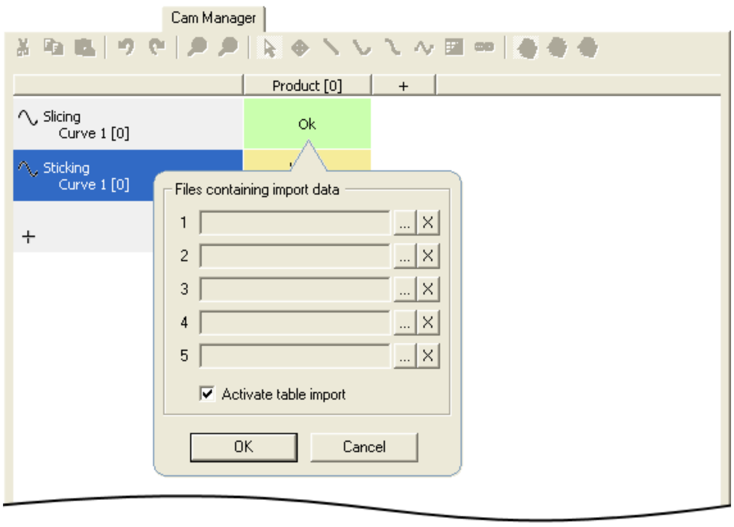


x = x position of the interpolation point
y = y position of the interpolation point
a = acceleration (optional)

If the acceleration information is missing, the acceleration track is formed from the derivations of the motion profile.

How to import existing data into a data field:

1. In the *Context menu* (right click) belonging to the data field, select the command **Import interpolation point table...** in order to open the dialog box entitled *Files with import data*.
2. In the dialog box entitled *Files with import data*, select the option **Activate table import**.
   - Once this option has been selected, you can click the respective buttons **...** on the right to select up to five files with import data:

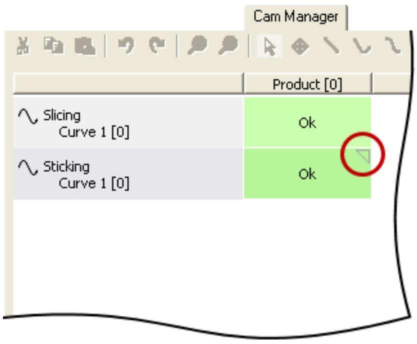


   - If more than one profile is chosen, these profiles are appended to each other. The sequence depends on the numbering of the imports.

3. Click the **OK** button to close the dialog box and accept the settings.

After the import

If the data have been successfully imported without errors, the status "OK" is displayed for the data field and a small triangle now symbolises the fact that the data file contains import data.



Tip!

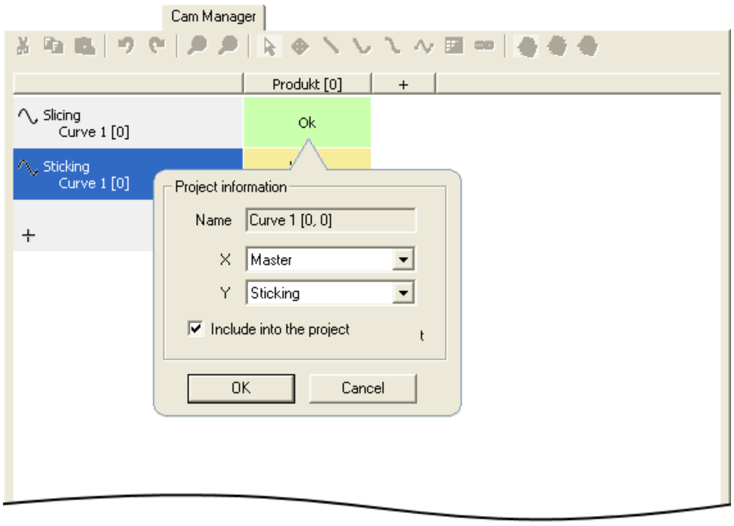
By double-clicking the data field, you can cause the imported curve to be shown in the »Cam Editor« where you can edit it (for example, expanding, compressing, or applying an offset).

- Without processing by the »Cam Editor«, »Engineer« transfers the imported grid-point table to the drive controller without carrying out changes.

14.2.4 Displaying project information

How to display information on a project:

1. In the *Context menu* (right click) belonging to the data field, select the command **Properties...** in order to open the dialog box entitled *Project information* :



- In this dialog box you can assign measuring systems to the curve, the cams or the position markers.
- If the option *Include in project editing* is deactivated, this matrix element cannot be edited. Therefore there is no check for correctness. The curves, cams or position markers are not transferred to the drive during download.

It makes sense to deactivate the option *Include in project editing* if you want to transfer the data to the drive even though the curve still has to be optimised.

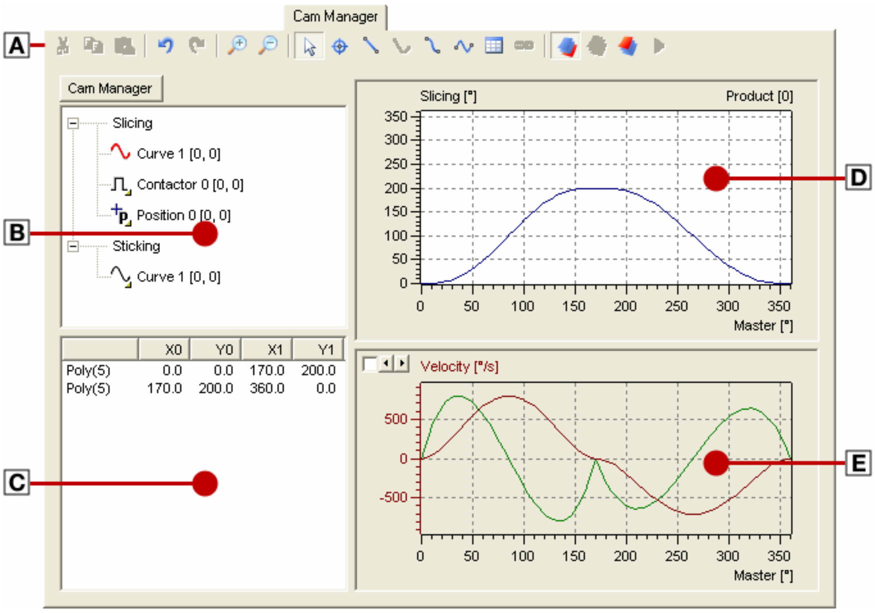
14.3 Creating cam data with the »Cam Editor«

With the »Cam Editor« you can create curves (motion profiles or characteristics) with the help of graphic objects (point, line, polynomial) as well as cams and position markers for drive controllers with cam functionality.

- The »Cam Editor« is a standard component of the »Engineer« HighLevel and provides basic curve functions.
- The optionally available »Cam Designer 3« provides additional functions for more extensive applications:
  - Additional possible curve object types that can be inserted in the curve sheet.
  - Curve components (sub-curves) can be edited.
  - The function "Trigger automatic connection of segments" has been activated.
  - The technology wizard for cross cutter solutions has been activated.
- The upgrade from the »Cam Editor« to »Cam Designer 3« and thus the activation of the full functional range will be carried out along with the installation of a licence key via a separate setup which can be purchased from Lenze.

14.3.1 User interface

A change from the »Cam Manager« to the »Cam Editor« results in the latter being displayed in the **Cam Manager** tab:



A. Using the icons in the »Cam Editor« *Toolbar* is the simplest way to execute some of the most frequently used menu commands of the »Cam Editor«, omitting the need to click the *Menu bar* first.

B. In the *Project tree*, the existing tracks are shown.
   – The *Project tree* is necessary in addition to the known »Engineer« *Project view* because not all drives of an electrical shaft have to have a cam function.

C. The *Object list* is a list of all objects in active mode.
   – Each line in the list contains the object type and the coordinates of the object.
   – The lines are sorted according to the X values (master). This is a standard setting. A different sorting sequence can be achieved by clicking the fields in the header.

D. The *Worksheet* is the drawing area for entering and editing graphic objects for the track selected in the *Project tree*.

