

Totally Integrated Power

# SIMARIS design Help

Software Functions in Detail

www.siemens.com/simaris

9.0.0

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# **1** Introduction

### 1.1 Dimensioning of electrical networks with SIMARIS design

With SIMARIS® design it is possible to dimension electrical networks from medium voltage to the wall outlet on the basis of real products, in compliance with all the relevant standards (VDE, IEC) and reflecting the present state of the art.

Within the scope of the specifications required for the calculation, network operating modes and switching states can be freely defined. Shortcircuit current, load flow, voltage drop and energy balance are calculated. The requirements as to personal, short-circuit and overload protection are also automatically included in the calculation. Dimensioning also includes the busbar trunking systems required for pow er transmission. It is also possible to dimension complete motor starter combinations.

The professional version of SIMARIS design additionally provides the following options:

- Dimensioning of networks with parallel network operation, also with simultaneous operation of transformers and generators
- Automatic selectivity evaluation
- Representation of isolated networks
- Passive and active changeover in the emergency pow er supply
- Consideration of energy efficiency aspects within net planning

### 1.2 System requirements

The follow ing equipment is required as minimum to run SIMARIS® design:

- Processor: Intel Core i3 / AMD Phenom II X4
- 4 GB RAM
- Free hard disk space: 400 MB (if a country is selected) up to 2.5 GB (if all countries are selected)
- Screen resolution
  - Format 4:3: 1280x1024 (recommended 1400x1050)

- Format 16:9: 1366x768 (recommended 1680x1050)

- Supported operating systems: Windows 7, Windows 8
- Supported MS-Office versions: Office 2007, Office 2010

### **1.3 Setup instructions**

### 1.3.1 Setup from DVD

- Close all other applications on your computer.
- Insert the SIMARIS DVD into the DVD drive and start setup.exe.
- The setup w izard guides you through the installation and allows not only the installation of SIMARIS design but also the installation of SIMARIS project and SIMARIS curves. SIMARIS project is not available for all countries because of the product portfolio that is integrated in the softw are, so that this program can only be installed if you have selected one of the respective countries in the country selection.
- Follow the instructions of the setup wizard.
- The installation of SIMARIS design can be implemented as local or as netw ork installation.
- After installation, please check w hether updates are available and install them. To check w hether updates are available, you can initiate a query provided that your computer is connected to the Internet via <u>Help menu</u> 3 ↑ → to "Start Online Update", provided that your computer is connected to the Internet. Then you can install available updates online. Another option is to use the <u>Help menu</u> 3 ↑ → "Dow nload Update Package" to open the update page on the Simaris w ebsite, dow nload the update package and install it manually afterw ards. This w ebsite, w hich provides updates for the SIMARIS planning tools, can also be accessed by clicking the <u>w w w .siemens.com/simaris/update</u>.

### 1.3.2 Setup after download

- Request a dow nload link at www.siemens.com/simaris/dow nload by entering and sending your data.
- The dow nload link will be sent to you by e-mail. Having dow nloaded the zip file that can be accessed through this link, unpack it on the hard disk of your computer and then start setup\_sd60.exe.
- The setup w izard w ill guide you through the installation.
- Follow the instructions of the setup wizard.
- The installation of SIMARIS design can be implemented as local or as network installation.
- After installation, please check w hether updates are available and install them. To check w hether updates are available, you can use the Help menu 3↑ → to "Start Online Update", provided that your computer is connected to the Internet. Then you can install available updates online. Another option is to use the Help menu 3↑ → clicking "Dow nload Update Package" to open the update page on the Simaris w ebsite, dow nload the update package and install it manually afterw ards. This w ebsite, w hich provides updates for the SIMARIS softw are tools, can also be accessed by clicking <u>w w w.siemens.com/simaris/update</u>.

### 1.3.3 Registration

- The softw are may be used in a demo mode for 20 days after its installation. Only those days are counted on which you actually open the program. In order to be able to use SIMARIS design permanently, you must register on the Internet at <u>w w w .siemens.com/simaris/register</u>.
- Please enter your data there and request a licence by submitting the form. This licence will then be sent to you by e-mail within half an hour.
  If you have obtained a SIMARIS design professional version, please ensure that you have your authorisation code at hand, since you will only
- receive a licence offering the extended functionality of the professional version of SIMARIS design if you have entered this authorisation code.
   The licence of the basic version of SIMARIS desgin entitles you to use SIMARIS design permanently, without enabling the additional functions of the professional version.
- As long as the licence key has not been read in, you will be asked w hether you want to read in the licence key now during every program start or respectively, w hether you would like to register now or later.

Evaluation mode	8	×
SIMARIS design: 7.0.0 (2524)		
This is an unregistered copy of SIMARIS design.		
You may evaluate this software for 19 days.		
After 20 days of usage a registration is necessary. This is free of o requires your contact data and a valid e-mail address. Do you like i now?	:harge and to register	I
If you are already registered please enter a license key.		
Enter license key Register now Register	er later	

- Clicking the "Enter licence key" button starts the import process of your licence key. The brow ser opens where you can set the file path of your licence key and select the licence file identified by the file extension .lic-sd. As soon as you open this file, the licence file is read in and the program is started.
- Clicking the "Register now" button automatically opens the registration page for the SIMARIS tools provided you are online. How to proceed from there was decribed in the previous section.
- Clicking the "Register later" button takes you straight to the program, but you will again be prompted to register during the next program start.
- You can initiate the licence key import w hile the program is running using the Tools menu  $23 \rightarrow$  "Licence".

### 1.3.4 Setup and use of national versions

In the setup wizard you can choose technology packages which you want to install from a country list.

SIMARIS design 7.0 Setup		8 <u>-                                   </u>
Choose Components Choose which features of SIMA	RIS design 7.0 you want to install.	SD <sub>7</sub>
Check the components you war install. Click Next to continue.	nt to install and uncheck the compor	nents you don't want to
Select components to install:	Program files (required)  Program files (required)  Albania  Algeria  Angola  Argentina  Argentina  Armenia	
Space required: 2.0GB	Australia	•
Siemens AG 2012 (C)		
	< Back	Next > Cancel

- On the one hand, this implies the language selection, because with each country selection the national language and English are installed as languages. On the other hand, this also implies the installation of the technology package pertaining to the selected country, i.e. the product range available for the country, the technology of which complies with the regulations and conditions of the respective country. It is possible to select several countries which is above all necessary if you are editing projects for different countries, because you should, of course, edit each project with the relevant technology package only.
- If you later w ant to edit a project for a country w hose technology package / language is not installed, this can be made up for w ithout any problems by restarting the installation, selecting a country or several further countries and thus installing the required languages and technology packages. All installed countries and, if a country w as selected, also the associated languages are displayed for selection in the program step Project definition 38. How ever, the program must be restarted after every change applied to the selection. Please note that you must also reinstall any available updates, since the updates only install that part w hich belongs to the national versions already installed on your computer. How to check w hether an update is available and how dow nload and install it, if necessary, is described in the section Setup from DVD 5 and Setup after dow nload 5.
- When having edited and dimensioned a project with a specific country setting and reopening this project while having made a different country selection in SIMARIS design, the dimensioning and device selection of the previous country setting is kept first but might not go with the product portfolio available in the new ly selected country or with the technology required there. It is therefore absolutely necessary to restart dimensioning so that the technology and product selection relevant for this country is made.
- When editing projects for various countries, the national language and English are each provided for editing. This means, for example, that you can edit the project in English but can change to the national language for documentation purposes. Or you can send the project file to the country and the editor there can open and edit the project in the national language.

# **2 Program Interface and Structure**

### 2.1 Overview of the program sequence



# **2.2 Navigation bar / workflow bar** With the help of the navigation bar you can go to the desired program step by directly clicking it.



Project definition		
Project definition	In this program step, you can enter master and customer data and change the regional settings as well as the technical settings of the medium- and low -voltage side.	

Network design		
2 Network design	In this program step, the actual netw ork is designed, electrical equipment is selected and these elements are dimensioned either automatically or manually.	

Project output		
3 Project output	In this program step, you can create various output variants to document your project, which you can print out, save as files and also post-edit in parts. SIMARIS design professional moreover provides the option to export a transfer file for import in SIMARIS project.	

## 2.3 Icon bars

### 2.3.1 Main window

	Create new project	of	Cut
6	Open project		Сору
	Save current project	R	Copy element
	Save current project as	Ê	Paste
×	Delete circuit		

### 2.3.2 Network design



The tool bar in Network design is divided into 11 sections relating to the various functionalities, e.g. editor functions, graphical network editing, dimensioning, etc. This allows for fast and easy editing. All settings and options resulting from this will be described in detail in the following.

#### 2.3.2.1 Network diagram in a separate window

ø	
Move	netw ork
diagra	m to separate
w indo	w

Clicking this icon opens a new separate window in which only the network diagram and the corresponding tool bar are displayed. This window can then be dragged onto a second monitor to get a better overview while editing. If you want to see the network diagram within the original program window again, click this icon again to disable the function.

#### 2.3.2.2 Selecting elements and browsing the network diagram

k 🖓			
Selection tool	Having clicked this icon, you displayed at the bottom left n deactivated.	can select elements of e ext to the netw ork diagra	existing objects in the netw ork diagram, so that their properties are am. At the same time, any still active element from the library is
brow se	<ul> <li>This icon opens a search will structure according to variou</li> <li>In the "Status" section you still any notes or errors le</li> <li>In the "Network" section</li> <li>In the "Type" section, ele boards, feed-in paths, co</li> <li>In the "Final circuits" section circuit, e.g. dummy load,</li> <li>In the "Selectivity" section selectivity. This section, le</li> </ul>	ndow in w hich you can is criteria. u can check w hether al eft. the netw ork structure is ments of the netw ork dia puplings, sub-distribution tion, the final circuits cor capacitor, motor n, the elements of the ne now ever, is only availab	search for items of equipment within the network or project items have been dimensioned without error or whether there are represented as a tree. agram are listed sorted by circuit type, e.g. main distribution boards itained in the network diagram are listed, sorted by the type of final etwork diagram are sorted according to the criterion of full or partial le in the professional version.
	Status Network Type Final	circuits Selectivity	
	Circuits	Properties	<u> </u>
	🗖 ОК		
	✓ B 1.1A.1.1	Section trunking system	
	✓ C 1.1A.2	Final circuit	
	Coupling 1.1A.1	Coupling	
	Coupling 1.1A.1	Coupling	
	✓ DL 1.1A.3.1	Final circuit	
	GS 1.18.1.4	Sub-alstribution	
		Final circuit	
	L 1.1A.1.1.7	Final circuit	
	L 1.1A.1.1.7	Final circuit	
	V L 1.18.1.1	Final circuit	
	In addition, you have a te Having entered the desire circuits that contain the s When you mark the desire corresponding element o	xt search option, i.e. you ed text in the appropriate earch w ord. ed element in the results n the netw ork diagram w	a can search the designation of a netw ork diagram element. he line in the search w indow, the list w ill be reduced to those list (the corresponding part is highlighted in blue in the list), the v ill be marked w ith a blue frame.
		-	



### 2.3.2.3 Operating modes

٢	This icon sets the required operating modes.
Set operating modes	A new window is opened in which the position of the infeed and coupling switches (open or closed) can be defined by clicking the switch within the feeder supply management graphic. The various operating modes that are required, e.g. normal operation and emergency operation, are defined by duplicating an existing operating mode. To do so click the corresponding button and then define the required states of the switches for the new operating mode and change the designation of the operating mode. Non-permissible combinations of switch positions are documented by red error messages, e.g. Switch state not supported!, in the operating-mode diagram. How ever, the defined switch positions and netw ork operating modes are not show n in the netw ork diagram but are graphically represented in the project documentation.
	Operating modes can be activated / deactivated. In the netw ork diagram only the data for active operating modes is show n. If the dimensioning is started again, the netw ork is dimensioned only on basis of active operating modes.
	<ul> <li>In the follow ing cases, dimensioning is impossible or does not deliver any result:</li> <li>Parallel infeed via a general coupling (only applies to the basic version)</li> <li>More than one pow er source at the target distribution board on the sub-distribution level with directional coupling (only applies to the professional version)</li> <li>Pow er sources not connected into the system</li> <li>For further information on this subject, please refer to the section <u>Dimensioning and message list</u> 102<sup>2</sup> in this Help.</li> </ul>

### 2.3.2.4 Dimensioning

With these icons the project can be dimensioned differently depending on the requirements.		
Dimension all circuits	Using this icon the entire project can be dimensioned.	
Dimension selected circuit	This icon serves for dimensioning the selected circuit and all elements contained therein.	
Dimension selected circuit	Using this icon the selected circuit and all dow nstream circuits connected to it are dimensioned. Dimensioning is, how ever, not performed across couplings in this case.	
For further information	n on the dimensioning process, please refer to thechapter Dimensioning and message list 102 in this Help.	

