

Getting started

Cam Designer Professional



Lenze

This Manual is valid for the **Cam Designer Professional** from version 2.3

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1 About this Manual

The Manual contains information on the **Lenze Cam Designer Professional V2.3**.

The »Cam Designer Professional« is a software which serves to create transfer recipes consisting of motion profiles, cam tracks and position markers, and transfer them from a PC to Lenze target systems.

Special features of the »Cam Designer Professional« are:

- ▶ Import of CAD data via standardised interfaces (VDI 2143).
- ▶ Operation of the program via a convenient PC user interface.
- ▶ Automatic smoothing of imported CAD data (motion profiles) for a smoother running of the drives.
- ▶ Easy creation of cams by means of graphic objects (e.g. lines, polynomials).
- ▶ Data is directly input using the physical unit.
- ▶ Assistance in drive dimensioning.
- ▶ Automatic generation of connections according to the motion rules (VDI 2143) by using an expert system (jerk-free movements for protecting the mechanics).
- ▶ Display of speed, acceleration and jerk.
- ▶ Creation of value pairs (position, speed or acceleration) for direct cam profile acceptance in Global Drive Control.
- ▶ Project management (statistics, author, version, date/time) and mail support.
- ▶ Printing of a cam graphics with project information and date.

1.1 Conventions used

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

Type of information	Marking	Examples/notes
Variable identifier	<i>italic</i>	Set <i>bEnable</i> to TRUE to...
Window		The <i>message window</i> ... / The <i>Options</i> dialog box...
Control element	bold	The OK button... / The Copy command... / The Properties tab... / The Name input field...
Sequence of menu commands		If the execution of a function requires several commands, the individual commands are separated by an arrow: Select File→Open to...
Keyboard command	<bold>	Use <F1> to call the Online Help. If a command requires a combination of keys, a "+" is placed between the key symbols: Use <Shift>+<ESC> to...
Program listings	Courier	IF var1 < var2 THEN a = a + 1 END IF
Keyword	Courier bold	
Link	<u>underlined</u>	Links are highlighted references which are activated by means of a mouse click.
Safety information	 	▶ Layout of the safety information (□ 7)

Type of information	Marking	Examples/notes
Step-by-step instructions		Like safety information, step-by-step instructions and tips can be recognised by an icon.
Tip		

1.2 Layout of the safety information

All safety information have a uniform structure:

- ▶ The icon characterises the type of danger.
- ▶ The signal word characterises the severity of danger.
- ▶ The note describes the danger and suggests how to avoid the danger.



Signal word

Note

Icon	Signal word	Meaning	Consequences if disregarded
 hazardous electrical voltage	Danger!	Impending danger to persons	Death or severe injuries
 general danger			
	Stop!	Potential damage to material	Damage to the controller or its environment
	Note!	Note	

2 System requirements

The following minimum requirements on hardware and software must be met to use the »Cam Designer Professional«.

- ▶ Microsoft® Windows ME®, Microsoft® Windows NT® 4.0 (as of Service Pack 5), Windows® 2000 (as of Service Pack 2) or Windows XP
- ▶ 64 MByte RAM
128 MByte RAM (XP, 2000)
- ▶ IBM compatible PC (CPU: Pentium 90 MHz processor or faster)
- ▶ Super VGA screen
- ▶ Hard disk with at least 120 MB of free disk space
- ▶ CD-ROM drive
- ▶ Mouse (Microsoft-compatible)

2.1 Connection with the target system

The communication with the target system (controller, Drive PLC, etc.) requires a fieldbus-specific interface module for the PC and the corresponding fieldbus modules for the target systems to be connected.

For system bus (CAN) communication, Lenze offers the following components as interface module for the PC:

Bus system		Max. number of target systems	
	PC port		Required hardware components
System bus (CANopen)		63	
	Parallel port (LPT port)		PC system bus adapter 2173 incl. connecting cable and voltage supply adapter • for DIN keyboard connection (EMF2173IB) • for PS/2 keyboard connection (EMF2173IBV002) • for PS/2 keyboard connection with electrical isolation (EMF2173IBV003)
	USB (Universal Serial Bus)		PC system bus adapter 2177 incl. connection cable (EMF2177IB)

3 Software installation



How to install the »Cam Designer Professional«:

1. Start Windows.
2. Insert the CD-ROM »Cam Designer Professional« into the CD-ROM drive.
 - If the auto-start function of the CD-ROM drive is active, the installation program is started automatically and you can proceed with step 5.
3. Select Run ... from the start menu.
4. Enter the letter for your CD-ROM drive followed by ":\setup.exe" (e.g. "e:\setup.exe") in the command line and confirm with OK.
5. Follow the instructions of the installation program.



Note!

Installation under Windows NT/2000/XP requires administrator rights!

4 Introduction

»Cam Designer Professional« is a graphic tool for the easy creation of electronic cams.

4.1 What's new?

- ▶ Integration of the 9300EK servo cam target system
 - Online download is possible via all drives
 - Import of the GDC files for easy import of existing profiles
 - Dividing the profiles into five freely selectable segments/sections
 - Direct creation of the profile fields *.LC7
- ▶ Integration of a technology assistant
 - This serves to simply create profiles for cross-cutter applications
- ▶ Free assignment of measuring systems for X and Y axes of the worksheet
- ▶ Page preview and printing information for profiles and cams.
- ▶ Improved import function for interpolation tables
 - Spline interpolation for an improved smooth running
 - Optional import of an acceleration profile e.g. with a non-linear feedback of moments of inertia
- ▶ Improved parameter setting of the modified trapezoidal acceleration
 - Motion profile suitable for cross-cutter applications

5 User interface

5.1 General settings



Note!

The »Cam Designer Professional« consists of the »Cam Manager« and the »Cam Designer«.

5.1.1 Using the direct help

The »Cam Designer Professional« has a direct help which can be used to display information about specific areas of the user interface.



Select the command **Help→Direct help** and click the area about which you want to obtain more detailed information.

If you have opened e.g. the dialog box *Settings* and click the input field **Rated cycles/min**, information about this dialog object is displayed when pressing <F1>.

5.1.2 Language selection

You can always select another language for the menu, dialog and help texts of the »Cam Designer Professional«.

- The available languages depend on the language files that have been installed together with the »Cam Designer Professional«.



How to select another language...

1. Select command **View→Set language**.
2. Go to the *Language configuration* dialog box and select the desired language.
3. Click OK to confirm your selection and close the dialog box.

5.1.3 Title bar

The *title bar* at the top of the application window shows the **program icon** and the **program name** on the left and the **window icons** on the right.

- ▶ With a click on the **Window icons**    you can change the representation of the application window as follows:
 - Icon in the *task bar* ()
 - Full screen ()
 - Window size ()
- ▶ A click on the **program icon** opens the **system menu** which also includes commands for positioning and changing the size of the application window.
- ▶ A click on the **window icon**  or a double-click on the **program icon** exits the »Cam Designer Professional«

5.1.4 Menu bar

The menu commands can be accessed via the *menu bar*.

- ▶ A click on an item of the main menu opens the corresponding menu and lists the menu items contained in it.
- ▶ Click a menu item to execute the corresponding function.
 - Menu items which are displayed in light grey are currently deactivated because the execution of the corresponding function would not make any sense in the current program state.



Tip!

Many frequently used functions can be executed faster by means of the [Toolbar](#) icons. ( 16)

5.1.5 Workspace

The document windows (worksheets) are displayed in the workspace.

- ▶ When the »Cam Designer Professional« is started, the workspace is blank because there are no open projects.
- ▶ The worksheet is the area for entering and editing graphic objects.