E. Under the *Worksheet*, the *Time derivations* of the objects (speed, acceleration and jerk) are shown.

Short overview of the toolbar

- The icons available in the toolbar depend on the mode selected and the program context which you are currently in.
- Click an icon to execute the corresponding function:

Icon	Menu command	Function
	-	Change back to the »Cam Manager«.
	Edit→Cut	Cut out marked object (to the clipboard).
	Edit→Copy	Copy highlighted object (into clipboard).
	Edit→Insert	Insert object copied or cut.
	Edit→Undo	Reset last workstep.
	Edit→Redo	Redo workstep that has been reset.
	View→Zoom in view	Enlarge view of the worksheet.
	View→General view	Reset view of the worksheet to standard size.
	Draw→Selection	Highlight drawing objects.
	Draw→Point	Draw a point. • Function is only available with »Cam Designer 3« licence upgrade.
	Draw→Line	Draw a line.
	Draw→Polynomial(2)	Draw second order polynomial. • Function is only available with »Cam Designer 3« licence upgrade.
	Draw→Polynomial(5)	Draw fifth order polynomial.
	Draw→Point table (polygon)	Import points from a text file (*.txt).
	Draw→Typify connection	Specify a specific connection type for individual, automatically generated curve segments. • Function is only available with »Cam Designer 3« licence upgrade.
	View→Object input mode	Change to the object input mode for entering graphical motion objects.
	View→Curve mode	Change to the curve mode. • Function is only available with »Cam Designer 3« licence upgrade. • In this mode the individual graphical objects from the input mode are automatically connected to a closed cam.

Icon	Menu command	Function
	View➞Interpolation mode	Change to the interpolation mode. • Starting from an ideal, complete cam that was calculated in connection mode, table interpolation is carried out. The table contains the interpolation points of a linear interpolation. • **Note:** The button is only active in the *Expert mode* of the »Cam Editor«! – If the *Expert mode* has been deactivated, all the necessary steps automatically take place when the buttons **Curve mode** and/or **Interpolation mode** are clicked.
	Edit➞Start calculation...	Calculate cam in the connection or interpolation mode and arrange interpolation points optimally. • **Note:** The button is only active in the *Expert mode* of the »Cam Editor«! – If the *Expert mode* has been deactivated, all the necessary steps automatically take place when the buttons **Curve mode** and/or **Interpolation mode** are clicked.

14.3.2 Creating curves

Note!

When creating curves or characteristics in the »Cam Designer«, the following technological restriction is to be observed:

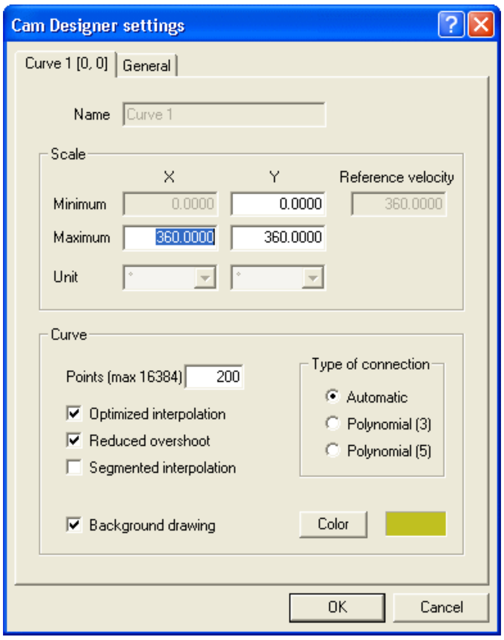
- If linear sections are created in a curve and these sections encompass more than half the maximum value range (i.e. more than 200 %), they must be represented with at least three interpolation points.
- In practice, this means that, in the case of linear sections that exceed the zero line, an interpolation point must be at the zero crossing or in the middle of the segment. In cases of doubt, the linear progression should be entered manually with two sections.

For position curves in the Modulo measuring system, this restriction is not relevant because, in this case, the permissible value range is adhered to automatically.

14.3.2.1 Step 1: Basic settings

If necessary, you can adapt the basic settings for the curve to be created (the motion profile or the characteristic). This is done in the dialog box entitled *Cam Designer settings*.

Select the **Edit→Cam Designer settings**... command to open the *Cam Designer settings* dialog box.



For each curve available in the *Project tree* of the »Cam Editor« the dialog box contains an individual tab within which the settings for the corresponding curve can be adapted.

Property	Information
Name	Name of the curve • Specifications by the »Cam Manager«.
Scaling	
Minimum / maximum **Unit**	Value range of the X and Y axes and their units in the *Worksheet*. • Value range for X axis is in preparation.
Curve	
Number of points	Number of interpolation points for table interpolation
Optimised interpolation	If this option is selected, an optimum distribution of points is calculated with the help of a neuronal network (artificial intelligence). This means that sections that are only slightly curved (e.g. lines) are represented only by a few interpolation points. In sharply curved sections, in contrast, many interpolation points are located. As a result, the curve is of a higher quality. • Option only activated with »Cam Designer 3« licence upgrade.
Reduced overshoot	If this option is selected, the curve objects are replaced with straight lines, if necessary. As a result, overshooting can be avoided. • Option only activated with »Cam Designer 3« licence upgrade.
Segmented interpolation	If this option is selected, the area for the interpolation is divided into segments with a definable number of points.
Background layout	If this option is selected, the curve remains visible in the chosen colour when you edit another curve. It is therefore easier for you to keep an eye on dependencies that may exist between the movements.

14.3.2.2 Step 2: Entering curves

You describe the motion profile or the characteristic by entering graphic objects in the *Worksheet*.

Note!

The »Cam Editor« needs a closed curve in order to be able to create cam data in the curve mode.

The »Cam Designer« only requires the entry of the basic conditions. The segments can then be joined automatically by the »Cam Designer«. ▶ Step 3: Triggering automatic connection of segments (📖 291)

Tip!

When using the »Cam Designer«:

Only define the basic conditions that are absolutely necessary. Limit the length of the stop positions to the minimum possible length.

The more degrees of freedom the »Cam Designer« has during the automatic generation, the smoother the resulting curves will be. If required, also line segments are added to the polynomials.

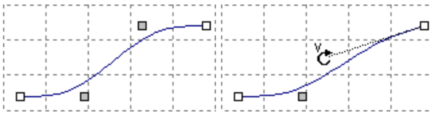
At the beginning, start with a minimum number of basic conditions. Then trigger automatic connection of the segments in the curve mode. After this, add further basic conditions, if necessary, in the object entry mode.

How to enter graphic objects in the worksheet:

1. Change to the object input mode.
2. Select graphic object in the *Toolbar* or in the **Draw** menu.
3. Draw selected object in the worksheet.

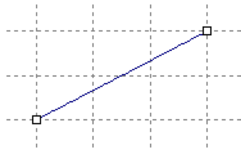
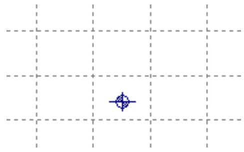
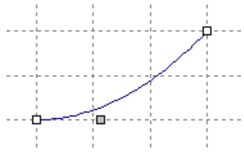
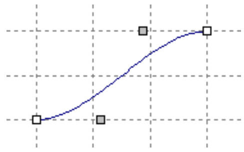
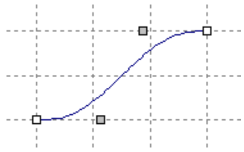
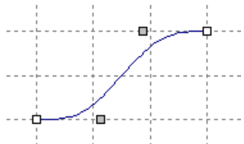
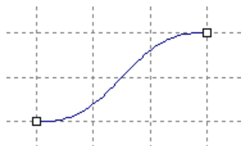
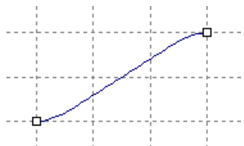
   Drawing a **point**:
   - Move the mouse pointer to the desired coordinates.
   - Press the left-hand mouse button.

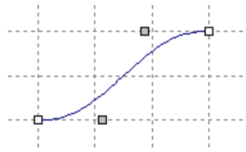
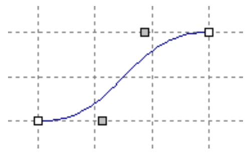
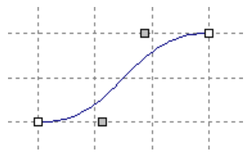
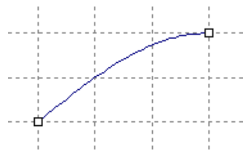
   Drawing **other objects** (line, polynomial, etc.):
   - Move the mouse pointer to the desired starting point.
   - Draw mouse pointer to the desired end point while keeping the left mouse button pressed.
   - At the light grey square, you can then alter the speed at a boundary value.



The shape and position of an object can still be altered later by dragging it with the mouse.