### 2.3.2.5 Network diagram views

These icons activate the set of views available in this program. The network diagram is displayed according to the selection made, i.e. the parameters pertaining to the selected view are displayed next to the individual elements of the network diagram.		
Netw ork diagram with device parameters	<ul> <li>This icon is active by default. In this view the follow ing parameters are displayed for the elements of the network diagram:</li> <li>Automatically generated element designation with consecutive numbering</li> <li>Brief description of the elements</li> <li>Depending on the type of element, further data is displayed, e.g. <ul> <li>rated current of the element</li> <li>length of the element</li> <li>rated voltage of the element</li> <li>cable cross sections</li> <li>MRPD</li> <li>number of poles.</li> </ul> </li> </ul>	
Netw ork diagram w ith load flow / load distribution	<ul> <li>This icon activates a view in which not only the designation and MRPD of the elements on the network diagram are displayed but also parameters such as <ul> <li>pow er</li> <li>pow er factor cos φ</li> <li>voltage percentage at this point in the network</li> <li>summated voltage drop in percent</li> <li>simultaneity factor</li> <li>permissible operating current of a connecting line lz</li> <li>operating current lb</li> </ul> </li> <li>and further technical data.</li> </ul>	
Netw ork diagram w ith short-circuit load	Clicking this icon displays not only the name and MRPD of the elements on the network diagram but also the minimum and maximum short-circuit currents as well as further information on the short-circuit strength. Attention: Minimum and maximum short-circuit current are displayed with reference to the number of poles an element has, e.g. for a single-pole load lk 1 <sub>min</sub> and lk 1 <sub>max</sub> are displayed.	
Netw ork diagram w ith energy report	By activating this icon, the follow ing information is displayed at every main distribution, sub-distribution and pow er - apparent pow er - active pow er - reactive pow er - rated apparent pow er - loaded phase conductors.	
Netw ork diagram w ith user-defined labelling	If you need your ow n, individual label configuration of the netw ork diagram, you can compile such individual labelling using the Tools menu $23 \rightarrow 3$ "Settings" $\rightarrow 3$ "Configurable netw ork diagram output". This variant of labelling can be displayed in the program step "Netw ork design" and can be output as a user-defined view in the program step "Project output", as described in the section Output types $103$ . Only for the China country setting: Within this individual configuration, DI types can also be selected for the netw ork diagram labelling.	

### 2.3.2.6 Selectivity

Selectivity view	•	This icon opens a new, separate window with the selectivity view. But it is necessary to select an element/switching device in the network diagram first, whose characteristic curves and setting options will then be displayed. If the settings of the elements are changed via the regulators displayed on the left of the selectivity view, the characteristic curve in the graphic on the right is synchronously adapted. These changed settings are saved, but only until automatic dimensioning is started, which then overwrites these values according to the dimensioning results that were gained.



#### 2.3.2.7 Paper size

#### A4<sup>™</sup> ▼ Set paper size

A4 portrait	Alt+P, 4, P
A4 A4 landscape	Alt+P, 4, L
A3 A3 portrait	Alt+P, 3, P
• 🗚 A3 landscape	Alt+P, 3, L
A2 A2 landscape	Alt+P, 2
A1 A1 landscape	Alt+P, 1
AO AO landscape	Alt+P, 0
🛄 Define page format	Alt+P, U
Reload frame	Alt+P, F
Changes	Alt+P, I

Via the pull-down menu of the **Set paper size** icon you can choose from seven predefined paper sizes and the option to specify a user-defined paper size.

The currently set paper size is displayed in the icon on the tool bar using the symbols from the menu.

The predefined paper sizes are each provided with a drawing frame, whereas the user-definable paper size is not. The paper size selected for the overall diagram in this program step should be selected in such a way that the lettering is still legible, depending on the size of the network diagram. In the case of large network diagrams it is possible - also if selecting a large paper size - to split the printout into several smaller pages which can then be pieced together again like a jigsaw puzzle. This is necessary, for example, if no printer is available for printing the large paper size. If "Define page format" is selected from the pull-dow n menu, a separate window opens for entering the user-defined settings for the page format. Here, the width and height of the desired page format can be entered in mm; the values can range from 100 mm to 5,000 mm.

Via the menu item "Reload frame" you can load your own drawing frame. After this menu item has been selected, the brow ser is opened and you can select a file in .dxf or .dwg format, which is then displayed as drawing frame in the graphic area and can be used to edit a project.

Via the menu item "Changes" you can add a title block for a change index at any position in the network diagram.

Status:	Änderung:	Datum:	Name:

As soon as you have placed the small table in the diagram, e.g. by clicking the left mouse button, a window opens for entering the data. When you click"OK", the data that was entered is automatically transferred to the change index in the diagram.

S D 6.0				×
State:	Change:	Date:	Name:	_
		ОК	Cancel	

The change index can be edited and extended using the context menu, which opens as soon as the mouse pointer is placed on the change index in the graphic and the right mouse button is pressed.

Add entry
Change
Move table
Delete

Here you can do the follow ing with the change index:

Expand it by one line, i.e. add a new entry
Edit it, i.e. change existing entries
Move it to a suitable free space on the graphic
Delete it.

### 2.3.2.8 Scale up / Scale down

Scale up / Scale dow n	With the scale up and scale dow n icons the size of the elements in the netw ork diagram can be changed in relation to the page size. Therefore, it is not a zoom function but a real resizing. Starting from the preset original size, the elements can be scaled dow n by a maximum of six stages and theoretically scaled up endlessly. The thus set size will be applied to all elements of the netw ork diagram and will also apply when placing further elements.
	ATTENTION:
	Especially when scaling down elements, this setting is to be checked with regard to the legibility of the data on the printout, because the legibility might vary greatly depending on the printer.

#### 2.3.2.9 Align

Ausrichten     Image: Compared by the second s		
For the vertical alignm	ent of main and sub-distribution boards, the follow ing options are provided:	
E	Left alignment, the element selected farthest on the left serving as reference point.	
÷	Vertically centred alignment, the w eighted centre of all selected elements serving as reference point.	
Ŧ	Right alignment, the element selected farthest on the right serving as reference point.	

For the horizontal alignment of selected elements, the follow ing options are provided for aligning the selected elements:		
·••	At the level of the top (selected) element.	
-‡-	In the weighted horizontal centre of all selected elements.	
.+.	At the level of the low est (selected) element.	

To align a main or sub-distribution board to an upstream distribution board, it is possible to align the starting and end point of the connecting line betw een the tw o distribution boards

F.	vertically
	horizontally.

Selected elements can be distributed evenly. The respective outermost elements of the selection are set as reference points and, at regular intervals, the elements in-betw een are

រករ	aligned horizontally.
Ŧ	aligned vertically.

### 2.3.2.10 Zoom functions

🖾 🖁 🗗	
Zoom selection	When this icon is clicked, the mouse cursor changes into a crosshair in the network diagram, with the help of which the area to be zoomed can be selected by drawing a frame around it.
Zoom netw ork diagram	With this icon, the displayed cut-out of the network diagram can be set in such a way that all elements are displayed as large as possible, i.e. the display is limited by the outmost elements of the network diagram.
Zoom output format	With the help of this icon, the view can be reset to the selected paper size, i.e. to the full view of this format.

#### 2.3.2.11 Quick view of calculation results

If the quick view of calculation results is activated on the tool bar, it is possible to call up a window with the calculation results for each **dimensioned** item of equipment by placing the mouse pointer on the desired item of equipment.

¢ircuit-breaker: <i>LV-CB 1.1A.2b</i>					
Requiremen	nt:				
Ibem	=	909,327 A	Ibs	=	765,004 A
pz	=	3	Tu	=	45 °C
Icu	=	24,805 kA	Icm	=	49,783 kA
- · · · · ·					
Catalog refer	ren	ice: 3WL111UZUB3.	IIAA2/LSI		
Process val	lue	es:			
In max	=	1.000 A	In(r0)	=	1.000 A
In zul	=	1.000 A	I2	=	1.450 A
pz	=	3	Tu	=	50 °C
Icu	=	55 kA	Icm	=	121 kA
ta	=	0,49 s	ta(min abs)	=	0,49 s
			ta(min kzs)	=	0,49 s
Variation v	alu	ies:			
IR	=	1.000 A	tR	=	10 s
Isd	=	12.000 A	tsd	=	0,4 s
Ii	=	20.000 A			
Characteris	tic	s:			
Îc-value	=	52,09 kA	I²t-value	=	27.275,139 kA²s
Ikmin	=	15,987 kA	ta perm ABS	=	5 s
Ikmin/Cmin	=	16,829 kA			
Ikmax	=	24,805 kA			
I²t(Ikmax)	=	27.275,139 kA²s	ta perm (Ikmax)	=	5,447 s
I²t(Ii)	=	282.240 kA²s	ta perm (Ii)	=	8,379 s
I²t(setpoint)	=	282.240 kA²s			
I²t(Ikmin)	=	125.243,797 kA²s	ta perm (Ikmin)	=	13,112 s



i

### 2.4 Menu bar and key combinations

File Edit Dimensioning View Tools Help

### 2.4.1 File menu

<ul> <li>New</li> <li>Open</li> <li>Save</li> <li>Save as</li> <li>1 Demo_SD50_test.sd [Program Files/]</li> <li>2 Demo.sd [Program Files/Siemens/]</li> <li>3 test.sd [Program Files/Siemens/]</li> <li>4 Demo_SD50.sd [Program Files/]</li> </ul>	Ctrl+N Ctrl+O Ctrl+S Ctrl+Shift+S	<ul> <li>In the File menu, select</li> <li>New to create a new project.</li> <li>Opento open an existing project with the file extension .sd.</li> <li>Save settings to save an existing project.</li> <li>Save as to save an existing project in any directory under any name.</li> <li>One of the listed projects edited last to continue editing it. By default, the last 4 edited projects are provided for selection. Using the Tools menu → Settings → Editor settings, this number can be increased to 9.</li> <li>Exit to close SIMARIS design.</li> </ul>
Exit	Alt+F4	Note: While a project is opened or buffered, a backup copy of the project is saved under the same name as the original project but with the extension .bak. This file can be found in the same directory in which you saved your project. It serves for restoring the original state or the last saved state of a project in the event of a fault.