5.1.6 Status bar

The display is optional.

The program status is indicated in the *status bar*.

The status bar describes the action which is executed by the menu item selected or a pressed button of the toolbar and displays the coordinates of the mouse pointer.



Tip!

If you position the mouse pointer over an icon in the [Toolbar](#) or a menu command, more information about the corresponding function will be indicated in the *status bar*.

5.1.7 Document window (worksheet)

If you open a project, the corresponding *worksheet* will be indicated in a *document window* in the [Workspace](#) of the Cam Designer Basic.

By default, the *document window* is displayed on a full screen, i.e. the *document window* fills the whole *workspace* of the »Cam Designer Professional«.

- ▶ With a click on the **window icons**    at the top right of the *document window* you can change the representation of the *document window* as follows:
 - Icon within the *workspace* ()
 - Full screen ()
 - Window size ()
- ▶ A click on the **program icon** opens the **system menu** which also includes commands for the positioning and size of the *document window*.
- ▶ A click on the **window icon**  or a double-click on the **program icon** closes the *document window*.
- ▶ Use the key combination <Ctrl>+<F6> to jump from one *document window* to the next *document window*.

"Window" menu

The **Window** menu contains the following commands for the arrangement of the *document window*:

Command	Function
New window	Opens a new window with the same contents as the active window. In this way, it is possible to display different parts or views of a worksheet simultaneously. • The new window will be automatically the active window and will be indicated above all other open windows. • If the contents of an open window is changed, the contents of all other open windows of the project change as well.
Cascade	Cascades all windows in the workspace.
Horizontal	Arranges all windows in the workspace horizontally.
Arrange icons	Arranges all windows reduced to an icon at the bottom of the workspace. • If a window opens in this section, it may happen that one or all icons are hidden because they are under the window.
1, 2, 3...	All open windows are listed at the end of the Window menu. A click on an entry activates the corresponding window (and places it on top of the desktop). • The active window is indicated by a hook in front of the entry.

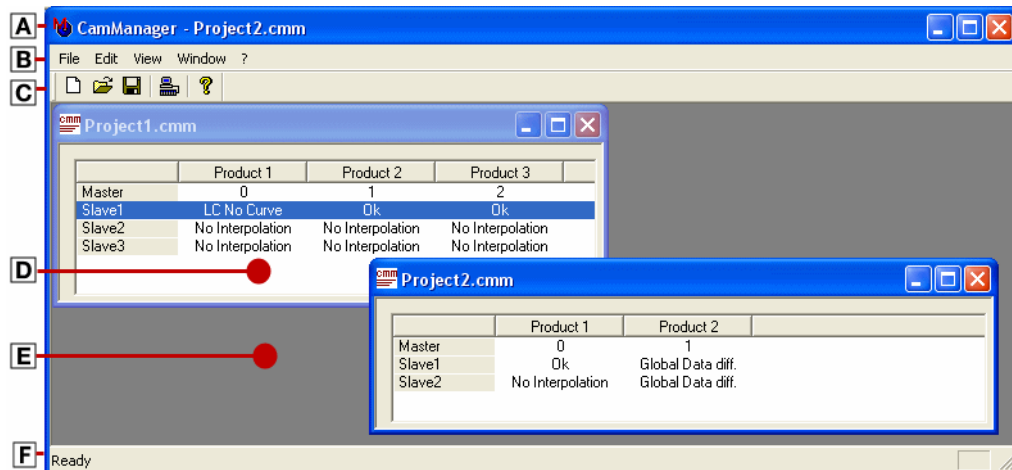
5.2 Cam Manager



Go to the *Start menu* and select

Programs→Lenze→Global Drive Cam Designer Professional 2.3→Cam Manager
to start the »Cam Manager« with user interface.

The user interface »Cam Manager« contains the following control and function elements:



A [Title bar](#)

C [Toolbar](#)

E [Workspace](#)

B [Menu bar](#)

D [Document window \(worksheet\)](#)

F [Status bar](#)

5.2.1 Toolbar

The display is optional.

Via the icons of the *toolbar* you can easily execute some of the most frequently used menu commands without making a detour via the [Menu bar](#). The selection of the available functions depends on the active mode/window.

- Simply click an icon to activate the corresponding command.

Icon	Menu command	Function
	File→New	Creates a new Cam Manager project.
	File→Open	Opens a Cam Manager project.
	File→Save	Saves the project under the current name.
	File→ Connect to OPC Server	Establishes an online connection with the controllers.
	?→Information on Cam Manger	Opens a dialog box with version info



Tip!

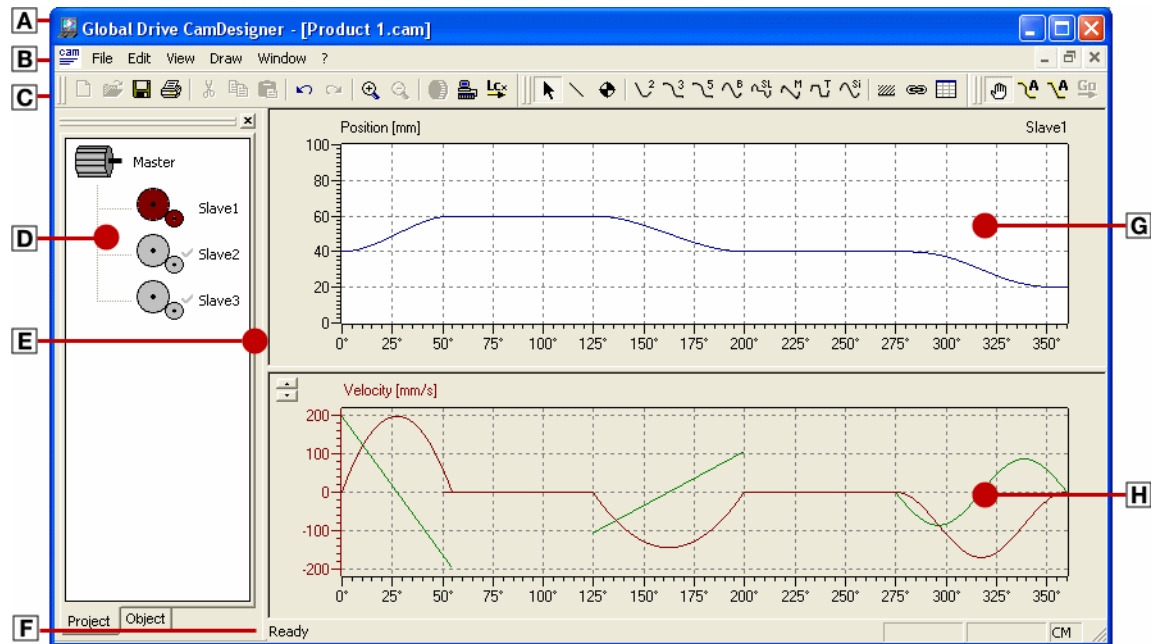
If you move the mouse pointer over an icon, a tool tip pops up providing a short information on the corresponding function. Moreover, an additional information is displayed in the [Status bar](#).

5.3 CAM Designer



Go to the »Cam Manager« and select **Edit→Start Cam Designer** to start the »Cam Designer« with user interface.

The user interface »Cam Designer« contains the following control and function elements:



A Title bar

C Toolbar

E Screen divider

G Workspace

B Menu bar

D Project structure

F Status bar

H Output area

5.3.1 Toolbar

The display is optional.

Via the icons of the *toolbar* you can easily execute some of the most frequently used menu commands without making a detour via the [Menu bar](#). The selection of the available functions depends on the active mode/window.