Overview of graphical objects

Icon	Object	Example
	**Line** The base elements stop (S) and speed (V) are defined with a line.	
	**Point** **Function is only available with »Cam Designer 3« licence upgrade.** The base elements reversal (R) and motion (M) are defined with a point. • In the default setting, the boundary value speed has been set to "0" for the point. This corresponds to the more frequent case of reversal (R). • In the default setting, the boundary value acceleration is calculated automatically in curve mode. • If necessary, the two boundary values can be adapted to the point in the *Properties* dialog box.	
-	**Polynomial(2)** **Function is only available with »Cam Designer 3« licence upgrade.** Second order polynomial $y = A2 \cdot x^2 + A1 \cdot x + A0$	
-	**Polynomial(3)** **Function is only available with »Cam Designer 3« licence upgrade.** Third order polynomial $y = A3 \cdot x^3 + A2 \cdot x^2 + A1 \cdot x + A0$	
	**Polynomial(5)** Fifth order polynomial $y = A5 \cdot x^5 + A4 \cdot x^4 + A3 \cdot x^3 + A2 \cdot x^2 + A1 \cdot x + A0$	
	**Polynomial(7)** **Function is only available with »Cam Designer 3« licence upgrade.** Seventh order polynomial $y = A7 \cdot x^7 + A6 \cdot x^6 + A5 \cdot x^5 + A4 \cdot x^4 + A3 \cdot x^3 + A2 \cdot x^2 + A1 \cdot x + A0$	
-	**Sloped sine line (Bestehorn)** Especially suitable for S-S (stop-stop) motion. $y = A3 \cdot x - \frac{A2}{2\pi} \cdot \sin(2\pi \cdot A1 \cdot x + A0)$ In the standard case, the coefficients have the following values: A3 = 1, A2 = 1, A1 = 1, A0 = 0	
-	**Sine-straight line combination** **Function is only available with »Cam Designer 3« licence upgrade.** Suitable for R-R (reversal-reversal) motion. Inflection point & parameter C can be set in the *Properties* dialog box. • The parameter C determines the ratio of the sine parts to the middle part. –At a value of 1, the middle part is equal to 0. –The standard value is 0.5.	

Icon	Object	Example
-	**Modified sine curve** **Function is only available with »Cam Designer 3« licence upgrade.** Suitable for the following movements: • R-V (reversal-speed) (is also called "harmonic combination") • V-V (speed-speed) Turning point & curve type can be set in the *Properties* dialog box.	
-	**Acceleration trapezium** Suitable for the following movements: • R-V (reversal-speed) (is also called "harmonic combination") • V-V (speed-speed) Turning point & curve type can be set in the *Properties* dialog box.	
-	**Modified acceleration trapezium** **Function is only available with »Cam Designer 3« licence upgrade.** Suitable for the following movements: • R-S (reversal-stop) • S-S (stop-stop) Turning point & curve type can be set in the *Properties* dialog box.	
-	**Simple sine curve** **Function is only available with »Cam Designer 3« licence upgrade.** Suitable for a circular motion of two orthogonal axes. • Suitable for jerk-free motion but only with restrictions. The angles on the left and right can be set in the *Properties* dialog box in the range of 90° to +90°.	
	Point table (polygon) Importing a point table in the ASCII format	

14.3.2.3 Step 3: Triggering automatic connection of segments

This function is only available after installing the »Cam Designer 3« licence upgrade.

After entering the technological basic conditions by means of graphical objects the segments available can be connected automatically by the »Cam Designer«.

▶ The »Cam Designer« calculates the connections automatically (when a changeover to curve mode is made). Manual starting of the connection calculation is only possible if the *Expert mode* has been activated.

How to have the connections calculated:

1. Change to the curve mode.
   - The objects from the entry mode are still visible (colour: "orange") but cannot be edited.
2. Start calculation of the connections.
   - The calculation of the connections starts automatically when the **Curve mode** button is clicked.

The connections are generated in such a way that impact-free and jerk-free motion is enabled in accordance with the laws of physics. In addition, a check is made to see whether a transition from one movement to another is possible without inflection points. This is possible precisely when only positive or only negative acceleration values are acceptable. If necessary, the polynomials are replaced with lines.

For the base elements reversal (R) and motion (M), the acceleration values are also pre-assigned in such a way that the resulting jerk is kept to a minimum.

Under the *Worksheet*, the speed, acceleration and jerk variations of the resulting motion profile are displayed.

Tip!

You can change back to the object input mode anytime to add further basic conditions. Afterwards you simply change back to the curve mode and have the connections recalculated.

14.3.2.4 Step 4: Adapting acceleration for points

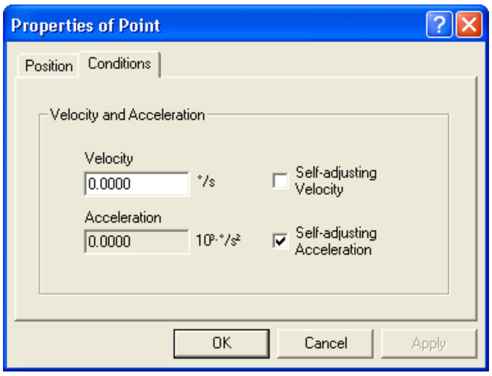
With regard to the calculation of the connections in the curve mode, the values for the acceleration are set automatically for all point objects for which the **Self-adjusting acceleration** option in the *Properties* dialog box has been selected (default setting).

The acceleration for these point objects is set to a value that connects the adjacent connection objects (e.g. polynomial 5th degree) to form an optimum motion profile.

There are cases where the use of algorithms does not lead to an optimum curve. Overshooting at the connections can occur, especially in the case of highly asymmetrical relationships.

How to carry out a manual correction of the acceleration:

1. In the *Context menu* (right-hand mouse button) belonging to the point in question, select the **Properties...** command in order to open the dialog box *Properties of point*:



2. In the **Boundary values** tab, deselect the option **Self-adjusting acceleration**.
3. Enter the desired acceleration in the **Acceleration** input field.
4. Click the **OK** button to close the dialog box and accept the settings.

5. The connections are calculated automatically.
    - If *Expert mode* has been activated, calculation is to be started by clicking the button.

14.3.2.5 Step 5: Generating an interpolation point table

The actual development of the motion profile has now been completed. However, the »Cam Manager« (and also the drive controller) needs the motion profile in the form of an interpolation point table.

How to generate the interpolation point table:

1. Change to the interpolation mode.
    - Generation starts automatically when you click the **Interpolation mode** button.

After the interpolation point table has been generated successfully, you can change back to the »Cam Manager« to transfer the cam data to the controller.

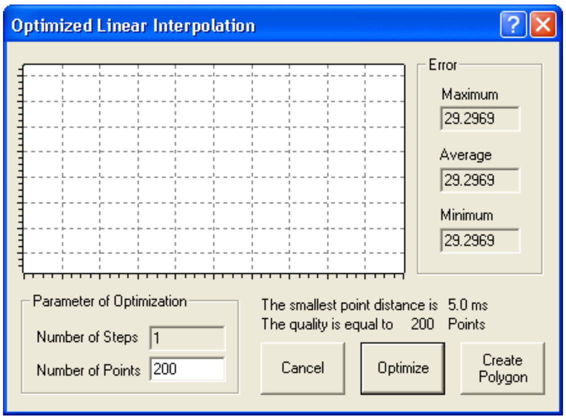
Optimised linear interpolation of the interpolation points

Note!

The **Optimised linear interpolation** dialog box is only visible in the »Cam Designer« if *Expert mode* has been activated.

- The *Expert mode* in the »Engineer« can be activated in the *General* tab in the menu **File→Cam Designer settings**.

If, in the *Cam Designer Settings* dialog box, the option **Optimised interpolation** has been selected for the curve, the *Optimised linear interpolation* dialog box is initially shown after the calculation has started:



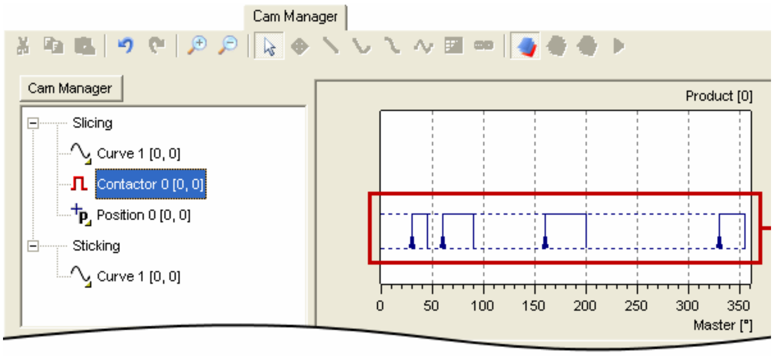
- If you click the **Optimise** button, an optimum distribution of points is calculated with the help of a neuronal network (artificial intelligence). This means that sections with little curve (e.g. lines) are represented with only a few interpolation points. In sharply curved sections, in contrast, there are many interpolation points.
- If you click the **Generate polygon** button, the optimised interpolation point table is inserted into the object list.