### 2.4.2 Edit menu

♥ Undo Ctrl- ♥ Redo Ctrl-	+Z +Y	In the Edit menu, select
of Cut Ctrl- □ Conv Ctrl-	+X +C	
Convielement Ctri-	+Shift+C	
👔 Paste Ctrl-	+V	
🗙 Delete 🛛 Dele	ete	
Select all Ctrl-	+A	
Align Lavout lines Ctrl-	+L	
Gibrowse Cur	+F	
♥ Undo Ctrl+ ♥ Redo Ctrl+	+Z +Y	<ul> <li>Undo to undo the last editing step. By default, the last 20 editing steps can be undone. Using the Tools menu → Settings → Editor settings, this number can be increased to 100.</li> <li>Restore to restore the editing steps which have been undone.</li> </ul>
		To be able to track the <b>Undo</b> and <b>Redo</b> editing steps, the respective last step is show n directly in the menu with its short name. If the project is saved during the editing process, the saved editing steps are retained for Undo and Redo operations, i.e. they can still be used. Only when the project is closed, they will be deleted, so that they are no longer available for editing when the project is called up again. How ever, <b>Dimensioning</b> of a project cannot be undone. Conversely, this also means that as soon as dimensioning is being carried out during an editing process, the saved editing steps are reset.
o∱ Cut Ctrl+	+X	After having selected the elements to be edited, select Cut, Copy, Copy element or Paste to use the corresponding functions for editing. You can also access these functions.
📄 Copy 🛛 Ctrl+	+C	using the tool bar for network design in the <u>Main window</u> [9] via identical icons or by using
Copy element Ctrl+	+Shift+C	the cotext menu (right mouse button). The difference betw een the "Copy" and "Copy element" function is that "Copy" allow s to
📑 Paste Ctrl-	+V	copy complete circuits, e.g. distribution boards and final circuits, whereas "Copy element"
		A description how these circuits and elements saved on the clipboard can be inserted at a different position on the network diagram can be found in the section Graphic editing of elements 7 <sup>th</sup> .
🗙 Delete 🛛 Dele	ete	<b>Delete</b> to remove elements. This can also be done using the same icon saved in the tool
Select all Ctrl-	+A	<ul><li>bar in Netw ork Design.</li><li>Choose Select all to select all elements placed in the diagram for further editing.</li></ul>

Align  Layout lines Ctrl+L	Align to align the elements in the netw ork diagram according to your requirements. A submenu is opened which contains the same functions for aligning the diagram as the corresponding icon in the Netw ork Design tool bar in the section <u>Netw ork design</u> 10.
	<ul> <li>Layout lines to subsequently move a line in the network diagram keeping the left mouse button pressed. The new ly selected line layout can be frozen using the right mouse button (context menu) by selecting "Block line" and this freeze can be undone again in the same w ay (by selecting "Unblock line").</li> <li>If the selected line layout is not frozen, it will not be available any more after having saved and recalled the project, because in this case all lines will be recreated according to the rules provided. How ever, only those lines / line sections can be moved w hose end or break points are not fixed. The starting and end points of the lines are usually fixed through the position of the items of equipment in the netw ork diagram so that they can only be displaced by moving the respective item of equipment.</li> </ul>
ब्ह्र Browse Ctrl+F	<b>Browse</b> to search for items of equipment within the network or project structure according to various criteria in the search window which is now displayed.

### 2.4.3 Dimensioning menu

🕘 Operating modes	F5	In the Dimensioning menu you can set the required operating modes as well as the various options for dimensioning a network, which are also each described by
All circuits	Alt+D, Space	reference to the icons on the Network Design tool bar in the chapter Dimensioning 12
Selected circuit	Alt+D, C	
🖧 Sub network	Alt+D, S	

### 2.4.4 View menu

\ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	Single-line diagram with device parameters Single-line diagram with load flow/load distribution Single-line diagram with short-circuit load System configuration with energy report Own View Selectivity Quick view results	<ul> <li>Using the View menu, you can</li> <li>select the various view options for the network diagram</li> <li>open the w indow to display Selectivity, w hich at the same time displays the colour marking for selectivity evaluation in the network diagram (this is only available in the professional version).</li> <li>enable the Quick view of calculation results</li> <li>select the desired Zoom function</li> <li>select the Paper size</li> <li>scale up/dow n the network diagram.</li> <li>For a detailed description of these functions/options, please refer to the previous chapter Main w indow.</li> <li>Select the left (Icon bars) under the corresponding icons.</li> </ul>
© ⊛ ⊥	Papersize	

### 2.4.5 Energy Efficiency menu

Power loss	In the Energy Efficiency menu, you can use the menu item <b>Power</b>
	<b>loss</b> to open a dialogue for viewing the power losses determined for selected devices. This function is, how ever, only available to users of the SIMARIS design professional version.



Pv abs =

10.552 W

Change device...

In this dialog all circuits of the netw ork diagram are listed, sorted in descending order based on the magnitude of their absolute pow er loss. In further columns the apparent pow er and the relative pow er loss of the circuits are listed as w ell. The accumulated length show s the distance betw een the relevant circuit and the main distribution for the operating mode selected.

Besides being sorted according to absolute pow er loss, the list can also be sorted either according to apparent pow er or relative circuit pow er loss. To do so, left-click on the corresponding column header. As soon as the circuit w as selected in the table (now highlighted in blue), ist composition and the components contained therein as show n in the grey field on the right. In addition the pow er losses of the components in this circuit are displayed, i.e. the absolute pow er losses of cable connections, busbar connections and devices. The circuit selected in the list is also marked w ith a blue frame on the netw ork diagram.

How ever, the energy effciency analysis only considers the transformers and the low -voltage side of the network diagram, so that the medium-voltage side components possibly displayed for feeding circuits are**no**considered and/or listed.





#### 2.4.6 Tools menu

Favourites	
License Alt+L	
Settings Alt+Enter	
Favourites	
Favourites       Add favourite         Edit favourites       Load favourites         Import favourites       Export favourites	<ul> <li>Select Favourites to call up various edit options for the favourites you saved for infeed, distribution board and final circuits.</li> <li>Add favourite</li> <li>Edit favourites</li> <li>Load favourites</li> <li>Import favourites</li> <li>Export favourites</li> </ul>
Favourite       X         Name:       Distribution 3         Description       xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	To add a favourite, select the required elements in the netw ork diagram and then select Tools menu → Favourites → Create favourite The window displayed on the left opens, in which you can enter a name and description of this favourite. By clicking the "OK" button, this data is saved together with the favourite. The favourite is automatically assigned to one of the 3 available categories System infeed, Distribution board or Final circuits. The naming of the favourites must be unique, i.e. it is not possible to save a new favourite under an existing name. The favourites files are identified by the extension .sdt (= SIMARIS design template).
System infeed       System infeed	To edit existing favourites, select Tools menu 25 → "Favourites" →"Edit favourites". Here you can find a list of all favourites currently available. Clicking the "Edit button opens a window for entering their names and descriptions (see above). Enable the "Delete" button to select one or more favourites for deletion. This step is finally executed, when you confirm the action by clicking "OK".

- Using the Tools menu → Favourites → Load favourites..., complete favourites libraries are loaded. How ever, access to the currently used favourites library will be deleted when doing this. This function is to serve for being able to change between different libraries, e.g. between a library with items for 690 V networks and one for 400 V networks.
- Using the Tools menu → Favourites → Import favourites..., favourites libraries can be imported. This means that the favourites from the imported file are saved in addition to the currently existing favourites in the favourites library. If one of the names of the imported favourites already exists, the name of the imported favourite is modified automatically by adding an underscore and the low est available number and thus becomes unique.
- Using the Tools menu → Favourites → Export favourites..., favourites libraries can be generated, i.e. all currently existing favourites are saved in a library which can then be reactivated later using Tools menu → Favourites → Load favourites....

#### Licence

License Alt+L	In the Tools menu select Licence to view the data for your current software setup, such as version number, licence setting (basic or professional), in a window now on display. In this window, you will also
	find a button for triggering the import of the licence file. Licence files can be identified in SIMARIS design by the extension .lic-sd.

Settings			
Settings Alt+Enter	In the Tools menu select <b>Settings</b> to view and change the settings for the follow ing topics. Dependent on the selection you made, the tree in the left part of the window now displays: Editor settings Draw ing frame Save settings Configurable netw ork diagram output Selectivity settings (user-defined and printer colours of the I-t diagram) Update settings		

Editor settings		
Settings         Drawing border         Save settings         Configurable network diagram output         B selectivity settings         Update settings	Editor settings   Editor settings  Enable professional mode Enable extended ranges Show warning on delete of favourites Show dailog type of Lightning/ surge protection Show question on insert of surge protection Show information on dimensioning List of last opened files Quantity 4 Undo Number of steps 20  Reset Apply  OK Cancel	<ul> <li>Here you can, for example, deactivate and reactivate the professional mode if you have the professional licence. This is required, for example, to be able to further edit projects from users who do not use a professional version and to subsequently send them back to these users again for further editing. If projects which were created in the basic mode are further edited in the professional mode, they cannot be edited with a basic version any more but only be read.</li> <li>For specific input dialogues in the program the input limits of technical data can be extended, i.e. an extended value range can be activated and deactivated. This refers to the minimum short-circuit capacity of medium voltage any entry of generators any entry of generators the option to enter phase angles of the short-circuit currents when defining neutral system infeed through short-circuit currents.</li> <li>This window also provides options to enable and disable the warnings when deleting elements in the network diagram or favourites queries as to the type of lightning current/overvoltage protection and prior to adding surge arresters the information displayed during dimensioning.</li> <li>Furthermore, it is possible to set the number of files relating to projects edited last that shall be displayed in the File menu (default 4, maximum 9) editing steps to be saved (default 20, maximum 100), so that they can be undone the Edit menu.</li> <li>With the "Reset" button you can reset all settings made to the standard settings.</li> </ul>

#### Drawing frame

Settings		
Editor settings Drawing border	Drawing border	
- Save settings - Configurable network diagram output	Show drawing frames	
Selectivity settings	A4 portrait SIMARIS design	Browse
- opuate settings	A4 landscape SIMARIS design	Browse
	A3 portrait SIMARIS design	Browse
	A3 landscape SIMARIS design	Browse
	A2 landscape SIMARIS design	Browse
	A1 landscape SIMARIS design	Browse
	A0 landscape SIMARIS design	Browse
	Text field SIMARIS design	Browse
	Changes SIMARIS design	Browse
		Reset Apply
		OK Cancel

- In this window you can replace the drawing frames saved in the program by your ow n drawing frames. By clicking the "Brow se..." button, the brow ser is opened and you can import your ow n drawing frames with a suitable page size in .dxf format.
- Later you can delete these imported frames again by clicking the red cross next to the respective frame.
- In the same w ay, you can save a text field w hich is frequently required or save a change index in .dwg or .dxf format and delete it.
- With the "Reset" button you can reset all fields to standard values again; in this case, for example, you can reset the drawing frames to the default drawing frames provided in the program.
- Clicking the "Apply" button saves all changes permanently, so you can, for example, resort to those draw ing frames that you had read into the program yourself.