- Simply click an icon to activate the corresponding command.

Icon	Menu command	Function
	File→New	Creates a new Cam Designer project.
	File→Open	Opens a Cam Designer project.
The commands New and Open are only active in the Cam Designer if the project has been created without the Cam Manager.		
	File→Save	Saves the project under the current name.
	File→Print	Prints the project.
	Edit→Cut	Deletes a selected object and moves it to the clipboard.
	Edit→Copy	Copies a selected object and moves it to the clipboard.
	Edit→Paste	Pastes a copied or cut object into the current position.
	Edit→Undo	Undoes the last action.
	Edit→Redo	Redoes the last undone action.
	View→Zoom In	Enlarges the worksheet view.
	View→Complete View	Resets the worksheet view to standard size.
	Edit→Acceleration Dimensioning	Opens the dialog box "Acceleration Dimensioning".
	File→Connect to OPC Server	Establishes an online connection to the drive/drives.
	File→Create LCx-file and Download	Creates the *.LCx file and executes the download.
	Draw→Select	Selects the drawing objects.
	Draw→Line	Draws a line.
	Draw→point	Draws a point (reversal)
	Draw→Polynomial (2.)	Draws a 2nd grade polynomial.
	Draw→Polynomial (3.)	Draws a 3rd grade polynomial.
	Draw→Polynomial (5.)	Draws a 5th grade polynomial.

Icon	Menu command	Function
	Draw→Sloped Sine	Draws a sloped sine function (Bestehorn).
	Draw→sine/line combination	Draws a sine/line combination.
	Draw→Modified sine curve	Draws a modified sine curve.
	Draw→Table	Inserts a table object.
	View→Object Input Mode	Input of motion objects.
	View→Interpolation mode	Changes to the interpolation mode.
	Edit→Start Calculation	Connects the profile segments.

**Tip!**

If you move the mouse pointer over an icon, a tool tip pops up providing a short information on the corresponding function. Moreover, an additional information is displayed in the [Status bar](#).

5.3.2 Project structure

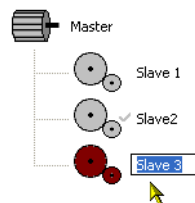
The display is optional.

The project structure consists of the tabs **Project** and **Object**.

Project

In this tab the master axis and the created slave axes are displayed.

- ▶ A double-click on the icon activates the corresponding slave axis. The associated profiles are displayed accordingly.
- ▶ A mouse-click highlights the name of the master or axis in blue. Then all actions refer to this axis.



Object

This tab shows the list of all objects of the slave axis selected in the active mode. Optionally, the objects of the lower levels, highlighted in grey, can also be shown.

Type	X0	Y0	X1	Y1
Line	0.0	0.0	40.0	0.0
Position	50.0	300.0		
Line	95.0	240.0	185.0	240.0
Point	265.0	360.0		
Position	275.0	100.0		
Line	340.0	0.0	360.0	0.0

- Each line in the list contains the object type and coordinates of the object. The lines are sorted according to the X values (master) as standard. A different sort sequence can be achieved by a mouse-click on the fields in the headline.
- It is possible to select one or several objects in the list by means of the mouse. The selection is also transferred to the graph of the worksheet.
- A click with the right mouse button on the corresponding object opens a submenu which contains various functions. The property dialogs of the objects can be opened, the object can be copied or deleted.

In the **Objects** tab, the lines, profiles etc. can be edited.

5.3.3 Screen divider

The screen divider is the border between two non-overlapping windows. In the »Cam Designer Professional« there is a screen divider between the worksheet, time derivations and the object list.

5.3.4 Output area

The display is optional.

- This area displays the time derivations of the objects from the worksheet.
- In this area, the cams of the individual tracks for the target systems **Servo PLC** and **ECS EA** can be created and edited.

6 Operation



Note!

The »Cam Designer Professional« consists of the separate programs »Cam Manager« and »Cam Designer«. To make full use of the product management the »Cam Manager« should be started first. Many settings can either be made in the »Cam Manager« and the »Cam Designer«.

After the first start of »Cam Manager« the user interface is displayed with an empty work-space.

- ▶ Now you can create a new project (worksheet) or open an existing project.

Entries via the Cam Manager

- ▶ The entire project
 - Machine structure
 - Name of the axis
- ▶ The feed constant and gear factor of each axis
 - Scaling of the axes for profile creation
- ▶ The master axis
 - Number of cycles of the machine
The value is a rated value and can maximally amount to 199% during operation.
- ▶ The slave axis
 - Number of profiles to be stored
 - Number of base points to be assigned
 - Selection of the data model
- ▶ The products (profiles, cams, position markers)
 - Product name
 - Product number



Note!

For representing dialog boxes no special names are used. In the majority of cases the names used in the system are adopted.



Tip!

In the installation directory of the »Cam Designer Professional« you can find example projects which can be used to make yourself familiar with the operation of the »Cam Designer Professional«.

What do you want to do?

- ▶ [Create a new project](#)
- ▶ [Open an existing project](#) (📖 31)

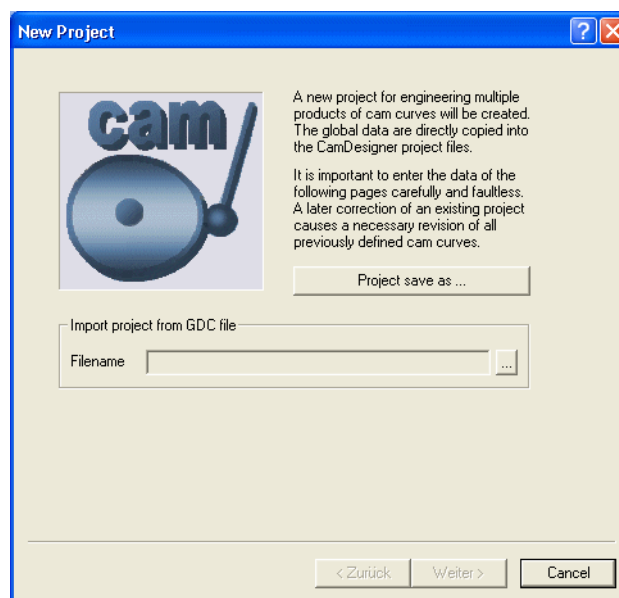
6.1 Create a new project

New projects are created by means of a wizard which issues a number of queries including the file name and directory for the new project as well as the settings for the master, a slave and a product.



How to create a new project...

Go to the *toolbar* of the »Cam Manager« and click the symbol  or select **File→New** to create a new project by means of the wizard:



Detailed information about the individual steps can be found in the following sub-sections.

After the basic settings have been selected by means of the wizard, you can add more slaves and products to your project if required for your drive application.

6.1.1 Step 1: Defining the file name and directory for a project



Tip!

We recommend to provide a project directory for each new project to be created.

- All path names within a project are relative and refer to the project directory.
- If you want to transfer a project to another PC, simply copy the project directory to the corresponding PC.

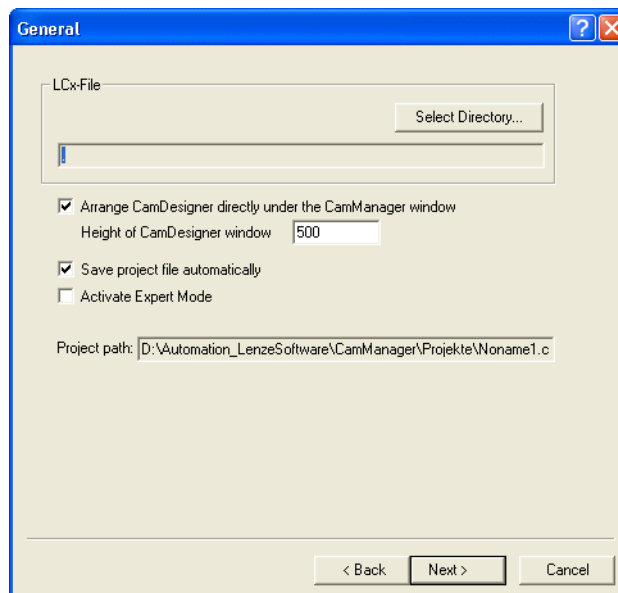


How to define the file name and directory for a new project...