How to generate the interpolation point table with Expert mode activated:

1. Change to the interpolation mode.
2. Start calculation of the connections.
   - The calculation of the connections starts automatically when the **Curve mode** button is clicked.

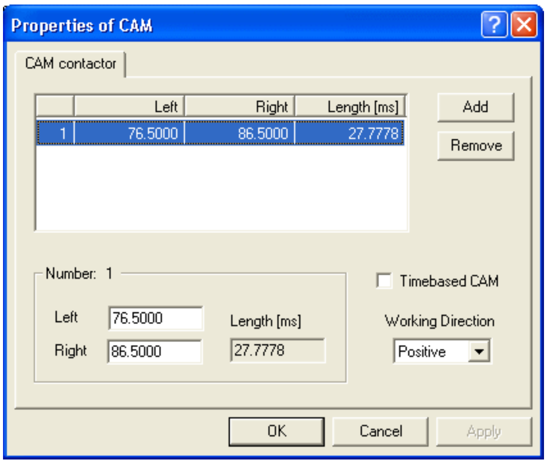
14.3.2.6 Creating cams

A cam track (A) can contain up to 16 cams of the same type (position or time cam):



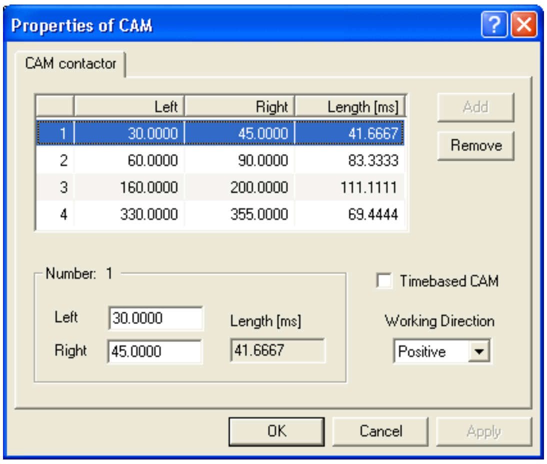
How to add cams to a cam track:

1. Select the cam track to be edited in the *Project tree* of the »Cam Editor«.
2. Move the mouse pointer in the *Worksheet* to the (approximate) cam position.
   - We will define the exact cam position/duration (of a time cam) in a later step.
3. In the *Context menu* (right-hand mouse button), select the **Add cam** command.
   - The cam is inserted at the position of the mouse pointer.
4. Double click on the cam in order to open the *Properties* dialog box:



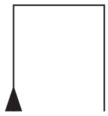
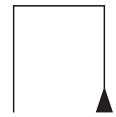
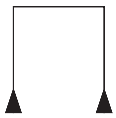
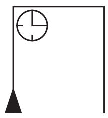
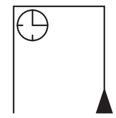
   - In the *Properties*, dialog box, the properties of all (max. four) cams of the track are shown.
5. Set the cam type (position or time cam) and the effective direction for all cams of the track.
6. Set the exact position/time period of the cam selected in the list field.
7. Click the **Accept** button in order to accept the settings for the cam selected.
8. Optional: Adding additional cams.
   - To do this, enter the position/duration of the cam and then click the **Add** button.

   Example: Four position cams with a positive effective direction:



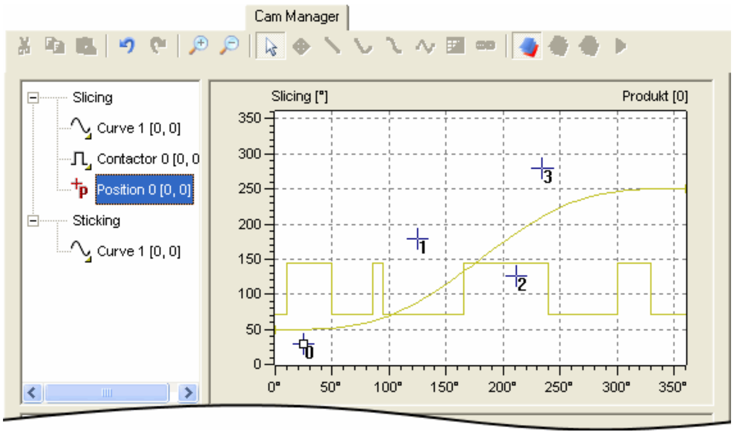
9. Click the **OK** button in order to accept the settings and close the dialog box.

Cam types

Representation	Meaning
	**Position cam with a positive effective direction** • Switch-on and switch-off positions are specified in advance by means of positions. • The cam switches if the direction of movement is positive (positive speed).
	**Position cam with a negative effective direction** • Switch-on and switch-off positions are specified in advance by means of positions. • The cam switches if the direction of movement is negative (negative speed).
	**Position cam with a bipolar effective direction** • Switch-on and switch-off positions are specified in advance by means of positions. • The came switches if the direction of movement is positive or negative.
	**Position-time cam with a positive effective direction** • The cam switches at the switch-on position if the direction of movement is positive (positive speed). • After the time defined the cam switches off again.
	**Position-time cam with a negative effective direction** • The cam switches on at the switch-on position if the direction of movement is negative (negative speed). • After the time defined the cam switches off again.

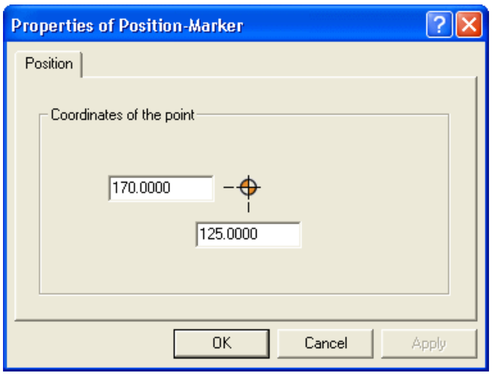
14.3.2.7 Creating position markers

A position track can contain up to eight position markers, which do not necessarily have to rest on the curve. Each position marker is identified with the number of the respective function block output:



How to add position markers to a position track:

1. Select the cam position to be edited in the *Project tree* of the »Cam Editor«.
2. Select the command **Draw → Position marker**.
3. Move the mouse pointer in the *Worksheet* to the desired coordinates and press the left mouse button.
   - The position marker is inserted at the position of the mouse pointer.
4. Double-click on the position marker in order to open the *Properties* dialog box:



5. Set the exact coordinates of the position marker.
6. Click the **OK** button in order to accept the settings and close the dialog box.

14.4 User motors

This function is available in »Engineer« HighLevel V2.7 and higher!

A user motor saves default values for Lenze controller codes relevant for the motor. A user motor can be created in your »Engineer« project (on the basis of the current controller settings of a controller).

User motors can be saved to a user motor catalogue and can be reused within the same project (or in other projects).

14.4.1 Creating user motors from controller settings

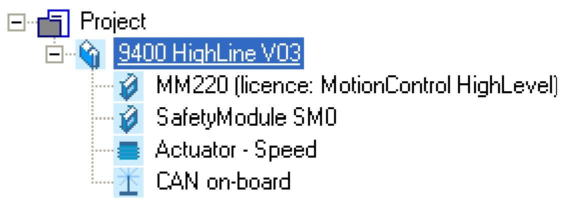
- Optimise the code values of a Lenze controller in the »Engineer« project until correct control of the motor is performed.
- A new user motor can be created from the current settings on the same project tree level.
- The new user motor can e.g. be copied within the project or saved to a user motor catalogue to be reused in other »Engineer« projects.

Note!