#### Save settings

Settings Editor settings Orawing border Save settings Configurable network diagram output B Selectivity settings Update settings	Save settings Create a backup copy (*.bak) Save automatically [min]	Reset Apply	<ul> <li>Here you can set w hether a backup copy of the edited file is to be created, and you can determine the intervals of automatic intermediate storage.</li> <li>Using the "Reset" button you can reset all settings made to the standard values.</li> <li>The "Apply" button saves your changes permanently.</li> </ul>
		OK Cancel	

#### Configurable network diagram output



- The menu item "Configurable netw ork diagram output" allow s you to create a user-defined variant for labelling the netw ork diagram.
- These user-defined labels can be created in this window for all network diagram elements, this also includes infeed and distribution board circuits, switching and protective devices and components in final circuits.
- To do so, first select the element from the the tree at the top left corner for w hich you w ant to create a label.
- Below the tree, this means at the bottom left part, all parameters available for selection for this element will be immediately displayed.
- Select a parameter by clicking the arrow key in the centre and choose the parameters you require for labelling your network diagram as desired. These parameters will then be show n in the field at the bottom right corner
- At the top right, you will see a preview of the selected label for the respective element.
- Clicking the "Apply" button saves this selection permanently, which makes it available for other projects as well.
- The netw ork diagram with this configured labelling variant can be displayed as current view (<u>Netw ork diagram views</u> 13) in the program step "Netw ork Design". In the program step "Project Output", this view can be exported individually (select "Current view") or together with the standard view s (select "All view s") for documentation purposes. Export can be made in form of a PDF or DWG/DXF file.
- If you w ant to exchange the selected settings for the configurable netw ork diagram output w ith other editors of the project or transfer it to a different computer, you can export these settings to a file using the "Export" button. The file extension for the export file is ".profile". This file w ith the extension ".profile" can be read by another editor, or respectively by another computer using the "Import" button and can thus be used for further project editing and project documentation.

#### Selectivity settings



- Selectivity evaluation w hich is available in the professional version only can be enabled and disabled in this screen.
- It is also possible to enable and disable hints on the selectivity evaluation here.
- As a further device characteristic for the assessment of the selectivity a common envelope curve of all upstream devices and a common envelope curve of all direct dow nstream devices can be displayed and hidden in the Selectivity w indow.
- If selectivity evaluation has been enabled and a selectivity window is open, all switching devices of a network are highlighted in colour in the graphical representation of the diagram according to the following criteria:
  - green: element is fully selective,
  - yellow: element is partially selective,
  - grey: element cannot be evaluated.

This can be interpreted as follows: The behaviour of device combinations regarding selectivity can only be established by testing.

For those combinations marked as fully or partially selective, appropriate testing is available, but not for the items marked in grey.



selectivity diagram (see above) in such a way that it is automatically minimized. This means, the legend is always show n minimized at first, so that it doesn't overlay the curves on display. Only during mouseover, the legend is enlarged and thus legible.



#### Update settings

Settings       Update settings         Drawing boder       Saese settings         Configurable network dagram output       Image: Configurable network dagram output         Selectivity settings       Image: Configurable network dagram output         Image: Configurable network dagram output       Image: Configurable network dagram output         Image: Configurable network dagram output       Image: Configurable network dagram output         Image: Configurable network dagram output       Image: Configurable network dagram output         Image: Configurable network dagram output       Image: Configurable network dagram output         Image: Configurable network dagram output       Image: Configurable network dagram output         Image: Configurable network dagram output       Image: Configurable network dagram output         Image: Configurable network dagram output       Image: Configurable network dagram output         Image: Configurable network dagram output       Image: Configurable network dagram output         Image: Configurable network dagram output       Image: Configurable network dagram output         Image: Configurable network dagram output       Image: Configurable network dagram output         Image: Configurable network dagram output       Image: Configurable network dagram output         Image: Configurable network dagram output       Image: Configurable network dagram output         Image: Configurable network d	Cancel	<ul> <li>Here, you can define w ether the program shall look for new updates after each program start or not.</li> <li>To ensure that your softw are is alw ays up-to-date, w e recommend to enable the automatic update check.</li> <li>If you decide to disable this option, you can still trigger such an update check regularly by clicking the Help menu → Check for Updates.</li> </ul>
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### 2.4.7 Help menu

<ul> <li>are using the program.</li> <li>Tutorial to start a presentation which gives you an overview of the program functionality divided into several chapters and illustrated by many graphics and brief explanations.</li> <li>Technical manual to get access to a PDE file which contains additional information about</li> </ul>
<ul> <li>SIMARIS design and SIMARIS project.</li> <li>Load demo project to open a demo project.</li> <li>Key assist to open a window show ing a list of all key combinations available in the program, in which you can search for the desired key combination by scrolling.</li> <li>Start online-update to check whether an update is available for SIMARIS design, which you</li> </ul>
<ul> <li>Compare the second of the later of</li></ul>

## 2.4.8 Corresponding key combinations

ions can be used as follows	s:
	<b>Plus</b> means that <b>both keys are to be pressed</b> , i.e. either both keys are simultaneously pressed, or keep the first key pressed and press the second key at the same time.
	Comma means that you must first press the first key combination, then release all keys, then press the second key and release it, if necessary, press the third key etc.
	<ul> <li>Press the "Alt" key, keep it pressed and simultaneously press the "P" key. A small window opens in the bottom right corner of the program, which lists all available paper sizes and the key combinations required for their setting.</li> <li>Release both keys and shortly press the "3" key to set the DIN A3 format. The first window is closed and another small window opens in w hich the further available variants (portrait and landscape) are displayed.</li> <li>By pressing the "P" key, the paper size is converted to the desired portrait size.</li> </ul>
Alt+P, 0       ▲         Alt+P, 1       ▲         Alt+P, 3, L       ▲         Alt+P, 3, L       ▲         Alt+P, 4, L       ▲         Alt+P, 4, P       Ct+Shift+H         Ct+Shift+H       Ct+Shift+H         Ct+Shift+H       ▲         Alt+Y       ▲         Alt+Y       ▲         Ct+Shift+H       ▲         Ct+Shift+H       ▲         Alt+Y       ▲         Alt+Y       ▲         Alt+Y       ▲         Alt+Y       ▲         Alt+Y       ▲         Ct+Hentt       ▲         Ct+Left       Ct+Hentt         Ct+Left       Ct+Hentt         Ct+Hentt       Ct+Hentt         Ct+F       ▲         Alt+P, I       Ct+Shift+Numpad_Divide         Ct+Shift+Space       Ct+C         Ct+Shift+C       Ct+X         Alt+P, U       ■	<ul> <li>All available key combinations can also be displayed in the program itself by calling the corresponding list using the <u>Help menu</u> 3 ↑ → "Key combinations" menu. An alphabetically sorted list will be displayed at the bottom right of the screen where you can look for the key combination you need.</li> <li>Moreover, the key combinations are also displayed in the corresponding menus or when calling functions via the icons on the tool bar, in addition to the labelling.</li> </ul>
	Alt+P, 0 Alt+P, 1 Alt+P, 2 Alt+P, 3, L Alt+P, 3, L Alt+P, 4, L Alt+P, 4, L Alt+P, 4, L Alt+P, 4, P Ctrl+Shift+H Ctrl+Shift+H Ctrl+Shift+H Ctrl+Shift+H Alt+Shift+H Alt+Shift+H Alt+Shift+H Alt+Shift+H Alt+Shift+H Alt+Shift+H Alt+Shift+Numpad_Divide Ctrl+Shift+Numpad_Divide Ctrl+Shift+Space Ctrl+Shift+C Ct

The functions which can be called via the menus as well as via key combinations are labelled with the corresponding key combinations in the menus.

Extract of the key combinations in S	MARIS design		
Call / Change to program step	Step - Netw ork planning	Ctrl + 2	Ctrl + 2 2
	Step - Project output	Ctrl + 3	
	Step - Project definition	Ctrl + 1	Ctrl +
File menu	New	Ctrl + N	Ctrl +
	Open	Ctrl + O	Ctrl +
	Save settings	Ctrl + S	Ctrl +
	Save as	Ctrl + Shift + S	
	Exit	Alt + F4	Alt <b>F</b> 4
Edit menu	Undo	Ctrl + Z	Ctrl +
	Redo	Ctrl + Y	Ctrl +
	Cut	Ctrl + X	Ctrl +
	Сору	Ctrl + C	Ctrl C
	Paste	Ctrl + V	Ctrl +
	Delete	Del	Del
	Select all	Ctrl + A	Ctrl +
	Align	F10	F10

Moving equipment within network diagram	Shift to the left	Arrow left	-
	Shift to the left (big step)	Shift + arrow left	Û + -
	Shift upw ards	Arrow up	1
	Shift upw ards (big step)	Shift + arrow up	
	Shift to the right	Arrow right	-
	Shift to the right (big step)	Shift + arrow right	Û +
	Shift dow nw ards	Arrow down	1
	Shift dow nw ards (big step)	Shift + arrow dow n	Û +
Helpmenu	Show list of key combinations	Shift + F1	1 F1

# 3 First Start

### 3.1 Call start wizard

Sector Create new project	When you start the SIMARIS design software, the start wizard opens
Welcome to SIMARIS design	automatically.
What do you want to do?	
• Create a new project	
C Open an existing project	
Browse	
C Load the demo project	
Tutorial	
<back next=""> Finish Cancel</back>	

# 3.2 Create new project

Project Data       Here you can enter data for the project.       Project name:     new       Project description:     new       Docation:	Select "Create a new project". "Next" opens the window for the project data. Enter the master data on the project here. The entry of a project name and project description is mandatory (default entry is "new"), the entry of all other project data is optional.
Create new project       Image         Medium voltage       Here you can enter technical settings for medium voltage.         Nominal voltage [kV]:       20         Max. short-circuit power [MVA]:       250         Min. short-circuit power [MVA]:       100         Max. cross section [mm²]:       500         Min. cross section [mm²]:       25         Min. cross section [mm²]:       25         Min. cross section [mm²]:       25	"Next" takes you to the window for entering the technical settings for medium voltage. Attention: The values to be used for medium voltage must be obtained from the responsible pow er supply netw ork operator.

ow voltage Here you car Nominal volta						
Nominal volta	i eruer technical setti	inas for	low voltage			
Nominal volta		ingo ioi	ion ronage			
Froguopsy FU	Nominal voltage [V]:			400		-
Frequency [Hz]:				50		-
Permissible tr	ouch voltage [V]:			50		-
Ambient temp	perature of device [%	C]:		45		-
Number of poles: Earth fault detection: Reference point for voltage drop calculation: Relative operating voltage at reference point [%]: Max. permissible voltage drop in network [%]: Max. cross section [mm²]:			3-contact preferably, 4-contact if required		i -	
			if required		-	
			Transformer-	secondary terminals	-	
			100		-	
			14		-	
			300		-	
Min. cross se	ction [mm²]:			1.5		
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vision i V			Earth Sailt desertion faither-space from Rate particular stop on Rate, particular com Rate, particular com Rate, particular com Rate, particular com Reserved on Rate, particular Reserved on	ningering odubries Rige Kristenskupet INS tige Ricelenskupet INS men odubries Nerstenske Mensenkatere	Property Instantion Instantis Instantion Instantion Instantion Instantion Instantion Ins	
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In the last window of the wizard, you can enter the technical settings for low voltage.

By clicking the "Finish" button, all preset values are applied and you are taken to the Step 2, <u>Netw ork design</u>  $10^{1}$ .

All of the data entered in the last three windows can be checked and corrected, if necessary, at a later stage during the project edit process in Step 1, <u>Project definition</u> 38 since all entries and settings will be show n there in form of a synopsis.

The entered values and selected quantities are saved when the program is exited and used as defaults when the program is restarted.
**3.3 Open existing project** Select "Open an existing project" in the start wizard and then "Brow se..." to select a SIMARIS design file with the extension .sd. Clicking the "Finish" button opens the SIMARIS design file.

Project files of versions 4, 5, 6 and 7 can be opened.