1. Go to the *New project* dialog box and click the **Project save as** button to open the *Save as* dialog box.
2. Go to the *Save as* dialog box and select the directory in which you want to store the new project.
3. Enter a name for the new project in the **File name** input field.
4. Click OK to confirm the settings for the new project and close the *Save as* dialog box.
5. Go to the *New project* dialog box and click **Next** to proceed with the next step.

6.1.2 Step 2: General settings

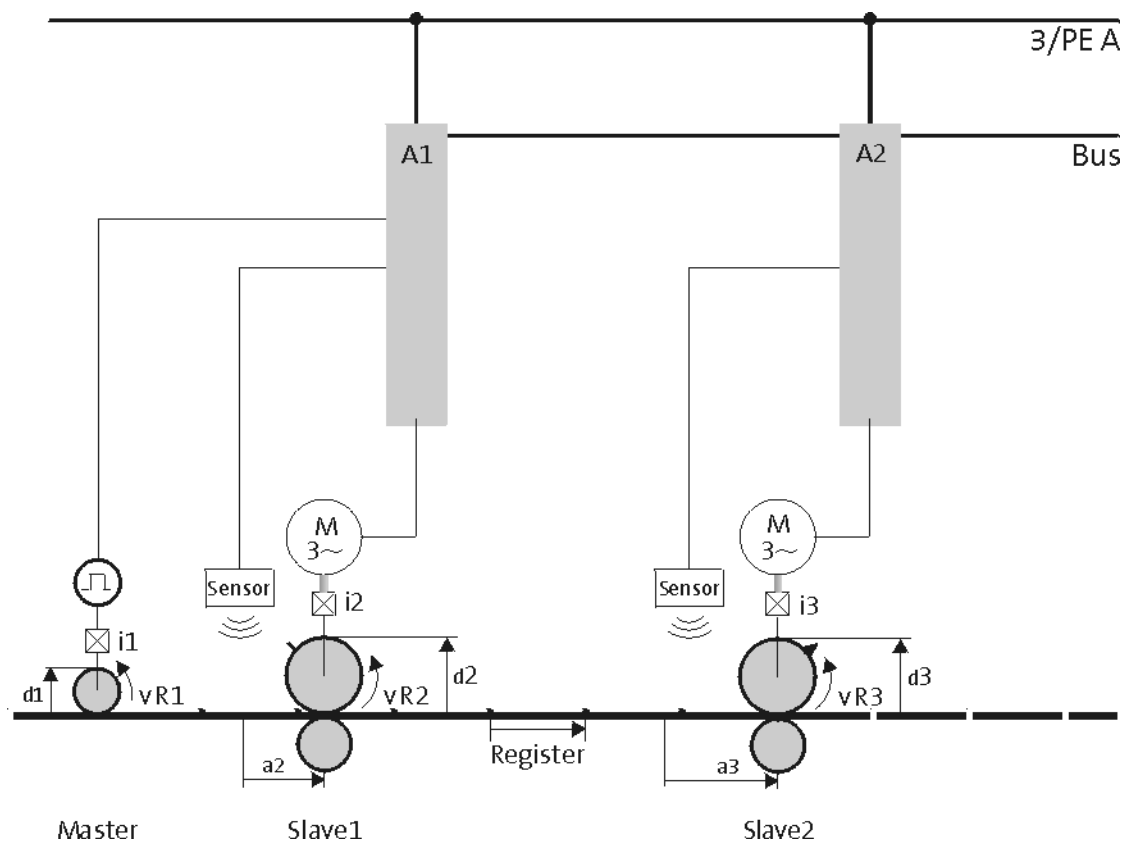
The dialog box **General** is displayed for the project settings and when recreating a project. It contains product-independent data.



Dialog object	Description
Button Select directory	Opens a dialog for storing the project and LCx files.
Control field Direct CamDesigner...	If the control field is active, the Cam Designer is directly arranged below the Cam Manager. The height of the Cam Designer windows can be specified in the corresponding input field.
Control field Save project file automatically	If the control field is active, the project files of the Cam Manager and Cam Designer are stored automatically.
Control field Activate Expert Mode	If the control field is active, settings can be made in additional dialogs.
Display field Project path	Display of the project's memory location.

6.1.3 Step 3: Defining the properties of the master

The following overview shows the relevant global data for the **electrical shaft** function. Here, a perforating machine (slave1) and cross cutter (slave2) are represented schematically.



Variable	Description
i1	Value from the division of the gear factors $z2/z1$ in the dialog box Master
i2/i3	Value from the division of the gear factors $z2/z1$ in the dialog box Slave
d1	Diameter of the master roll
d2/d3	Diameter of the slave rolls

Example with a master axis and two slave axes:

Specifications from the data sheet

Specification	Formula	Description
Master gear factor = 100	$i1 = 100$	$z2/z1 = 100/1$ dialog box Master
Slave gear factor $1/2 = 1$	$i2/i3 = 1$	$z2/z1 = 1/1$ dialog box Slave
d1 diameter of master roll = 500mm	$d1 \times \pi$	Dialog field of Master feed constant
d2/d3 diameter of slave rolls = 1000mm	$d2 \times \pi$ or $d3 \times \pi$	Dialog field of Slave field constant
Register		Maximum of the master

The entries in the axes reflect the machine constants. Therefore, only work with real values.

- The master axis has the features of an **electrical shaft**.
- The master axis can be a real or virtual axis.

**Note!**

If you only use a virtual master, then enter in the group field **Machine** under **Gear factor** in the input field **z2** 100 and in **z1** 1. This serves to achieve a higher resolution of the master angle.

► Enter the indicated values into the dialog box *Master* ein.

Dialog object	Description
Input field Name	Name of the master axis
Input field Minimum	In the dialog box <i>Master</i> the 0.0000 must always be entered here.
Combination field Unit *	The unit used
Input field Maximum *	Cycle - An electrical shaft can be divided e.g. from 0° to 360° or from 0 to 100mm as a register. - In this case, one master cycle amounts to 360° or 100mm
Input field Cycles/min	Production cycles in 1/min The value can maximally amount to 199%. - The machine speed which you want to reach with this profile is set in the input field Cycle/min. - Serves the display –to dimension the acceleration –of the time cams of the cam group.
Input field Rated cycles/min	Production cycles in 1/min The nominal value can maximally amount to 199%. The maximum possible machine speed can be entered in the input field Rated quantity cycle/min. This entry is important for the acceleration precontrol. (Servo PLC and ECSEA...)
Input field Gear factors z2/z1 *	Ratio i1 of an upstream gearbox. (e.g. 100/1 as real value)
Input field Feed constant *	Path per revolution at the output end of the gearbox. ($d1 \times \pi$ or one revolution = 360° if an angle is specified) The physical unit entered is converted to the encoders. - Enter, for instance, the leadscrew pitch. - When entering increments, enter the number of increments per revolution.

Fields must be filled with * !



How to define the properties of the master...