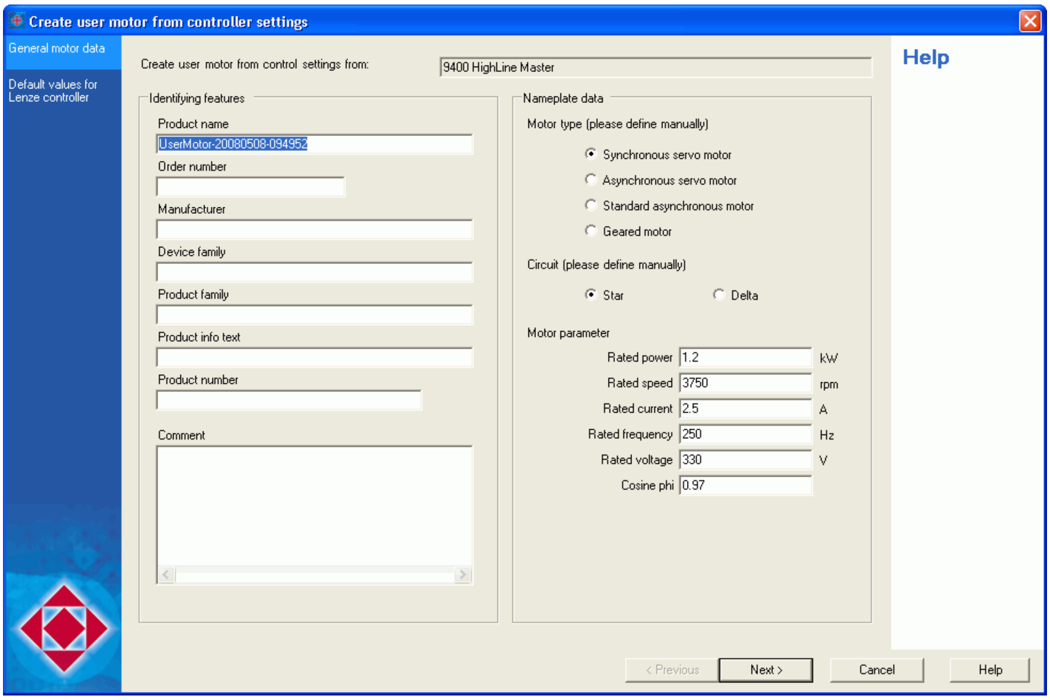
- If the selected drive controller is **online**, the **online values of the respective code** are read in to determine the nameplate data and the default values of the new user motor.
- If the selected drive controller is **offline**, the **offline values of the code in question** are used to determine the nameplate data and the default values of the new user motor.

How to create a motor from controller settings:

1. Select a controller in an »Engineer« project.
   - A Lenze 9400 HighLine is used as an example:

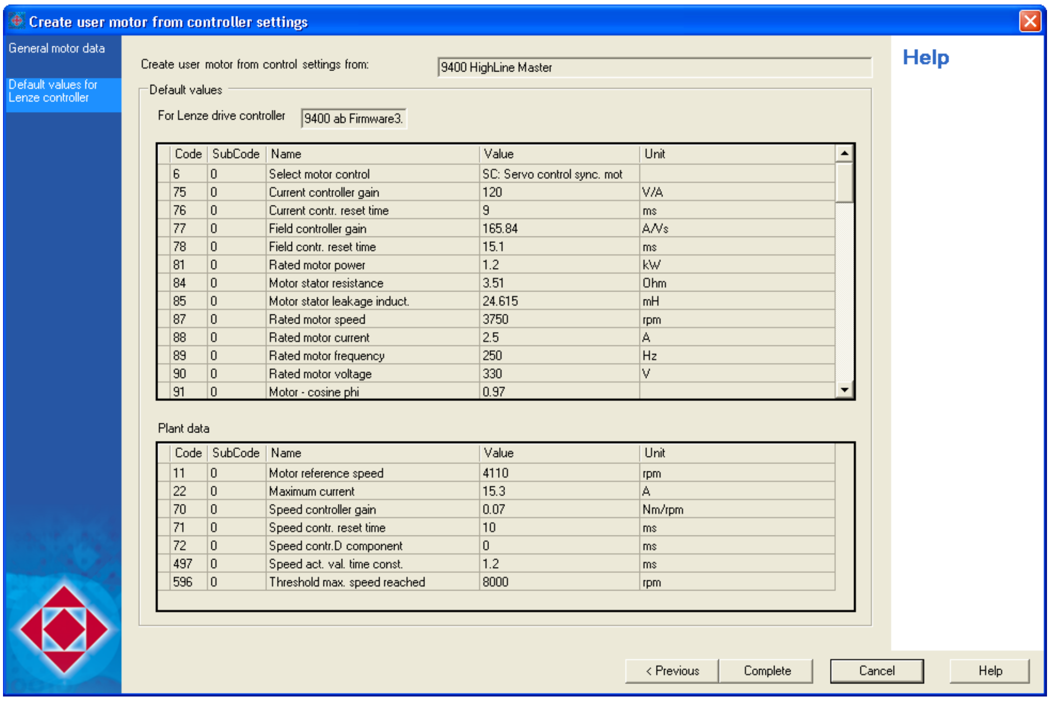


2. Select **Create user motor** via the context menu of the controller.
   - The *Create user motor from controller settings* dialog box opens.



3. Enter the data required in the dialog box.
   - The nameplate data (general data such as rated power and rated frequency) of the new user motor are calculated from the code values of the controller previously selected if possible.
   - If some pieces of nameplate data cannot be calculated from the code values of a specific controller (example: the rated motor power cannot be calculated from the codes of an 8200vector), the respective input field in the *Create user motor from controller settings from* dialog box remains empty. The values can be entered manually.

4. Click the **Next** button.
   - The dialog box shows the default values which are determined from the code values of the previously selected controller and are transferred to the new user motor. The parameter list below shows the so-called *Plant data*.



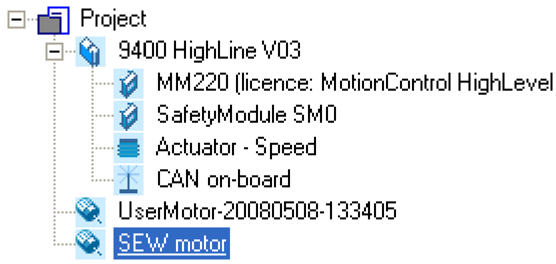
5. Click the **Complete** button to create the user motor.

14.4.2 Saving a user motor to the user motor catalogue

A user motor can be saved to a user motor catalogue to be reused in other »Engineer« projects.

How to save a user motor:

1. Select a user motor in the »Engineer« project that has been created.



2. Select **Save motor to catalogue** from the context menu of the user motor.
   - The *Save motor to catalogue* dialog box shows the parameters of the user motor, identification features and nameplate data.
   - The parameters can be changed anytime later on.
3. Click the **Next** button.
   - The default values for the controller selected are displayed.
   - If there already is a motor of the same name in the user motor catalogue, you will be asked whether you would like to save the motor under another name or whether you would like to replace the motor that has been saved under that name so far. Alternatively, certain default value sets can be transferred to the user motor already saved in the catalogue.
4. Click the **Complete** button.
   - **Note:** A user motor already saved in the user motor catalogue can be extended by additional data. Default values for 8400 controllers e.g. can be added to a motor which only contains default values for 9400 controllers so far.

14.4.3 Inserting the user motor into the project

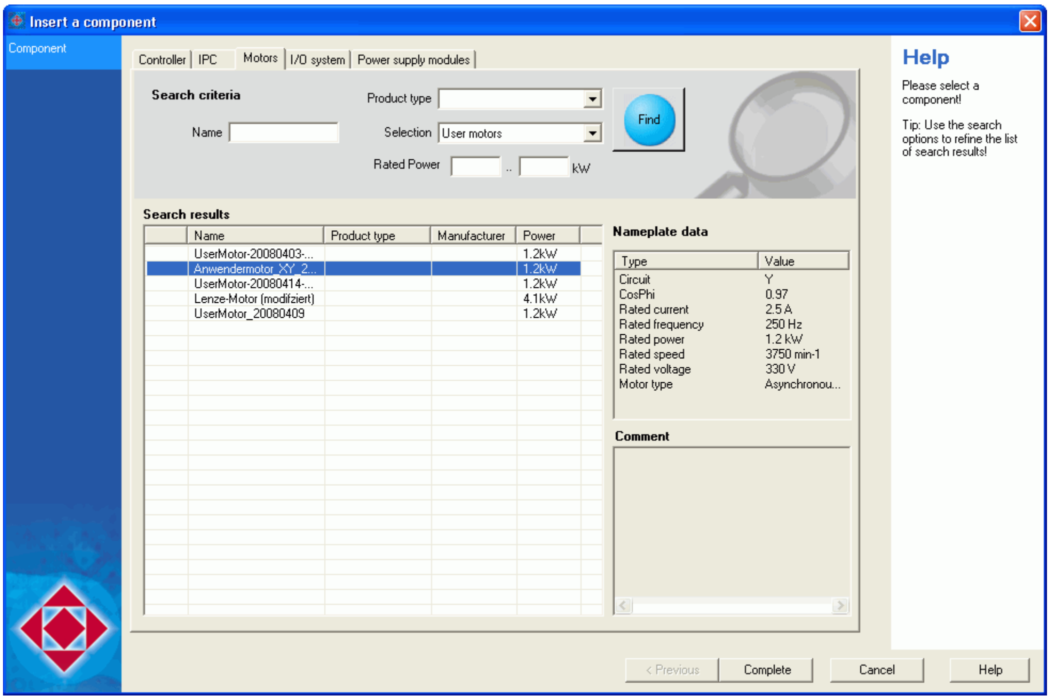
Tip!