Section 24 Contract C	g legacy project 🛛 🗧 🗴	Note on the adjustment of the voltage factor at the low -voltage level
Proj indir resu	<ul> <li>ification of change for implementation of standards:</li> <li>60364-4-41: <ul> <li>new disconnecting time values for TN- and TT-networks</li> <li>additional protection using RCD's in final circuits</li> </ul> </li> <li>60909-0: <ul> <li>Update of factor cmax from 1.05 to 1.1</li> </ul> </li> <li>ijects created with SIMARIS design 4.0 or 4.1 may icate error messages after loading and may have other ults after dimensioning the network.</li> </ul>	As of version 5.0 and higher the voltage factor cmax=1.1 in accordance with Table 1 of DIN EN 60909-0 (VDE 0102):2002-07 is used for calculating maximum short-circuit currents at the low -voltage level. This value cannot be changed in the program interface and will be output in the project documentation and Defaults / netw ork parameters table. Therefore, w hen old projects of versions 4.0 and 4.1 are loaded, this info w indow is displayed.

#### 3.4 Load demo project

Select "Load the demo project" in the start wizard. By clicking the "Finish" button the demo project is opened.

#### 3.5 Tutorial

As soon as you click the "Show" button on the right next to "Tutorial", the presentation will be started, which gives you an overview of how to handle the program.

You can also access the tutorial during the program workflow using the <u>Help menu</u>  $3^{\uparrow}$   $\rightarrow$  "Tutorial" link.

# **4** Project definition

After a project w as loaded or created and the start w izard exited, w hich includes recording the data relevant for project definition, you will automatically be taken to Step 2, <u>Network design</u> 10. In order to view, complete or alter <u>Project definition</u> data saved during this editing step or any other project editing step, click



## 4.1 Project data

In an existing project, the master data, client data, regional settings and comment can be comp	pleted and changed in the Project definition.
Master data       new         Project name:       new         Project description:       new         Planner:       user         Design office:       Created on:         Created on:       Friday, 13. August 2010         Changed on:       Friday, 13. August 2010	The entry of a project name and project description is mandatory (default entry is " <b>new</b> "). The length of the project name is limited to 40 characters and the project short description is limited to 19 characters. The entry of the planner's name (default entry is the Window s login name) and the design office is optional and limited to 19 characters each. This part of the screen also show s the creation date of the project and the date of the last change. If you are editing a new project on the basis of an earlier project, modifying it according to the new requirements, it is possible to set the dates for the creation of the plant and the last change of the project to the current date by clicking
Client data Location: Client:	The location of the client project and the client's name can be input as client data, each limited to 19 characters.
Regional settings       IEC         Standard:       Deutschland         Language:       English	Regional settings of SIMARIS design are made in the Project definition and are closely linked to the installed country packages. This means that by selecting a country, the respective technology package, too, which comprises suitable and technologically compatible products for this country which are also regionally available, is used for product selection and automatic dimensioning within the scope of configuration. For every country, its national language or English can be set as language ("regional setting"). Changing the language and/or the country only becomes effective after a restart of SIMARIS design. More than 60 countries with a total of 21 languages can be installed and specified for SIMARIS design. A detailed list of all of the available country settings can be found in the setup document and on the Internet at w w .siemens.com/simaris.



#### 4.2 Technical settings

	Medium voltage	
	Nominal voltage [kV]:	20
	Max. short-circuit power [MVA]:	250 💌
	Min. short-circuit power [MVA]:	100 💌
	Max. cross section [mm²]:	500 💌
	Min. cross section [mm²]:	25
	Low voltage	
	Low voltage Nominal voltage [V]:	400
	Low voltage Nominal voltage [V]: Frequency [Hz]:	400 <b>•</b>
}	Low voltage Nominal voltage [V]: Frequency [Hz]: Permissible touch voltage [V]:	400 <b>•</b> 50 <b>•</b>
2	Low voltage Nominal voltage [V]: Frequency [Hz]: Permissible touch voltage [V]: Ambient temperature of device [°C]:	400 • 50 • 50 • 45 •
	Low voltage Nominal voltage [V]: Frequency [Hz]: Permissible touch voltage [V]: Ambient temperature of device [°C]: Number of poles:	400 50 50 45 3-contact preferably, 4-contact if required
202	Low voltage Nominal voltage [V]: Frequency [Hz]: Permissible touch voltage [V]: Ambient temperature of device [°C]: Number of poles: Earth fault detection:	400 50 50 45 3-contact preferably, 4-contact if required If required
	Low voltage Nominal voltage [V]: Frequency [Hz]: Permissible touch voltage [V]: Ambient temperature of device [°C]: Number of poles: Earth fault detection: Reference point for voltage drop calculation:	400 50 50 45 3-contact preferably, 4-contact if required if required Transformer-secondary terminals
	Low voltage Nominal voltage [V]: Frequency [Hz]: Permissible touch voltage [V]: Ambient temperature of device [°C]: Number of poles: Earth fault detection: Reference point for voltage drop calculation: Relative operating voltage at reference point [%]:	400       •         50       •         50       •         45       •         3-contact preferably, 4-contact if required       •         If required       •         Transformer-secondary terminals       •         100       •
-	Low voltage Nominal voltage [V]: Frequency [Hz]: Permissible touch voltage [V]: Ambient temperature of device [°C]: Number of poles: Earth fault detection: Reference point for voltage drop calculation: Relative operating voltage at reference point [%]: Max. permissible voltage drop in network [%]:	400       •         50       •         50       •         45       •         3-contact preferably, 4-contact if required       •         if required       •         Transformer-secondary terminals       •         100       •         14       •
	Low voltage Nominal voltage [V]: Frequency [Hz]: Permissible touch voltage [V]: Ambient temperature of device [°C]: Number of poles: Earth fault detection: Reference point for voltage drop calculation: Reference point for voltage at reference point [%]: Max. permissible voltage drop in network [%]: Max. cross section [mm²]:	400       •         50       •         50       •         45       •         3-contact preferably, 4-contact if required       •         if required       •         Transformer-secondary terminals       •         100       •         14       •         300       •
	Low voltage Nominal voltage [V]: Frequency [Hz]: Permissible touch voltage [V]: Ambient temperature of device [°C]: Number of poles: Earth fault detection: Reference point for voltage drop calculation: Reference point for voltage drop calculation: Relative operating voltage at reference point [%]: Max. permissible voltage drop in network [%]: Max. cross section [mm <sup>2</sup> ]: Min. cross section [mm <sup>2</sup> ]:	400       •         50       •         50       •         45       •         3-contact preferably, 4-contact if required       •         If required       •         Transformer-secondary terminals       •         100       •         14       •         300       •         1,5       •

The technical settings enable the user to review the data for medium and low voltage w hich he set in the start w izard, and, of course, to change them. Changed settings w ill be saved and w ill be available again after every program restart.

If technical data are changed w hile a project is being edited, an immediate check w ill be performed. How ever, equipment w ill only be adjusted accordingly once the project has been redimensioned.

The picture on the left shows the technical settings as originally delivered.

Attention: The values to be used for medium voltage must be obtained from the responsible pow er supply netw ork operator.

Please define the reference point for voltage drop calculation as required in your project. When the option "Transformer-secondary terminals" is selected, the transformer's voltage drop is not factored in the calculation, w hereas it is factored in w hen "Transformer-primary terminals" is selected, w hich may cause the required values to be exceeded.

# 5 Network design

# 5.1 Network design user interface

#### 5.1.1 Overview

Network design is the second step in the workflow. After the start wizard has been finished, the program automatically changes to this view and is ready to create the project.

In this program step, the user interface is subdivided as follow s:

- Graphics window with tool bar as main workflow area A detailed description of the functions available on this tool bar can be found in the section <u>lcon bars</u> <sup>9</sup> under "Network Design". This section not only describes the functions for editing the network diagram but also the option for dimensioning and setting the various network diagram views (device parameters, load flow / load distribution, short-circuit load, energy report).
- Message list (below the graphics window) the message list contains error messages, w arnings, hints and notes of diemensioning errors. An explanation of the meaning of the different message types can be found in the section <u>Dimensioning and message list</u> 1021 at "Message list".
- Library or Favourites or Graphic/symbols on the top left next to the graphics window details are described in the section Library, Favourites, Graphic/symbols 41.
- Hints and Properties (middle to bottom left next to the graphics window)
   Details are described in the section Hints 43 and Properties of circuit and equipment 44.



5.1.2 Library, Favourites, Graphic	c/symbols
Library Favourites Graphic/ symbols System infeed   Coupling          Image: System infeed   Coupling	<ul> <li>The library provides different versions of</li> <li>system infeeds and couplings</li> <li>distribution boards</li> <li>final circuits</li> <li>w hich can be used w hen creating a netw ork diagram.</li> <li>The icons are activated by clicking on them. Afterw ards, the activated element can be inserted at the appropriate position in the netw ork diagram with a mouse click.</li> <li>A detailed description of the individual elements made available by these icons and their use in the netw ork diagram can be found in the chapter <u>Overview of the icons library</u> <sup>[48]</sup> Handling of Netw ork design.</li> </ul>
Library Favourites Graphic/ symbols          System infeed         Infeed 1         Distribution board         Distribution 1         Final circuits         Final circuit 1	<ul> <li>Under Favourites, the user can keep a selection of system infeeds, distribution boards and final circuits in order to later include them in projects to be edited.</li> <li>The functions to be used for editing favourites can be found in the Tools menu → Favourites. These functions are described in the section Menu bar and key combinations 19.</li> <li>In addition, the creation and handling of favourites is described in more detail in the chapter Overview of the icons library 1481 "Handling of Netw ork design".</li> </ul>
Library Favourites Graphic/symbols     Annotation   free graphic     A     Image: Column bit           Image: Column bit <b>Image: Column bit      <b>Image: Column bit      <b>Image: Column bit      <b>Image: Column bit      <b>Image: Column bit      <b>Image: Column bit      <b>Image: Column bit      <b>Image: Column bi</b></b></b></b></b></b></b></b>	When this button is activated, annotations can be added to the network diagram at the desired position by pressing the left mouse button. They can be formatted as follows in the window that is now displayed: <ul> <li>font colour</li> <li>font size either by directly entering the font size or by setting it with the regulator.</li> </ul> <li>Annotation <ul> <li>Image: Color and Scaling</li> <li>Image: Co</li></ul></li>

The three other buttons

✓ O □ allow for adding

- lines
- circles or ellipses
- rectangles

to the network diagram. To do this, first enable the desired button by clicking it, then place the element at the desired position on the network diagram by pressing the left mouse button and zoom it up to the desired size by keeping the left mouse button pressed.

With the help of the context menu that opens, when the mouse is placed on a graphic to be edited and the right mouse button is pressed, these added graphics can be

- copied or cut and then pasted again
- deleted.

Сору
Cut
Paste
Delete
Properties

Selecting the menu item Properties opens the follow ing window in which you can define the graphic style (e.g. solid, dashed or dotted line), the line thickness and colour.

S D 6.0		8	×
Style:	Width:	Color:	
		• <b>•</b>	
			_
	OK	Cancel	

#### 5.1.3 Hints

Below the library, a section with hints on the program handling is displayed depending on the respective situation. The follow ing are some examples supporting you in familiarizing with working in the network diagram:

Hints\$Image: Select a power supply from the library first and place it onto the empty page.	Hint in case of an empty network diagram
Hints        Image: Click onto the connection square and drag the mouse to create the network-element.	Hint when adding an element
Hints       Click onto the connection         Square and drag the mouse       Click orteate a general coupling         for standard power supply.	Hint w hen adding a normal ("general") coupling
Hints Click onto the connection square and drag the mouse to create a directed coupling for emergency	Hint w hen adding a directed coupling
Hints        Image: Section tool to to modify your network     Use the selection tool to modify your network       Image: Section tool to to modify your network diagram     Image: Section tool to modify your network	Hint when editing the network elements

#### 5.1.4 Properties of circuit and equipment

- When selecting one of the circuits contained in the netw ork diagram w ithout selecting a specific item of equipment, the properties of this circuit are displayed in the "Properties" section.
- When selecting an item of equipment in the netw ork diagram, the properties of the circuit to which this item of equipment belongs are displayed in the "Properties" section and below that also the properties of the item of equipment itself.