- Go to the *Master* dialog box and select the properties of the master.
 - The **Name** of the master is indicated on your worksheet.
 - The **Cycles** of the axis are the maximum number of operating cycles per minute.
- Click **Next** to proceed with the next step.

6.1.4 Step 3: Defining the properties of the slave

The entries in the axes reflect the machine constants. Therefore, only work with real values.

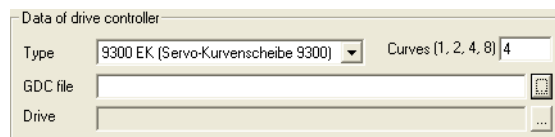
► Enter the indicated values into the dialog box *Slave*.

Dialog object	Description
Input field Name	- The slave axis must have a definite name (e.g. Slave1) and must not be used for other slaves at the same time. - The name of the slave axis is used by the CamDesigner. CamDesigner creates a Slave1.LC9 or Slave1.LC7. In this *.LC9-file or *.LC7-file all profile data, cams and position markers are stored.
Input field Minimum *	Set range of motion
Input field Maximum *	
Combination field Unit *	Selection of the unit
Control field Absolute data model Relative data model	When using the absolute data model, you have internal or external (PC) access to each single base point. However, a fewer number of base points is available then. - If the control field Absolute data model is not marked, the relative data model is used. When using the relative data model, more base points are available. The base points are distributed automatically. - If the relative data model is used, the entire profile can only be accessed with the Cam Designer Basic/Professional or Cam Loader to change the profile data.
Input field Curves *	Maximum number of the curve profile to be stored. Reserves should be considered in the maximum number of curve profiles.
Input field Points *	Number of base points Maximally 1 base point/ms or less
Group field Background drawing	Curves are distinguished by colour. Improved representation of the profiles in multi-axis applications. This serves to make a collision analysis.
Input field Gear factors z2/z1 *	Ratio between motor and tool Example: multi-stage gearbox Gearbox numerator = $z2 \times z4 = 28 \times 32 = 896$ (value of z2) Gearbox denominator = $z1 \times z3 = 23 \times 15 = 359$ (value of z1)

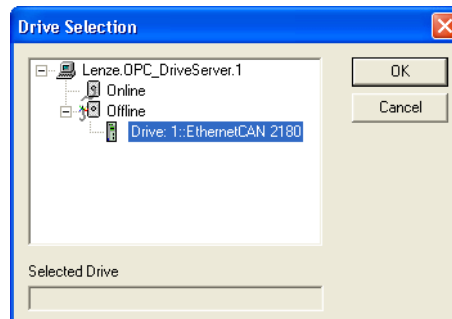
Dialog object	Description
Input field Feed constant *	Path per revolution at the output end of the gearbox. (If an angle is stated, one revolution = 360°) The physical unit entered is automatically converted to the encoders. • Enter, for instance, the leadscrew pitch. • When entering increments, enter the number of increments per revolution.
Group field Data of drive controller	The selection field Type serves to select a target system. • Servo PLC/ECS servo system • 9300 EK (9300 servo cam) The input field GDC file serves to import a GDC file. • Only if 9300 EK (9300 servo cam) has been selected. The button ... serves to select a drive. Assignment of a drive via bus address. • The assignment is only necessary if profiles, cams etc. are to be changed. • To change profiles, cams etc. online, all drives must be online.

Fields must be filled with * !

- When selecting the **Type** "servo cam profiler 9300 EK" you can optionally indicate the corresponding **GDC file**. The **Gear factors** and the **Feed constant** will then be automatically read from this file.



- If you have an online connection you can use the ... button after the **Drive** input field to assign a drive to the slave axis.



- The selections under **Absolute data model** and **Curves** have a direct influence on the maximum number of points. If you need more points for the table of base points, deactivate the selection **Absolute data model** and use the relative data model or reduce the value under **Curves**.
- The maximum number of **Curves** depends on the selected type.



How to define the properties of the slave...

1. Go to the *Slave* dialog box to select the properties of the slave axis.
2. Click **Next** to proceed with the next step.

6.1.5 Step 4: Defining the product properties

**Tip!**

In the following text, the term "Product" is used for motion profiles, cams and position markers because product-dependent sequences of motion can be achieved through different cam profiles.

Dialog object	Description
Input field Name	Name of the product
Input field Product number	Numerical assignment With this number the profiles, cam group and position markers are activated in the drive. They can be numbered in any order. It is impermissible to assign a number twice.
Control field Change of ...	The file name is automatically change in the directory
Field Project file for Cam Designer	Displays the file name Use Save as to select another directory

**Note!**

Make sure that the product numbers have been selected correctly.

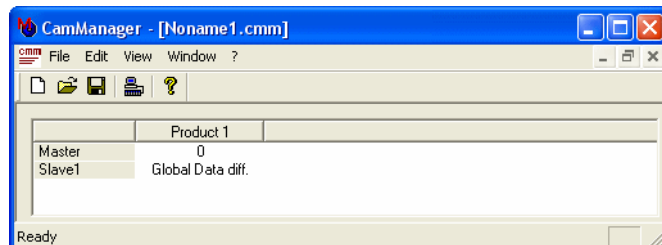
- The **name** serves the »Cam Manager« to internally manage the products.
- The maximum **product number** depends on the type of target system selected. The slave axes can have different target systems.
- "0" is assigned to the first product data set.



How to define the product properties...

1. Go to the *Product* dialog box and select the product properties:
2. Click **Finish** to complete the creation of the new project.

After the basic settings have been selected by means of the wizard, the master, slave and product are indicated on the *worksheet*:



Next steps

Now you can assign the files for the slave to the product and add more slaves and products to your worksheet, if required.

► [Editing settings on the worksheet](#) (32)

6.2 Open an existing project



Tip!

- It is possible to open several projects (*worksheets*) simultaneously in the »Cam Manager«. The commands for arranging the *worksheets* can be found in the "Window" menu.
- With a click on the entries **1...4** in the **File** menu you can open one of the four projects edited last.



How to open an existing project...

1. Click the symbol  in the *symbol bar* or select **File→Open**.
2. Select the corresponding project file (*.cmm) in the dialog box *Open*.
3. Press the button **Open**.
 - After this, the project worksheet will be displayed in the workspace.

Next steps

► [Editing settings on the worksheet](#) (📖 32)

6.3 Editing settings on the worksheet

The *worksheet* consists of a table including all axes and products of the plant or machine project.

Each line of the table represents an axis and each column a product:

	Products		
	Product 1	Product 2	Product 3
Master	0	1	2
Slave1	Overlapped Obj...	Ok	Ok
Slave2	No Interpolation	No Interpolation	No Interpolation
Slave3	No Interpolation	No Interpolation	No Interpolation

- Ⓐ Products
- Ⓑ Master axis
- Ⓒ Slave axes
- Ⓓ Product number
- Ⓔ Status (profiles, cams and position markers)



Tip!

- If you want to edit a setting on your *worksheet*, simply click the corresponding field in the table.
- In the *Context menu* (right mouse key) and the **Edit** menu, you can find further commands, e.g. to add slaves and products to your project or remove them from it.
- The commands of the Window menu can be used to arrange the worksheets in the workspace.

(13) ▶ [Document window \(worksheet\)](#)

Master axis

The topmost line in the table is the master axis. It indicates the product number for each product (the product number does not refer to the master):

	Products			
	Product 1	Product 2	Product 3	Product 4
Master	0	1	2	3
Slave1	Overlapped Obj...	Ok	Ok	No Interpolation
Slave2	Ok	No Interpolation	No Interpolation	No Interpolation
Slave3	Ok	No Interpolation	No Interpolation	No Interpolation
Slave4	No Interpolation	Global Data diff.	Global Data diff.	Ok

- ▶ A double-click on the *Name field* of the master axis Ⓑ opens the *Properties* dialog box for the master axis.
- ▶ A double-click on a *Product number field* Ⓓ opens the *Properties* dialog box for the corresponding product.