You can select the motor and other components at the same time as you insert an axis if you first activate the control field **Select individual components of the axis** and then select the corresponding components. ▶ Inserting axes (📖 59)

The user motor needs to be saved to the system's user motor catalogue before it can be inserted.

How to insert a user motor:

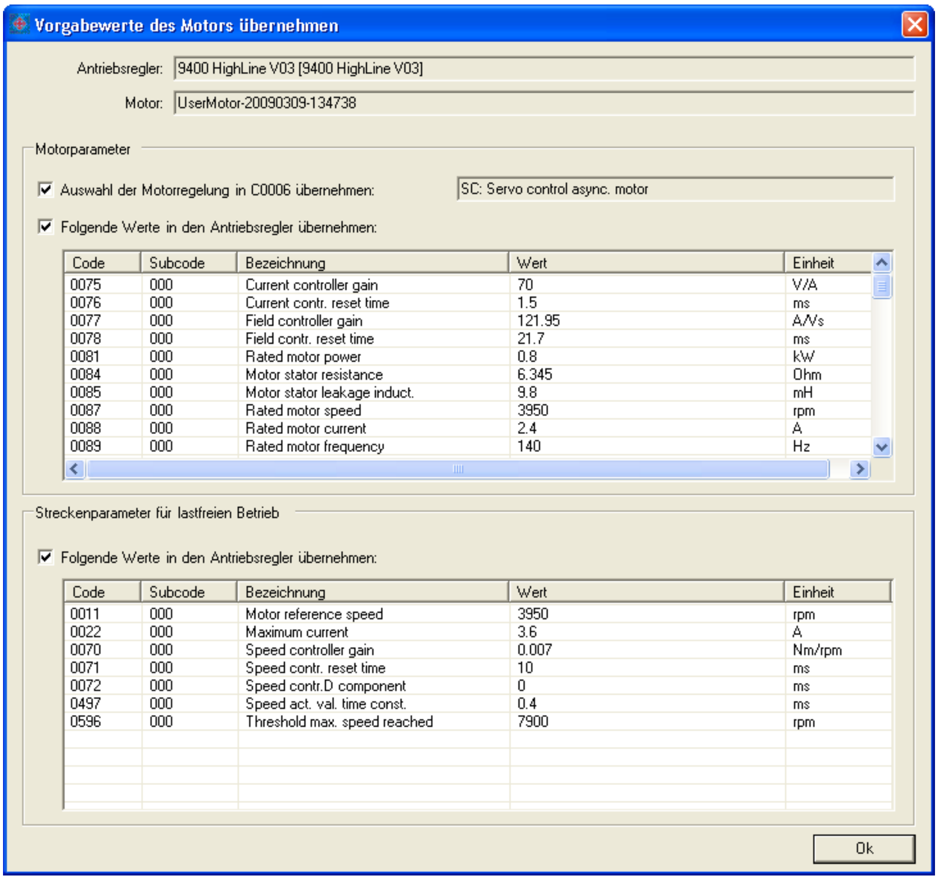
1. Open the *Project view* and select the system module or the axis into which the motor is to be inserted.
2. Click the icon to open the wizard for adding a component.
   - **Tip:** As an alternative, the wizard can be called by clicking **Insert → Component** in the main menu or **Insert component** in the context menu.
3. Select the **Motors** tab.
4. In the **Selection** list field, select *User motors*.
   - All user motors available are displayed in the **Search results** list field:



5. Select the user motor to be inserted in the **Search results** list field.
   - On the right, technical data of the motor selected are displayed.
6. Insert the selected user motor as component into the project by clicking the **Complete** button.

7. The user motor to be inserted provides default values for transfer into the corresponding codes of the controller. The following default values can be selected:
   - Type of motor control,
   - Motor parameters,
   - Plant parameters for load-free operation.

   As standard setting, all default values of the motor are selected for transfer to the controller.



   Note: The default values of the user motor will overwrite the controller settings!

8. Insert the selected user motor as component into the project by clicking the **OK** button.

   Note: If there already is a motor on the level intended for the user motor, you will be asked in a dialog box whether you would like to delete the other motors.
   - The dialog box then closes and the selected motor is inserted into the highlighted element.

14.4.4 Modifying/supplementing motor default values

If a controller has already been connected to a user motor in your project, the default values saved in the user motor can be modified by overwriting those values with the current code values of the controller.

If the user motor has not previously been provided with default values for the controller group in question, the default values are supplemented by the new data.

How to modify motor default values:

1. Create an »Engineer« project including a user motor.
2. Highlight the user motor.

3. Click the **Modify/supplement motor default values** button in the *Motor parameter* tab.

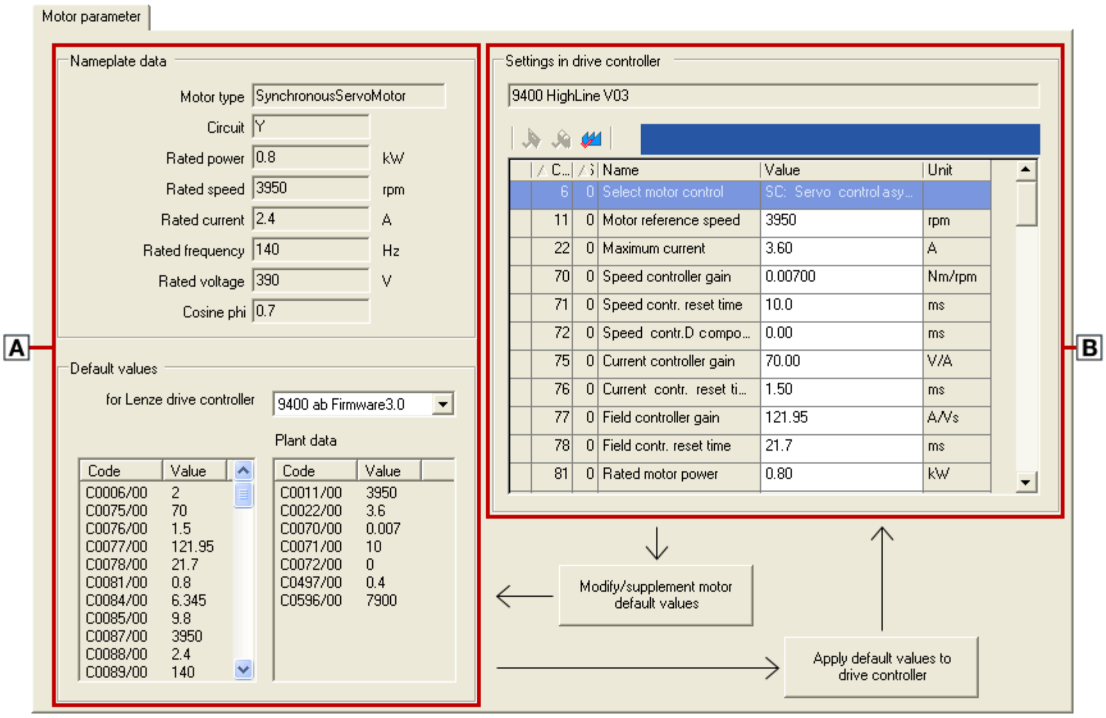
   Note: The controller settings will overwrite the default values of the user motor!

   - Confirm the query by clicking the **Yes** button to overwrite the default values of the user motor.

14.4.5 Transferring default values to the controller

If a controller has already been connected to a user motor in your project, the default values saved in the motor can be transferred once again to the controller. This will reset settings that might have been changed to the default values.

For this purpose, use the "Motor parameter" tab of the respective user motor.



Range	Functions
A	Data and default values of the user motor
B	Parameters of the controller connected

Note!

- The button for transferring the default values is only activated if the controller group suitable for the controller connected has been selected in the control field of the tab.
- If the drive controller is online at this point in time, the default values are transferred to the offline and online values of the relevant codes of the drive controller.
- If the controller is in offline mode, the default values will be transferred to the offline values of the controller codes in question.

How to transfer the default values to the controller:

1. Create an »Engineer« project including a user motor.
2. Highlight the user motor.

3. In the *Motor parameter* tab, click the **Apply default values to drive controller** button.

   Note: The default values will overwrite the controller settings!