These are examples.

Properties	*	Example: Properties when selecting a circuit
Properties of circuit Circuit System configuration Simultaneity factor Surge protection Target of dimensioning Selectivity interval As default No selection	LVMD 1.1A TN-S I I 1 Lightning/ overvoltage p I Backup protectior I Apply	
Properties Properties of circuit Circuit System configuration Simultaneity factor Separate protection Target of dimensioning Selectivity interval As default Transformer Designation Rated power Sn [kVA] Rated short-circuit voltage of	LVMD 1.1A.1   TN-S   I   I   Without   I   Backup protection   I   Apply     Transformer 1.1A   800   ukr [%]	Example: Properties w hen selecting a transformer

Properties *	Example: Properties w hen selecting a busbar line
Properties of circuit	
Circuit B 1.1B.1.1	
System configuration TN-S i	
Simultaneity factor	
Target of dimensioning	
Selectivity interval	
As default Apply	
Connection	
Designation B 1.1B.1.1	
Type of connection Busbar	
Length [m] 120	
Busbar system	
Properties 🛠	Example: Properties w hen selecting a sw itch
Properties of circuit	
Circuit LVMD 1.1B.1	
System configuration TN-Si	
Simultaneity factor	
Separate protection without 🗾 i	
Target of dimensioning Backup protectior 💌 🧴	
Selectivity interval	
As default Apply	
Switch	
Designation LV-CB 1.1B.1b	
Switch type Circuit-breaker 🗾 i	
Properties       ▲         Properties of circuit       LVMD 1.18.1         Circuit       LVMD 1.18.1         System configuration       TN-5         Simultaneity factor       1         Separate protection       ii         Target of dimensioning       Backup protectior         Selectivity interval       i         Selectivity interval       I         Switch       Designation         LV-CB 1.18.1b       Switch type         Switch type       Ircuit-breaker	Example: Properties w hen selecting a sw itch

Properties	*	Example: Properties w hen selecting a load
Properties of circuit —		
Circuit	L 1.1B.1.1.1	
System configuration	TN-S i	
Capacity factor	0,8	
Quantity	1 .	
Standard of MCB-selec	tion Icn (IEC 60898-1)	
Target of dimensioning	Backup protectior 💌 🚺	
Selectivity interval		
As default	Apply	
Load		
Designation	L 1.1B.1.1.1	
Rated current [A]	160	
Active power [kW]	88,681	
Place of installation	Inner zone	
	Overvoltage protection	

## 5.1.5 Tool bar

ø 🕟 🖓 🕹 🖉	🕨 🖓 👫 🖓	💠 👎 🔛 🗛 🗛 🖓 🕶	🗄   🗔 📇 🔂   🧵
-----------	---------	---------------	---------------

A detailed description of the functions and editing options in the network diagram available on the tool bar can be found in the section "lcon bars"  $\rightarrow$ <u>Network design</u> 10.

#### 5.1.6 Graphics window



# 5.1.7 Message list

Above	the li	st, the total number of messages available is displayed and a symbol also indicates the status of all messages.	
?		Circuits are contained in the projects which were not or cannot be checked (e.g. unloaded circuits).	
<b>(3)</b>		There are errors in the project.	
×		All circuits were checked and there are no faulty circuits. Warnings, notes and dimensioning errors are not separately recorded and associated to this node.	
The me	ssag	ge list displays four types of messages:	
8	-	Error messages which result in abortion of the calculation / dimensioning process	
Δ		Warning messages which indicate that default settings or standards have not been observed	
٠	-	Dimensioning errors w hich indicate an unsuccessful dimensioning process	
i		Information messages which contain general information or hints	
Further explanations of the interpretation and handling of messages can be found in the section Dimensioning and message list $102$ $\rightarrow$ Message list $105$ .			

## 5.2 Handling of Network design 5.2.1 Overview of the icons library

Library Favourites Graphic/ symbols
System infeed   Coupling
000 - 1
Distribution board
Final circuits

The icons library contains the icons available for the creation of the netw ork diagram, sorted in the categories

- System infeed / Coupling
- Distribution board
- Final circuits

The icons can each be selected with a mouse click and then placed at the desired insert position in the netw ork diagram with the mouse. Netw ork design alw ays starts with the creation of an infeed element and never with a coupling.

Suitable insert positions for further elements are indicated by orange squares which are, how ever, only displayed when moving the mouse pointer along the connections (busbars displayed in green or lines displayed in blue).

To create further netw ork elements in the diagram, click the left mouse button at one of these insert points, keep the mouse button pressed and drag the mouse pointer aw ay from the insert point. When releasing the left mouse button, the insert w izard of the respective element opens. The fields show n by this w izard must be filled in completely and must not

contain any w arning messages any more (identified by  $^{60}$ ) so that your entries can finally be completed by clicking the Finish button.

This insert w izard only permits the definition of basic properties and technical data on the infeeds, couplings, distribution boards and final circuits that w ere added. To view and change detailed data on the corresponding equipment after adding it, place the mouse pointer on th respective item of equipment, call up the context menu w ith a right mouse click and select the menu item "Properties" from the w indow w hich is then displayed, for example

- the default for the transformer capacity for transformers
- define the installation type and cable cross sections for cable connections

define in detail the types of protective devices to be used These equipment dialogues for the components of infeeds, couplings, distribution boards and final circuits are described in more detail in the section <u>Properties of circuits and equipment</u> [73].

## 5.2.2 Adding elements to the network diagram

#### 5.2.2.1 Adding system infeeds and couplings

There are 5 types of system infeeds or couplings provided for selection that can be used in the network diagram:

- Transformer w ith medium voltage
- Transformer without medium voltage
- Generator
- Neutral netw ork infeed
- Busbar section w ithout source
- Coupling



#### 5.2.2.1.1 System infeeds

To add the first infeed to the network diagram, or any additional infeed independent of existing ones in order to create an isolated network, select the icon of the required infeed in the library, choose an appropriate position in the network diagram with the mouse and place the infeed there with a click of the left mouse button. To add further infeeds as parallel infeeds to existing ones, select the icon of the desired infeed in the library, search for an appropriate insert point in the network diagram with the mouse (yellow rectangle), and insert the infeed by pressing and holding the left mouse button, then dragging the mouse aw ay from the selected insert point and finally releasing the mouse button.

After an infeed w as added to the network diagram, its insert w izard opens in which basic settings can be made. Please note the following for the data selection:

- The data items available for selection are each provided in drop-dow n menus.
- For lengths, e.g. of the medium-voltage cable or the low -voltage connection (cable/wire or busbar), input values from 0.1 to 10,000 m are permissible.
- When selecting the type of system configuration and when selecting a busbar system on the low-voltage side, additional information can be displayed in the insert wizard via the corresponding info buttons.
- A switching device upstream or dow nstream the connecting line must be selected at the low -voltage side.
- In case you enabled the query regarding lightning current and overvoltage protection, you have to define w hether you w ant to configure lightning current and overvoltage protection, overvoltage protection only or no protection at all for the new main distribution board, before you add an infeed. Depending on this choice, the selection of a surge arrester type will then be available in the insert w izard for loads that are to be added later, or it will not be available.
  - No protection  $\rightarrow$  no arrester type can be selected
  - Overvoltage protection only  $\rightarrow$  arrester type can be selected
  - Lightning and overvoltage protection → arrester type can be selected

When "Lightning and overvoltage protection" has been selected, transitions betw een buildings can also be considered in your planning. For this purpose, the insert wizard of the relevant items offers a "building transition" for selection, or this building transition can later be selected and deselected in the properties of the respective connection (if selected in the graphic) which are show n at the bottom left of the screen.

For an overview of the "power sources" in network calculation, i.e. transformers, generators, and UPS, please refer to the corresponding chapter of the Technical Manual for the SIMARIS planning tools, which you can access using the Help menu  $3 \uparrow \rightarrow$  "Technical Manual".

The variants available as infeeds are presented in the following.

Transformer <b>with</b> medium voltage	<ul> <li>This icon can be used to add an infeed circuit with transformer, medium voltage sw itching/protective device and transformer feeder line as well as the low -voltage side supply of the main distribution board via cables or busbars.</li> <li>Information about the "Typification of circuit-breakers in medium-voltage sw itchgear" can be found in the corresponding chapter of the "Technical Manual for the SIMARIS planning tools, which you can access using the Help menu 31 → "Technical Manual".</li> </ul>
Infeed: Transformer (incl. MV)         Add transformer with medium voltage         Specify the required parameters inside the infeed-circuit.         Type of switchgear         System configuration         Tvpe of switchgear         System configuration         Tvpe of switchgear         None         Type of connection         Cable/Line         Busber system         Length [m]         Busber system         Length [m]         Type of switchgear         None         Type of switchgear         None         Type of connection         Cable/Line         Type of switchgear         Croute-breaker         Type of switchgear         Circuit-breaker	<ul> <li>Before adding an infeed you have to define w hether you w ant to configure lightning current and overvoltage protection, overvoltage protection only or no protection at all for the new main distribution board.</li> <li>Attention: If "Transformer w ith medium voltage" is selected as infeed, w hen isolated netw orks are designed, these isolated netw orks are only separated at the low -voltage side. The medium voltage side is regarded as one netw ork.</li> </ul>
Transformer <b>without</b> medium voltage	This icon can be used to add an infeed circuit with transformer without a medium-voltage section and low -voltage-side supply of the main distribution board via cables or busbars.
Infeed: Transformer         Add transformer         Specify the required parameters inside the infeed-circuit.         Image: System configuration         Type of switchgear         None         Type of switchgear         None         Type of connection         Cable/Line         Busbar system         Length [m]         Building transition         Arrester type         None         Type of switchgear         Circuit-breaker         Type of switchgear         Ength [m]         Ength [m]	If you have enabled the query for checking ligthning current and overvoltage protection, you must define prior to adding the new main distribution board, whether you w ant to configure ligthning current plus overvoltage protection, overvoltage protection only or no protection for the new distribution board.