Slave axes

The following table lines represent the slave axes:

	Product 1	Product 2	Product 3	Product 4
Master	0	1	2	3
Slave1	Overlapped Obj..	Ok	Ok	No Interpolation
Slave2	Ok	No Interpolation	No Interpolation	No Interpolation
Slave3	Ok	No Interpolation	No Interpolation	No Interpolation
Slave4	No Interpolation	Global Data diff.	Global Data diff.	Ok

- A double-click on the *Name field* of a slave axis **C** opens the *Properties* dialog box for the corresponding slave axis.
- The *status display* **E** indicates the state of the corresponding slave axis and product.

6.3.1 Processing states

State	Meaning
-----	Product is not available in the axis (number of profiles lower than product number).
Global data diff.	The global product data do not comply with the Cam Manager.
Object vertical	There is an impermissible vertical movement (vertical line).
Overlapped Objects	Objects of the ideal cam overlap.
Objects without Space	Same X value but different Y value of adjacent objects.
Curve not closed	The ideal cam is no closed profile.
No Interpolation	There is no interpolation point table.
Interpolation diff.	The table of interpolation points does not comply with the ideal cam.
LC Read Error	The LC9 and LC7 files cannot be read or are not available.
LC Checksum Error	When reading the LC9 and LC7 files a checksum error has been detected.
LC Globals diff.	The global data of LC9 and LC7 files do not comply with the product.
LC No Curve	Under this product number there is no profile yet in the LC9 and LC7 file.
LC Points diff.	The point values in the LC9 and LC7 files do not comply with the point table.
LC CamContactor diff.	The cam data in the LC9 file do not comply with the product.
LC PosM/ Segment diff.	The data of the position marker of the LC9 file do not comply with the product.
OK	The cam data comply with the LC9 and LC7 file.

6.3.2 Adding a slave axis

New slaves are added at the end of the list. You can enter a symbolic name for the new slave which will be indicated on your *worksheet*.

- The name of the slave is also used as name for the LCx file.



How to add another slave axis to your worksheet...

1. Select **Edit→Add slave axis**.
2. Define the name and properties of the slave axis in the dialog box *Settings*.
3. Select **OK** to accept the setting and close the dialog box.

6.3.3 Selecting the properties of a slave axis

The properties of a slave axis can always be changed.



How to change the properties of a slave axis...

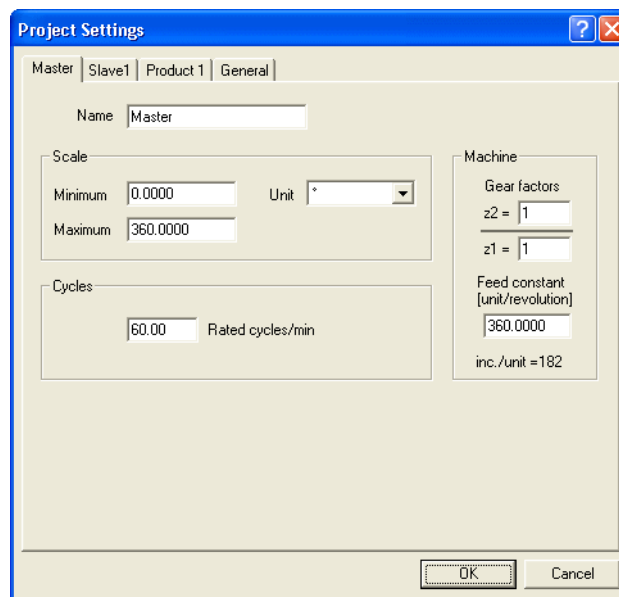
1. Double-click the grey field with the name of the slave axis whose properties you want to change on your *worksheet*.
2. Go to the *Settings* dialog box and enter the new settings.
▶ [How to define the properties of the slave...](#) (p. 28)
3. Select **OK** to accept the settings and close the dialog box.



Tip!

If you want to change the settings of several axes/products you can also use the command **Edit→Project settings....**

In the *Settings* dialog box that appears you can quickly change between the different axes/products by clicking the corresponding tabs:



6.3.4 Adding a product



How to add a product to your worksheet...

1. Select **Edit→Add product**.
2. Go to the *Project settings* dialog box and enter the **name** and the **product number** of the new product.
 - The product **name** is indicated on your *worksheet*.
 - The **product number** is indicated in the master line of your *worksheet*. Each product number may only be assigned once.
 - Later on, the user can use the **product number** (cam profile number) to activate the corresponding motion profile in the axis.
3. Select **OK** to accept the setting and close the dialog box.

6.3.5 Setting the product features

The product properties can always be changed.



How to change the product properties...

1. Double-click the field with the product number of the product whose properties you want to change on your worksheet.
2. Go to the *Settings* dialog box and enter the new settings.
3. Select **OK** to accept the setting and close the dialog box.

6.3.6 Deleting a product



Note!

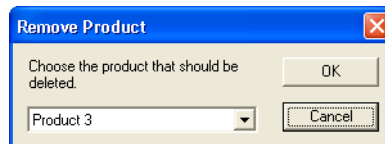
This function only deletes a product from the project/worksheet. The import data assigned to the product are **not** deleted!

Deleting a product cannot be undone!



How to delete a product...

1. Select **Edit→Delete product...**
2. Go to the *Delete product* dialog box and select the product to be deleted from the project:



3. Click **OK** to delete the selected product and close the dialog box.

6.3.7 Deleting a slave axis



Note!

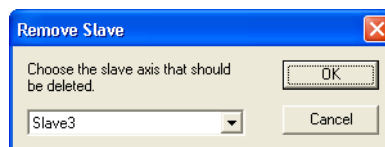
This function only deletes a slave from the project/worksheet. The corresponding LCx file is **not** deleted!

Deleting a slave cannot be undone!



How to delete a slave...

1. Select **Edit→Delete slave...**
2. Go to the *Delete slave* dialog box and select the slave to be deleted from the project:



3. Click **OK** to delete the selected slave and close the dialog box.

6.4 Starting Cam Designer

When the product and axes have been generated in the »Cam Manager«, the »Cam Designer« can be started.



Tip!

Many actions which have been described for the »Cam Manager« also apply to the »Cam Designer«.



Go to the »Cam Manager« and select **Edit→Start Cam Designer...**

- If only one product is available, the »Cam Designer« directly opens with the product.
- If several products have been generated, the dialog box *Start Cam Designer* is displayed. The corresponding product can be selected in the selection field.
- After the »Cam Designer« has opened, the profiles can be drawn there.



Directly click the product name in the »Cam Manager« so that the »**Cam Designer**« directly opens with the product.

- A profile can be generated in the operating range of the »Cam Designer« with the profile objects available.



Tip!

For additional information go to the »Cam Designer« and select the menu command **?→Help topics** or **?→Direct help** to get more information.

- Observe the following chapters:

- [CAM Designer](#) (17)
- [Using the direct help](#) (11)
- [Toolbar](#) (18)
- [Creating a cam](#) (44)

6.5 Online connection to the drives

The internal Lenze **DriveServer** is used for communication between »Cam Manager« and target system and LCx-file transfer.

- The DriveServer provides easy integration of drives into open automation structures based on **OPC** (*OLE for Process Control*).
- A specially adapted variant of the DriveServer and the bus server for the system bus (CAN) are part of the »Cam Designer Professional« installation package.