   - Confirm the query by clicking the **Yes** button to apply the default values to the drive controller.

Tip!

If the default values of a user motor have been changed in the project, the motor can be saved once again to the user motor catalogue. Replace the user motor already saved in the user motor catalogue or save the modified user motor under another name.

14.4.6 Deleting/exporting/importing user motors

The user motor catalogue provides the possibility of creating and managing user motors according to individual requirements. All user motors saved can be selected for the user motor catalogue to be edited.

User motors can be deleted, imported or exported from your motor catalogue according to your individual requirements:

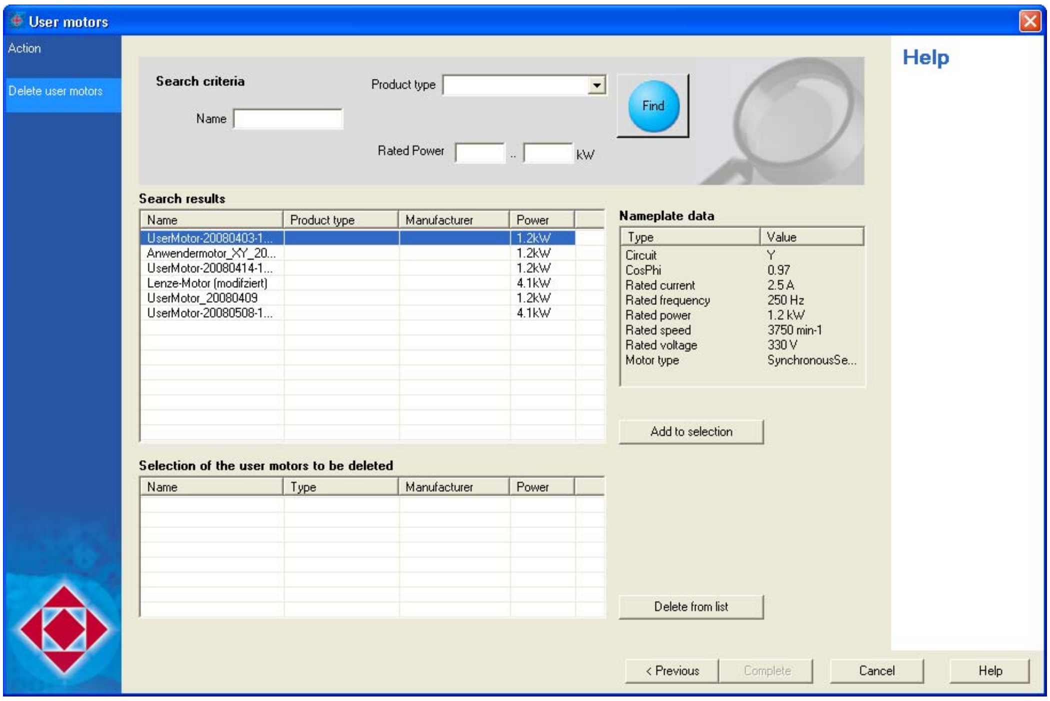
- Deleting user motors (📖 307)
- Exporting user motors (📖 308)
- Importing user motors (📖 309)

Deleting user motors

Select **Tools→User motor catalogue** to delete a user motor.

In the *User motors* dialog box, select **Delete user motors**,

Confirm your selection by clicking the **Next** button.



The dialog box will display the user motors available in the list of search results above.

How to delete a user motor:

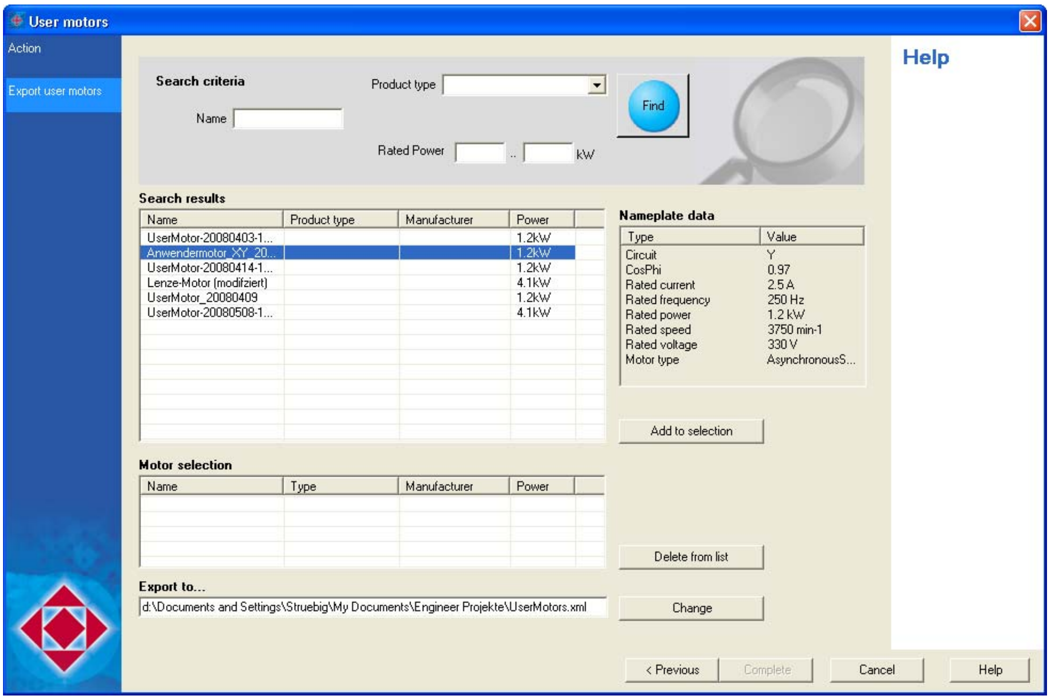
1. Highlight the desired user motor in the list of *Search results*.
2. Transfer the user motor highlighted to *Selection of the user motors to be deleted* via the **Add to selection** button.
3. If the **Complete** button is clicked, the selection of the user motors to be deleted will be removed from the catalogue.

Exporting user motors

Select **Tools →User motor catalogue** to export a user motor.

In the *User motors* dialog box, select **Export user motors**,

Confirm your selection by clicking the **Next** button.



How to export a user motor:

1. Highlight the desired user motor in the list of *Search results*.
2. Transfer the user motor highlighted to *Motor selection* via the **Add to selection** button.
3. Specify a storage location for the user motors exported in the *Export to...* input field.
4. Click the **Complete** button to export the user motors inserted in *Motor selection*.

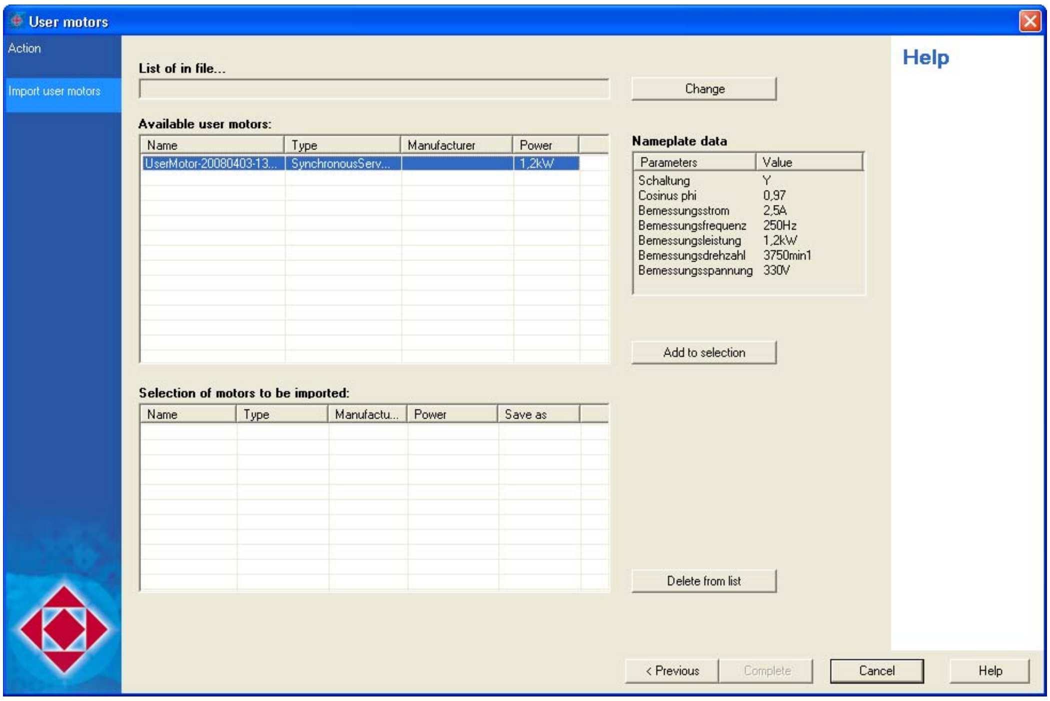
Importing user motors

The basic condition for the import of user motors is that the user motors should be described in the XML file format used in the »Engineer«.