Generator	This icon can be used to add an infeed circuit with transformer, medium voltage switching/protective device and transformer feeder line as well as the low -voltage side supply of the main distribution board via cables or busbars.
Infeed: Generator         Add generator         Specify the required parameters inside the infeed-circuit.         Image: System configuration         Type of switchgear         None         Arrester type         None         Type of connection         Cable/Line         Building transition         Arrester type         None         Type of switchgear         Image: System         Image: System	If you have enabled the query for checking ligthning current and overvoltage protection, you must define prior to adding the new main distribution board, whether you want to configure ligthning current plus overvoltage protection, overvoltage protection only or no protection for the new distribution board.
Neutral netw ork infeed	This icon can be used to add an infeed circuit with transformer without a medium-voltage section and low -voltage-side supply of the main distribution board via cables or busbars.
Network infeed   Impedances   Select the type of system infeed   Type of network infeed   Impedances   Loop impedance   Short-circuit currents     Short-circuit currents <a href="mailto:Back"><a href="mailto:Back">Back</a>     Next &gt;     Enish   Cancel</a>	<ul> <li>If you have enabled the query for checking ligthning current and overvoltage protection, you must define prior to adding the new main distribution board, w hether you w ant to configure ligthning current plus overvoltage protection, overvoltage protection only or no protection for the new distribution board.</li> <li>In the first w indow of the insert w izard the netw ork infeed has to be defined by entering impedances, loop impedances or short-circuit currents.</li> </ul>
	When clicking the "Next" button, the second window of the insert wizard opens, the layout of which differs depending on the selected type of network infeed:

<sup>111</sup> Network infeed	×	Impedances (second w indow of the insert w izard)
Impedances		
Define the values for the system infeed based on the	e model of "impedances"	Formula overhole used in the insert witzerd:
Rated current [A]	250	Z1 = impedance of the positive phase-sequence system Zs = loop impedance
_ Impedances		R1 = resistance in the positive phase-sequence system
Positive-phase-sequence impedance Z1max [m $\Omega$ ]	50 💌	Rs = loop resistance
Positive-phase-sequence impedance Z1min [m $\Omega$ ]	25	X1 = reactance in the positive phase-sequence system
Loop impedance Zs max $[m\Omega]$	100	$X_{s} = loop reactance$
Loop impedance Zs min [mΩ]	50	
	130	
Ratios		
Rauu Rimaxy Al max		
Ratio R1min/ X1min	1	
Ratio Rsmax/ Xs max	1	
Ratio Rs min / Xs min	1	
< Back	: Next > Finish Cancel	
뫲Network infeed	×	Loop impedances (second window of the insert wizard)
Loop impedance		
Define the values for the system infeed based on the	e model of "loop impedance"	Formula symbols used in the insert wizard.
		$Z_{s} = loop impedance$
Rated current [A]	250 💌	(0 = phase angle)
Loop		$\varphi$ = priase angle P0 = resistance in the zero phase-sequence system
Loop impedance [mΩ]	50	P1 = resistance in the positive phase sequence system
φ [°]	10	$X_1$ = resistance in the zero phase sequence system
		$x_0 = reactance in the positive phase sequence system$
Ratio R0/R1	7	
Ratio X0/ X1		
Patio Ikmay / Ikmin	4	
Rado Ikinaki Ikinin		
	1	
	1	
	1	
	1	
	1	
< Back		

Network infeed     Short-circuit currents     Define the values for the system infeed based on the model of "short circuit currents"	Short-circuit currents (second window of the insert wizard)
Rated current [A]       Image: Constraint of the second seco	Formula symbols used in the insert w izard: Ik3 = three-pole short-circuit current Ik1 = single-pole short-circuit current $\varphi3 =$ phase angle of the three-pole short-circuit current $\varphi1 =$ phase angle of the single-pole short-circuit current Note: Input of phase angle is only possible with the professional version of SIMARIS design and an activated extended value range (see section <u>Properties and equipment</u> <u>dialogue of neutral netw ork infeeds</u> 83).
< Back Next > Finish Cancel	
Network infeed       X         Add network       Specify the required parameters inside the infeed-circuit.         Image: System configuration       IT         Type of switchgear       None         Type of connection       Cable/Line         Busbar system       I         Length [m]       Image: Circuit-breaker         Type of switchgear       Circuit-breaker         Image: Circuit-breaker       Image: Cancel	In the third w indow of the insert w izard, the further required basic settings for the neutral netw ork infeed to be defined can be made now . The third w indow looks the same for all 3 variants of the neutral netw ork infeed.
It is possible to create any number of infeeds of the same type (trans or neutral network infeed) as parallel infeeds.	sformer, transformer with medium voltage, generator

Transformer I. 1A1 Sp. = 100 kW 2000 kW 2000 D 9x5 cohrect	After having placed the first infeed, the icon of the desired pow er source must still be activated in the library.
LV-C <sub>2</sub> L 1. 16. 3 Catencylane Catencylane Catencylane(2010/201/201	Move the mouse pointer along the low -voltage main distribution until a yellow insert symbol is displayed.
T LV-OD LIA IN Groutbreater	Press and hold the left mouse button and move the mouse upw ards / to the front until a new branch line is displayed. As soon as the left mouse button is released, the insert w izard appears again.
rs <u>⊝</u>	



#### 5.2.2.1.2 Couplings

Pow er sources can be connected with each other via couplings.

After having inserted a coupling in the network diagram, the respective insert wizard opens, in which basic settings can be made. Please note the following for the data selection:

- The data items available for selection are each provided in drop-dow n menus.
- For lengths of connecting lines (cable/wire or busbar), input values from 0.1 to 10,000 m are permissible.
- It is necessary to select a switching device upstream and dow nstream of the connecting line.









Coupling       X         Add general coupling       Specify the required parameters inside the distribution circuit.	In the second w indow , the basic settings for the coupling have to be made.
Type of switchgear Circuit-breaker  Type of connection  Busbar system Length [m] Type of switchgear None	
< Back Next > Finish Cancel	
Coupling       Source type         Select the type of power source for the new main distribution         Image: Coupling in the end of the new main distribution         Image: Coupling intervention in the end of the new main distribution         Image: Coupling intervention intervention intervention         Image: Coupling intervention interventintervention interventintervention intervention	In the third w indow , the type of infeed for the new main distribution is defined. All types of infeed are provided for selection, i.e. transformer w ith or w ithout medium voltage, generator and neutral netw ork infeed.
	The fourth window of the insert wizard corresponds to the insert wizard of the respective selected infeed.

#### 5.2.2.2 Adding distribution boards

The basic version provides five, the professional version six different types of distribution boards for selection in the library:

- Sub-distribution board
- Group sw itch
- Busbar trunking system
- Busbar trunking system with centre infeed
- Distribution board at the end of a busbar trunking system / rising mains cable
- Distribution board with equivalent electric circuit (impedance)



In general, distribution boards can be inserted in the network diagram by selecting the icon of the required distribution board in the library, searching for a suitable insert point (yellow rectangle) by moving the mouse pointer in the network diagram along the low-voltage main distribution and inserting the distribution board by pressing and holding the left mouse button, dragging the mouse pointer aw ay from the insert point and finally releasing the mouse button at the selected insert point.



After having added a distribution board to the network diagram, its insert wizard opens in which basic settings can be made. Please note the following for the data selection:

- The data items available for selection are each provided in drop-dow n menus.
- For lengths of connecting lines (cable/wire or busbar) or the busbar trunking system itself, input values from 0.1 to 10,000 m are permissible.

Sub-distribu	ition board		This icon can be used to add a sub-distribution board in the form of a distribution cabinet to a main or sub-distribution.
り Sub-distr	ibution board	X	
Add sub-distr Specify the rea	<b>ibution board</b> quired parameters inside :	the distribution circuit.	
	System configuration	ITi	
Ň	Type of switchgear	Circuit-breaker	
Ļ	Type of connection	Cable/Line	
	Busbar system	▼ i	
Î	Length [m] 🤅	3	
	Type of switchgear	None	
		Finish Cancel	

Group sw itch	This icon can be used to create a group sw itch or group back-up fuse w ithin a distribution cabinet or rising mains cable.
Sub-distribution       Image: Constraint of the system configuration       Image: Constraint of the system configuration         System configuration       TM-S       Image: Constraint of the system configuration         Type of switchgear       Circuit-breaker       Image: Circuit-breaker         Type of switchgear       None       Image: Circuit-breaker         Type of switchgear       Title       Circuit-breaker         Type of switchgear       Title       Circuit-breaker	Special use of the group switch in equivalent circuit mapping for a main distribution system with many pow er consumers: Soll eine Hauptverteilung mit vielen Verbrauchern dargestellt werden, so kann als Ersatzdarstellung die Haupsammelschiene mit einem Gruppenschalter verwendet werden. In diesem Fall muss beim Einfügen des Gruppenschalters im Feld "Art des Schaltgerätes" die Auswahl "keines" getroffen werden. Anschließend werden die Verbraucher im Netzplan grafisch an der Sammelschiene des Gruppenschalters platziert.
Busbar trunking system	This icon can be used to insert a sub-distribution board in the form of a busbar system with infeed from one end.
🖫 Busbar trunking system 🔀	Particularity of busbar trunking systems:
Add busbar trunking system Specify the required parameters for the trunking system. Select an appropriate busbar type. System configuration IT i	Except for group switches and motor starter combinations, all types of distribution boards and pow er consumers can be directly connected to busbar trunking systems.
Type of switchgear Circuit-breaker	
Type of connection Cable/Line	Exception:
Length [m] Type of connection Busbar Busbar system Type of connection Busbar Busbar system Connection I Busbar Connection I Busbar Connectio	If the busbar trunking system is intended as a rising mains cable for building floor supply (first type of connection: direct connection, second type of connection: cable/w ire), this enables a group sw itch to be connected directly to the busbar trunking system.
Eength [m] (S1)	A system overview of the various busbar systems incl. their technical data and configuration rules can be found in the "Busbar trunking systems" section of the Technical Manual for SIMARIS softw are tools which you can access using the <u>Help menu</u> $3$ $\rightarrow$ "Technical manual".



Busbar trunking system with centre infeed	This icon can be used to insert a sub-distribution board in the form of a busbar system w ith centre infeed.
Busbar trunking system       Image: Constant System with center infeed         Specify the required parameters for the trunking system. Select an appropriate busbar type.         Image: System configuration         Type of switchgear         Type of connection         Length [m]         Subsar         Subsar     <	In this case, not only the length of the busbar system starting from the connection point has to be entered in the insert w izard but also the length of the tw o branch lines starting from the branching point. The insertion of distribution boards and loads at these busbars w orks in the same w ay as described above. A system overview of the various busbar systems incl. their technical data and configuration rules can be found in the "Busbar Trunking Systems" section of the Technical Manual for SIMARIS softw are tools w hich you can access follow ing the link for the Help menu 3 → "Technical manual".
Distribution board at the end of a busbar trunking system / rising mains cable	This icon can be used to insert a sub-distribution system at the end of a busbar trunking system or of a rising mains cable, that means at a "gripper".
Sub-distribution board         Add sub-distribution board         Specify the required parameters inside the distribution circuit.         Image: System configuration         Type of switchgear         Circuit-breaker         Image: Finish         Cancel	The insert w izard displayed on the left only asks for the definition of the type of system configuration and the type of sw itchgear. The insertion of distribution boards and loads at this sub-distribution w orks in the same w ay as described above.