Select **File→Connect to OPC server** to connect the Cam Loader to the OPC server or cancel the connection.

A hook in front of the menu command indicates the connection with the OPC server.

6.6 Downloading the drive data

If connection with the **OPC** server has been established, it is possible to transfer the drive data for **several** slaves in one step.

- ▶ The configuration files (LCx files) for the selected axes are created first.
- ▶ If you have an online connection with the corresponding target system, the LCx file will be directly transferred to the target system.



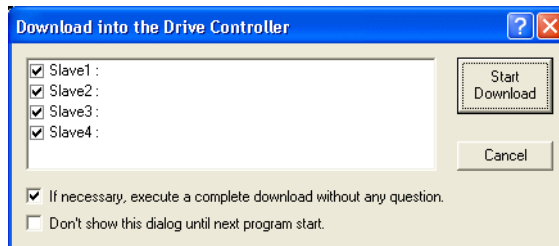
Note!

With the 9300 servo PLC, the LC9 file can only be downloaded if the target system includes a DDS project based on **Template Cam**.



How to download the drive data...

1. The processing states must be **OK**.
2. Select **File→Download of multiple axes...**
 - This command can only be executed if the Cam Loader is connected to the OPC server.
3. Go to the *Download to controllers* and select the slaves to be downloaded:



- If the option **If necessary, execute a complete download without any question** is activated, the data will be downloaded without further queries.
 - If the option **Don't show this dialog until next program start** is activated, this dialog will not be indicated again until the next program start. This can be useful for the commissioning of standard systems or in case of frequent downloads.
4. Click the **Start download** button to start the data transfer.



Note!

If you have not yet assigned a drive to one of the slaves the *Drive selection* dialog box opens automatically.

- Double-click the drive to be assigned to the slave in the DriveServer tree.
- Click **OK** to confirm your selection and repeat the assignment for other slaves, if necessary.

6.7 Saving the project



Note!

If you open several project simultaneously in the »Cam Manager«, this function refers to the project in the active window.



Click the  icon or select **File→Save** to save the project.



Tip!

Save your project at regular intervals to protect your data against power failures or system problems.

If you want to create a backup project on another data carrier or in another directory use the command **File→Save as...** instead.

► [Saving a project under another name](#)

6.8 Saving a project under another name



Note!

If you open several project simultaneously in the »Cam Manager«, this function refers to the project in the active window.



How to save an open project under another name...

1. Select **File→Save as...** to open the *Save as* dialog box.
2. Go to the **Save as** list field and select the directory in which you want to store the project.
3. Go to the **Name** input field and enter a name for the new project.
4. Click **OK** to save the project under the specified name in the selected directory and close the dialog box.
 - If you select the command **File→Save** the project will be saved with the new settings.



Tip!

This way you can create a new project or a backup project on another data carrier or in a directory other than the project directory on the basis of the current project.

6.9 Closing a project



Note!

If you open several Cam Loader projects simultaneously this function refers to the project in the active window.



Select **File→Close** to close the open project.

6.10 Exiting Cam Designer Professional



Note!

If you have not saved the changes made in one or several projects you will be asked if you want to save them before exiting the Cam Loader.



Select **File→Exit** or click the **Window icon X** in the **Title bar** to exit the »Cam Manager«.

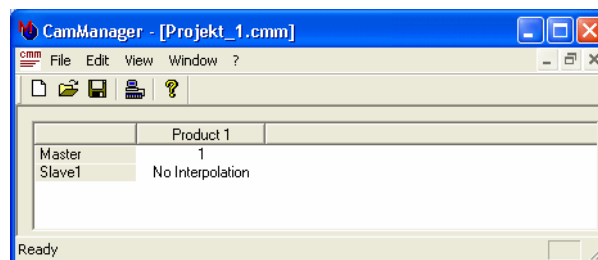
6.11 Creating a cam

The following chapter shows how fast you can create a cam.

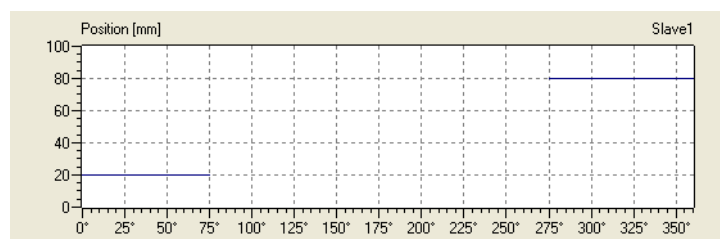


How to create a cam:

1. Start »Cam Manager«.
2. Select **File→New** or click the symbol .
 - The entries of the routine can be kept except for slight changes.
3. Go to the dialog box *New project* and press the button **Save project under name**.
 - Save the project e.g. as *project_1* in a specific directory.
4. Press the button **Next**.
5. Do not change the following three dialog boxes **General**, **Master** and **Slave1** and confirm with **Next**.
6. Go to the dialog box *product* and enter e.g. 1 in the input field **product number (max 47)**.
 - The »Cam Manager« is then as follows:

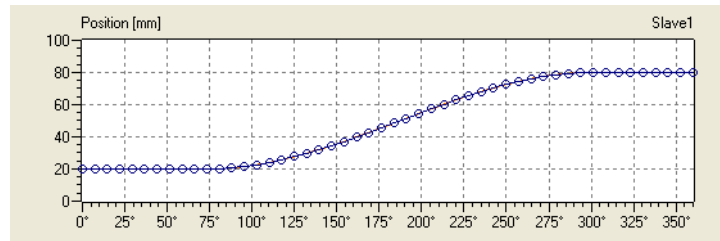


7. Press the button **Product 1**.
 - The Cam Designer opens.
8. Draw two horizontal lines in different positions in the workspace. These will be automatically connected in the next steps.



9. Use the button  to go to into the profile mode.
 - The profile segments are calculated automatically.
10. Use the button  to go into the interpolation mode.
 - The table interpolation is calculated automatically.

11. Press the button  to start the recalculation.
- Profiles and tables are recalculated. The workspace looks then as follows:



12. Establish an online connection to the drive and load it into the drive.

► [Online Download](#) ( 46)

6.12 Online Download



Note!

The download time increases if

- a high bus load (cross communication) exists.
- many data was changed.



How to make an online download:

1. Switch the »Cam Designer Professional« online by clicking **File→Connection to OPC server** or .
 - The button **online/offline** is only active if the **LDS-DriveServer** has been started.
The icon  for the **LDS-DriveServer** is situated in the status bar.
 - If the red point in the icon becomes green, the system is *online*.
2. Select **Edit→Project settings** to open the *Settings* dialog box.
3. Select in **Controller data** the drive to which the data is to be downloaded.
4. Select **File→Create and download LCx-file** or  to activate the profile or cam download.
 - The data for the current slave axis are written into the *.lcx-file.
 - After the download has been started with the button, a progress dialog appears.



Tip!

For the commissioning of production machines, the *.lc9-file can be attached to the PLC program.

7 Appendix

7.1 Target systems

Main features of the Software Package - Cam

- ▶ 48 profiles can be stored in the PLC
- ▶ 289 base points per profile in the relative data model
- ▶ 116 base points per profile the absolute data model
- ▶ Increased number of the available base points with reduced number of profiles reserved
- ▶ 48 cam groups can be stored
- ▶ Three tracks per cam group
- ▶ Four cams per track

Main features of the 9300EK servo cam

- ▶ 8 profiles can be stored
- ▶ 256 base points per profile in the relative data model
- ▶ 64 base points per profile the absolute data model

The »Cam Manager« which is included in the »Cam Designer Professional«, reflects the view on the machine and is the central input place for machine constants and profile data.