Select **Tools ➞ User motor catalogue** to import user motors.

In the *User motors* dialog box, select **Import user motors**,

Confirm your selection by clicking the **Next** button.



How to import a user motor:

1. Select the source directory for the user motors to be imported via the **Change** button.
2. Highlight the desired user motor in the list of *Available user motors*.
3. Transfer the user motor highlighted to *Selection of motors to be imported* via the **Add to selection** button.
4. Click the **Complete** button to import the user motors inserted into the *Motor selection*.

15 Glossary

A

AIF

Abbreviation for "**A**utomation**I**nter**f**ace". Lenze-specific interface on the controller, onto which a communication module can be plugged.

Communication module

Application

Implementation of a concrete function (e.g. speed control) on an individual device.

Application variable

Structure from element variables which is communicated with a specific transfer mode via network(s). The definition of an application variable is absolutely independent of a concrete network type.

Element variable

Axis

Is a special type of system module and generally contains at least one drive controller and a motor but, depending on the application, can also contain further devices such as gearboxes and encoders.

B

Bus server

Fieldbus-specific OPC server in accordance with DRIVECOM specification.

OPC
DRIVECOM

C

CAL

Abbreviation for "**C**AN **A**pplication **L**ayer". Communication standard (CiA DS 201-207) providing objects, protocols and services for the event- or polling-controlled transmission of CAN messages and the transmission of greater data areas between CAN nodes. Furthermore CAL offers efficient prodecures for an automatic allocation of message identifiers, for the initialisation and monitoring of network nodes and the assignment of an individual identification to network nodes.

CAN

Abbreviation for "**C**ontroller **A**rea **N**etwork". Serial, message- and not node-oriented bus system for max. 63 nodes.

CANopen

Communication profile (CiADS301, version 4.01) which originated under the umbrella association of the CiA ("CAN in Automation"), compliant with the CAL ("CAN Application Layer").

C

Catalogue

A catalogue contains descriptive information on all element types which an »Engineer« project consists of. The »Engineer« uses different types of catalogues, e.g. for devices, device modules, technology applications, function blocks, and motors. Each catalogue is identified by a versioning.

Catalogue package

A catalogue package is a quantity of related catalogues, which is provided with a name and version. Several versions of a catalogue package can be added to an »Engineer« installation. Each »Engineer« project can use an optional number of catalogue packages. Each catalogue package can be used in exactly one version.

Communication module

Extension module which for instance adds a communication interface to a controller and which on its own, i.e. without a device, cannot perform a function and is not communication-capable.

Function module
Communication module

CiA

Abbreviation for "**C**AN **in** **A**utomation (e. V.)": International manufacturer and user association with the target of distributing the knowledge about the internationally standardised CAN bus system (ISO 11898) worldwide and supporting its technical development.

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

Code

Parameter for Lenze devices for setting the device functions.

COM

Abbreviation for "**C**omponent **O**bject **M**odel": Architecture developed by Microsoft® for the interaction of individual executable software components (objects) which communicate with each other in the same way and which are only connected during the runtime of the program.

Controller

Generic term for Lenze frequency inverters, servo inverters, and PLCs.

D

DCOM	Abbreviation for "**D**istributed **C**omponent **O**bject **M**odel": COM for which the executable objects can be distributed to different computers within a local area network. ▸ COM
Device	Mechatronic unit which serves a specific purpose and which can feature mechanical, electrical and logical interfaces to its environment. A device is referred to as "communication-capable device" if it can communicate as a node within a network. In contrast to the mechatronic unit "system module", a device usually is not only developed when a system is designed in the course of a concrete project, but at a manufacturer's location. Examples of devices: controllers, PLCs, motors, gearboxes, sensors, encoders
DRIVECOM	"DRIVECOM User Group e.V.": International association of manufacturers for drive technology, universities and institutes with the objective of developing a simple integration of drives into open automation structures. ▸ Internet: http://www.drivecom.org/
DriveServer	Lenze software by means of which a simple integration of drives into open automation structures on the basis of OPC ("OLE for Process Control") can be carried out. ▸ OPC

E

Element variable	Variable that is used in an application to execute a specific functionality of the respective device. ▸ Application

F

Window icon	Button in the right-most position of the title bar to alter the window representation or close the window.
FIF	Abbreviation for "**F**unction**I**nter**f**ace". Lenze-specific interface on the controller, onto which a function module can be plugged. ▸ Function module
Function module	Device extension for the FIF interface which for itself, i.e. without a device, cannot perform a function and is not communication-capable on its own. ▸ FIF

H

Hyperlink	Optically highlighted reference which is activated via mouse-click.

M

Machine application

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

Menu bar

Bar in the upper position of the application window below the title bar, where the names of menus opening by mouse-click are shown.

L

L-force Controller

The L-force Controller serves as a central system for controlling and/or visualising machines.

N

NMT

Abbreviation for "**N**etwork **M**anagement": 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 "**O**bject **L**inking and **E**mbedding": Insertion of functional objects into other applications, e.g. a Microsoft® Excel table into a Microsoft® Word document.

OPC

Abbreviation for "**O**LE for **P**rocess **C**ontrol": Defines an interface based on the Microsoft® Windows® technologies OLE, COM and DCOM, which enables a data exchange between different automation devices and PC programs without considering driver and interface problems.

The OPC server provides the data, the OPC client receives them.

▸ COM
▸ DCOM

OPC tunnel

OPC server and OPC client can be located on different PCs that are linked via Ethernet. In order to establish communication between these computers, a special DCOM configuration is required. For networked OPC communication, Lenze uses an OPC tunnel that renders any configuration unnecessary.

P

PDF	Abbreviation for "**P**ortable **D**ocument **F**ormat", a universal file format for the exchange of electronic documents, developed by the company Adobe. By means of the Adobe® Reader® software that is available free of charge by Adobe, PDF files can be displayed and printed, irrespective of the application and the platform used for the creation. ▸ Internet: http://www.adobe.com/
PLC	Abbreviation for "**P**rogrammable**L**ogic **C**ontroller".
PLC Designer	Integrated development environment for the creation of IEC 61131 programs for Lenze PLCs.
Port	Connecting point or interface of an application or machine application. Via input ports for instance setpoints and control commands can be transferred to an application; via output ports an application can for instance provide actual values and status messages. ▸ Application ▸ Machine application
Project element	The top element (root element) in the project view with the global properties of the project.

R

RAS server	With the Remote Access Service (RAS), Windows offers the possibility of connecting clients to the local area network via a modem, ISDN or X.25 connection. This not only supports different clients, but also provides great flexibility with regard to the selection and possible combinations of the network protocols used. The clients connected to the Windows network via RAS can access the entire functionality of the network like they were directly connected locally to the network.
Reset node	Function of Lenze devices with a system bus (CAN) interface by which the device can be reinitialised if the data transfer rate, node address or identifiers are changed. NMT ▸ CAN ▸ NMT

S

ST	Abbreviation for "**S**tructured **T**ext": Standardised programming language (IEC 61131-3) for programmable logic controllers (PLC).
System bus (CAN)	Lenze bus system based on the CANopen communication profile (CiADS301, version 4.01). ▸ CAN
System module	Generic term for a mechatronic unit which in general can include several devices, one or more networks, information on parameter values, program logic, or pieces of documentation. A system module provides a specific technological function. It interacts with its environment and can usually be reused in another environment or system. The interfaces of a system module are generated by interfaces of its components.

T

Title bar	Bar in the upper position of the application window, which contains the program symbol and the program name in the left-most position, and the window symbols in the right-most position. ▸ Window icon
Top-down method	Design and implementation method which passes over step by step from general, comprehensive structures to increasingly specific details until the whole project structure is created.

V

Variable

Designation of a data memory that can adopt values which are specified by the data type and by pieces of information during the variable declaration.

X

XML

Abbreviation for "e**X**tensible **M**arkup **L**anguage", a meta language by means of which the structure of documents is described.

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FEEDBACK

Your opinion is important to us

We have written these instructions to the best of our knowledge and ability with the aim of providing you with the best possible support in the use of our products.

If you have suggestions for improvement, please e-mail us to:

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Thank you for your support.

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