The »Cam Manager« helps you to create the minimum system by dialog boxes described in detail. The Cam Manager serves to add and delete the tools and product data.

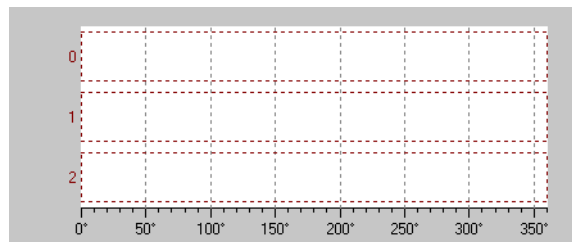
7.2 The cam group



Note!

Only available for Cam software package. The settings only apply to the product selected. For the other products, the settings have to be repeated.

Go to »Cam Designer Professional« and select the command **View→Edit Cam** to transfer the bottom window of the Cam Designer Professional to the corresponding mode.



7.2.1 Defining the cam type and cam reference



Tip!

The cam group can either refer to the X axis or to the Y axis. The cam group functions are available in the context menu of the right mouse button.



How to define the cam type and cam reference:

1. First, define the cam reference for the current data set under **Cam for Slave Axis**.
 - Subsequent changes are not possible. The selected cam data will be deleted and must be entered again.
2. The cam types for the individual tracks can be defined using the commands shown in the context menu.

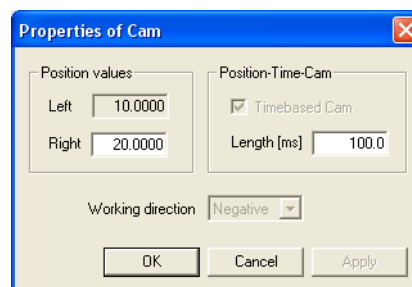
Position cam in positive effective direction
Position cam in negative effective direction
Position cam Both
Time-based cam in positive effective direction
Time-based cam in negative effective direction

- If you right-click in the track, you can directly change the cam type.
3. Select **Add New Cam** to add a new cam to the corresponding track.
 - You can add up to four cams to every track.

7.2.2 Cam types

Illustration	Meaning
	Position cam in positive effective direction Switch on and switch off point are defined by positions. The cam switches if the direction of the axis is positive (positive speed).
	Position cam in negative effective direction Switch on and switch off point are defined by positions. The cam switches if the direction of the axis is negative (negative speed).
	Position cam in positive and negative effective direction Switch on and switch off point are defined by positions. The cam switches in positive and negative direction of the axis.
	Time-based cam in positive effective direction The cam switches on at the switch on point if the direction of the axis is positive (positive speed). After the selected time, the cam switches off.
	Time-based cam in negative effective direction The cam switches on at the switch on point if the direction of the axis is negative (negative speed). After the selected time, the cam switches off.

Select **Properties of Cam** to edit the cam subsequently. In this dialog, time and length data can be accurately entered. The dialog box is always the same for all cam types. Only the corresponding fields on the dialog box are active.



Dialog object	Meaning
Input field Left	Initial value of the cam
Input field Right	Final value of the cam
Selection field Effective Direction	Positive or negative effect
Input field Length [ms]	Cam is active (only with time cam)

7.3 Error numbers, causes & remedies

Error number	Cause	Remedy
Errors within the DriveServer		
E7C18000	Error during download preparation.	Repeat download.
E7C18001	PLC has not stopped.	Stop the PLC program in the target system.
E7C18002	Controller inhibit is not set.	Set controller inhibit in the target system (e.g. via terminal 28 or code C0040).
E7C18003	Incorrect data type (no LC9 file).	Create new LC9 file.
E7C18004	Check sum check is negative (faulty check sum).	Restart the download. Increase time-out time in the system bus configuration tool (e.g. to 3 seconds).
E7C18005	Item can momentarily not be accessed due to download.	Repeat download after a few minutes or re-start your PC.
E7C18006	Target system is momentarily busy copying RAM blocks.	Start the PLC program in the target system.
E7C18007	Error occurred after the download.	Repeat download.
E7C18008	Error after version comparison during download of an LC7 file. Different versions in LC7 file and target system.	Update the operating system of the 9300 EK.
E7C18009	No template "Cam" in the target system.	Create DDS project based on Template Cam and transfer it into the target system.

7.4 Glossary

A

Absolute data model

Contains both the X and the Y coordinate. Therefore requires more space than the relative data model. The points are 1:1 transferred from the Cam Loader to the target system:

- Advantage: The distance between the points can be variable. This allows to optimise the distribution of the points according to the cam profile characteristics.
- Disadvantage: Compared to the relative data model, less points can be saved.

► [Relative data model](#)

Application window

Window in which programs are displayed under Windows.

C

Code

Lenze device parameter used to select the device functionality.

COM

Abbreviation for "**Component Object Model**": Architecture developed by Microsoft® for the interaction of separately executable software components (objects) that communicate with each other in the same way and are only connected to each other when the program is being executed.

Collision analysis

Layered presentation of several motion profiles to recognise an overlapping of the profiles.

D

DCOM

Abbreviation for "**Distributed Component Object Model**": COM in which the executable objects can be distributed to different computers within a local network.

► [COM](#)

DDS

Abbreviation for "**Drive PLC Developer Studio**": Development environment for the creation of IEC 61131 programs for Lenze PLCs.

Document window

Window with graphical user interface displayed by a user program in which a document is created, displayed and edited. Document windows are usually sub-windows of the program windows.

Drive PLC Developer Studio

See DDS.

DriveServer

Lenze software which enables easy integration of drives into open automation structures based on OPC ("OLE for Process Control").

► [OPC](#)

G

Global Drive Loader

Lenze software used to transfer PLC programs, parameter sets and application data to Lenze target systems.

H

Hyperlink

Highlighted reference which is activated by a mouse click.

I

IPC Abbreviation for Industrial PC. Industrial PCs are used in case of special environmental conditions, e.g. dirt or vibrations. They are slot CPUs with powerful processors and TFT displays (often with touch screens).

O

OLE Abbreviation for "Object Linking and Embedding": Integration of operational objects into other applications, e.g. Microsoft® Excel spreadsheets into Microsoft® Word documents.

OPC Abbreviation for "OLE for Process Control": Defines an interface based on the Microsoft® Windows® technologies OLE, COM and DCOM which enables data exchange between different automation devices and PC programs regardless of driver and interface problems.

► [COM](#)

► [DCOM](#)

P

PDF Abbreviation for "Portable Document Format". Universal file format developed by Adobe for the exchange of electronic documents. The Adobe® Reader® is provided free of charge and can be used to display and print PDF files independently of the application and platform used to create them.

PLC Abbreviation for "Programmable Logic Controller".

► [PLC](#)

R

Relative data model Only contains the difference between adjacent Y coordinates and therefore requires less space than the absolute data model. The distance between the X coordinates is transferred as a fixed-comma value to the target system. This leads to a certain difference between the imported data and the coordinates calculated by the target system. To compensate for this inaccuracy, the Y values are re-calculated by means of interpolation .

- Advantage: Compared to the absolute data model, more points can be saved.
- Disadvantage: The distance between the X coordinates of the points must always be the same.

► [Absolute data model](#)

T

Title bar Bar at the top of the application window including the program icon and the program name on the left and the window icons on the right.

V

VDI 2143 VDI guideline "Motion rules for cam mechanisms"

W

Worksheet Table including all axes and products of a system or machine project.

Window icon Button at the right end of the title bar which can be used to change the size of the window or to close the window.

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