Distribution with equivalent electric circuit (impedance)	<ul> <li>This icon can be used to insert an equivalent electric circuit (impedance) in the netw ork diagram. How ever, this is only possible in the professional version, i.e. if the professional mode is not active, this icon is not displayed.</li> <li>This equivalent impedance can be used as an aid to simulate connecting lines (cables/w ires - e.g. acc. to AWG; busbars for pow er transmission), reactor coils, isolating transformers, etc. It can also be used for mapping existing connecting lines on w hich an impedance measurement has been performed.</li> </ul>
Equivalent electric circuit (impedance)       Image: Circuit (impedance)         Equivalent electric circuit (impedance)       Define impedance values         System configuration       TN-C       Image: I	In the insert w izard, the zero or positive phase-sequence system of the phase, N and PE(N) conductors are to be entered: For the entry of resistances and reactances, values in the range from 0.1 to 10,000 m $\Omega$ are permissible.
Type of switchgear     Circuit-breaker       Type of connection     Cable/Line       Busbar system     i       Length [m]     I	"Impedances voltage drop relevant" If this option is enabled (checkmark set), the calculated voltage drop across the equivalent electric circuit (impedance) will be displayed and considered in the overall calculation, otherwise the value will not be included in the calculation and will not be displayed.
Z1 R1 [m $\Omega$ ] 100 X1 [m $\Omega$ ] 100 Z0 N-conductor R0 [m $\Omega$ ] 100 X0 [m $\Omega$ ] 100 Z0 PE(N)-conductor R0 [m $\Omega$ ] 100 X0 [m $\Omega$ ] 100 C PE(N)-conductor R0 [m $\Omega$ ] 100 X0 [m $\Omega$ ] 100 C Impedances voltage drop relevant C Impedances short-circuit relevant Type of switchgear None	Formula symbols used in the insert w izard: R0 = resistance in the zero phase-sequence system R1 = resistance in the positive phase-sequence system X0 = reactance in the zero phase-sequence system X1 = reactance in the positive phase-sequence system Z0 = impedance of the zero phase-sequence system
Finish Cancel	Z1 = impedance of the positive phase-sequence system

#### 5.2.2.3 Adding final circuits

The library provides six different types of final circuits for selection:

- Stationary load
- Pow er outlet circuit
- Motor
- Frequency converter
- Charging unit
- Capacitor
- Dummy load
- Overvoltage protection



In general, final circuits can be added to the network diagram by selecting the icon of the required final circuit in the library, searching for a suitable insert point (yellow rectangle) by moving the mouse pointer in the network diagram along the low -voltage main or sub-distribution and inserting the final circuit by pressing and holding the left mouse button, dragging the mouse pointer aw ay from the insert point and finally releasing the mouse button at the selected insert point.



When a distribution board was added to the network diagram, its insert wizard opens in which basic settings can be made. Please note the following for the data selection:

- The data items available for selection are each provided in drop-dow n menus.
- For lengths of connecting lines (cable/wire or busbar) or the busbar trunking system itself, input values from 0.1 to 10,000 m are permissible.
- The info buttons next to the "System configuration" and "Busbar system" fields provide further information about these issues, which is then displayed in another window.
- Depending on the choices made for lightning and overvoltage protection when adding the infeed, the selection of a surge arrester type will then be available in the insert wizard for loads to be added, or it will not be available.
  - No protection ightarrow no arrester type can be selected
  - Overvoltage protection only ightarrow arrester type can be selected
  - Lightning and overvoltage protection  $\rightarrow$  arrester type can be selected

Stationary le	oad		This icon allow s a stationary load or load group (several identical pow er consumers) to be connected to a main or sub-distribution system.
Madd stati	ionary load		Owing to the correlation of nominal current and active power, any
Add stationar	y load		modification of the selection of one of these fields automatically leads to a
Specify the re	quired parameters inside the consumer	r-circuit.	corresponding adaptation of the value of the other field.
			The number of loads in a load group can be defined in the "Quantity" field.
×	System configuration		
	Type of switchgear	Circuit-breaker	
	Arrester type	None	
	Type of connection	Cable/Line	
+	Busbar system	▼ i	
	Length [m]	8	
T		Building transition	
	Arrester type	None	
	Type of switchgear	None 🔽	
(P)	Number of poles (type of network)	3	
	Nominal current [A]		
	Active power [kvv]	55,426	
$\sim$	Quantity		
	Place of installation	Inner zone	
		Einich Concol	
Pow er outle	et circuit		pow er consumers) to be connected to a main or sub-distribution.
Pow er outle	et circuit		pow er consumers) to be connected to a main or sub-distribution.
Pow er outle	et circuit er outlet circuit	a x	Because of the interrelation betw een nominal current and active pow er,
Pow er outle	et circuit er outlet circuit itlet circuit quired parameters inside the consumer	-circuit.	<ul> <li>This icon allows a non-stationary load or load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> </ul>
Pow er outle	et circuit er outlet circuit Itlet circuit quired parameters inside the consumer	-circuit.	<ul> <li>This icon allows a non-stationary load or load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	er outlet circuit er outlet circuit ntlet circuit quired parameters inside the consumer System configuration	-circuit.	<ul> <li>This icon allows a non-stationary load or load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit er outlet circuit httet circuit quired parameters inside the consumer System configuration Type of switchgear	-circuit. TN-S I I Circuit-breaker I	<ul> <li>This icon allows a non-stationary load of load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit er outlet circuit Ittet circuit quired parameters inside the consumer System configuration Type of switchgear Arrester type	-circuit. TN-S I I Circuit-breaker I	<ul> <li>This icon allows a non-stationary load of load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit er outlet circuit attet circuit quired parameters inside the consumer System configuration Type of switchgear Arrester type Type of connection	-circuit. TN-S I I Circuit-breaker I None I Cable/Line I	<ul> <li>This icon allows a non-stationary load of load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit er outlet circuit titlet circuit quired parameters inside the consumer System configuration Type of switchgear Arrester type Type of connection Busbar system	circuit.	<ul> <li>This icon allows a non-stationary load of load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit er outlet circuit ttet circuit quired parameters inside the consumer System configuration Type of switchgear Arrester type Type of connection Buebar system Length [m]	-circuit. TN-S I I Circuit-breaker I None I Cable/Line I Building transition	<ul> <li>This icon allows a non-stationary load of load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit er outlet circuit titlet circuit quired parameters inside the consumer System configuration Type of switchgear Arrester type Type of connection Busbar system Length [m]	circuit.	<ul> <li>This icon allows a non-stationary load of load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit er outlet circuit tutet circuit quired parameters inside the consumer System configuration Type of switchgear Arrester type Type of connection Busbar system Length [m] Arrester type	-circuit. TN-S • i Circuit-breaker • None • Cable/Line • Building transition	<ul> <li>This icon allows a non-stationary load of load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit  er outlet circuit  titet circuit  quired parameters inside the consumer  System configuration  Type of switchgear  Arrester type  Type of connection  Busbar system Length [m]  Arrester type  Type of switchgear	-circuit. TN-S I I Circuit-breaker I None I Cable/Line I Building transition	<ul> <li>This icon allows a non-stationary load of load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit  er outlet circuit  ttet circuit quired parameters inside the consumer  System configuration Type of switchgear Arrester type Type of connection Busbar system Length [m] Arrester type Type of switchgear Number of poles (type of network)	-circuit. TN-S I I Circuit-breaker I None I Cable/Line I Building transition None I None I Non	<ul> <li>This icon allows a non-stationary load of load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit er outlet circuit ttet circuit guired parameters inside the consumer System configuration Type of switchgear Arrester type Type of connection Busbar system Length [m] Arrester type Type of switchgear Number of poles (type of network) Nominal current [A]	-circuit. TN-S • i Circuit-breaker • Cable/Line • Cable/Line • Building transition None • None • None •	<ul> <li>This icon allows a non-stationary load of load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit  er outlet circuit  titet circuit  quired parameters inside the consumer  System configuration  Type of switchgear  Arrester type  Type of connection  Buebar system Length [m]  Arrester type  Type of switchgear  Number of poles (type of network) Nominal current [A]  Active power [kW]	-circuit. TN-S I I Circuit-breaker I None I Cable/Line I Building transition None I None I None I Li,5 I 2,309	<ul> <li>This icon allows a non-stationary load of load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit  er outlet circuit  tutet circuit  quired parameters inside the consumer  System configuration  Type of switchgear  Arrester type  Type of connection  Busbar system Length [m]  Arrester type  Type of switchgear  Number of poles (type of network) Nominal current [A] Active power [kW] Quantity	-circuit. TN-S I I Circuit-breaker I None I Cable/Line I Building transition None I None I Line I Building transition None I Line Line I Line I Line I Line I Line I Line I L	<ul> <li>This icon allows a non-stationary load or load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit er outlet circuit er outlet circuit et circu	-circuit. TN-S I I Circuit-breaker I None I Cable/Line I Duilding transition I None I None I Line Line Line Line Line Line Line Line	<ul> <li>This icon allows a non-stationary load or load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit  er outlet circuit  tuet circuit  quired parameters inside the consumer  System configuration  Type of switchgear  Arrester type  Type of connection  Busbar system Length [m]  Arrester type  Type of switchgear  Number of poles (type of network) Nominal current [A] Active power [kW] Quantity Place of installation	-circuit. TN-S I I Circuit-breaker I None I Cable/Line I Building transition None I None I Line I Line I Inner zone I I	<ul> <li>This icon allows a non-stationary load of load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>
Pow er outle	et circuit er outlet circuit ttet circuit stet circuit stet circuit uired parameters inside the consumer System configuration Type of switchgear Arrester type Type of connection Busbar system Length [m] Arrester type Type of switchgear Number of poles (type of network) Nominal current [A] Active power [kW] Quantity Place of installation	-circuit. TN-S I I Circuit-breaker I None I Cable/Line I Building transition None I None I None I Label I Inner zone I Finish Cancel	<ul> <li>This icon allows a non-stationary load or load group (several identical pow er consumers) to be connected to a main or sub-distribution.</li> <li>Because of the interrelation betw een nominal current and active pow er, any modification of the selection of one of these fields automatically leads to a corresponding adaptation of the value of the other field.</li> <li>Via the "Quantity" field you can define the number of loads in a load group.</li> </ul>



Frequency converter	With this icon you can add a frequency converter to the main or sub distribution.
Add Frequency converter  Add Frequency converter Specify the required type parameters for the frequency converter.	The type of frequency converter will be determined automatically on basis of the performance and the application.
Application     Type     Performance     Basic     Medium	
Pumping/ ventilating/ compressing         Centrifugal pumps Radial/axial fans Compressors         Centrifugal pumps Radial/axial fans Compressors	
Moving Belt conveyors Belt conveyors Belt conveyors Chain conv	
Processing Mills Miles Mixers Kneaders Kneaders Kneaders Crushers Agitators Centrifuges Centrifuges Extruder Rotary furnaces	
Power mech [kW]       < Back       Next >       Finish       Cancel	

Add Frequency con	iverter		×	■ If "Frequency converter" is selected, in the section "Installation
Add Frequency converter		type" you can choose between		
Specify the required parameters inside the frequency converter-circuit.				- Built-In unit
				- Cabinet
Installation type				
	Built-in unit	Cabinet		and motor can be determined.
T	System configuration	TN-S	i	As cable cross-section the maximum connectable one is selected
	Type of switching device	None		by default.
	Type of connection	Direct connection		
	Length [m]			
<del>لم</del>	Preferred type of construction	Fused		
	EMC provision	No requirement	• i	
$\sim$				
ł	Type of connection	Shielded cable		
ł	Length [m]	U 1		
( )	Power mech [kW]	15	•	
	Quantity	1	×	
	< Back	Next > Finish	Cancel	

Charging unit			This icon can be used to connect the charging unit to a main or sub-distribution system.
50 Add charging	ı unit	a x	
Add charging	unit		
Specify the requ	ired parameters inside the charging unit.	^	
	System configuration	TN-S i	
_ <b>k</b>			
	Type of switchgear	Circuit-breaker	
	Arrester type	None	
	Type of connection	Cable/Line	
+	Busbar system	▼ i	
	Length [m] 🤞	3	
1		Building transition	
	Arrester type	None	
	Type of charging unit	wallbox 🔽 i	
	Integrated protection	with integrated protection	
	Mushov of poles (type of polywork)		
	Number or poles (type or network)	32	
	Nominal current or connector [A]	J32 I	
	Quantity	1	
		Finish Cancel	
50 Protection notes			Lising the info buttons payt to the fields "Integrated protection" and
According to IEC 601	364-7-722 every charging unit muct be equipped	with a residual current protective	"Type of charging unit", you can call up further information about
device (RCD) of a ra	ited differential current which does not exceed 30	mA.	the charging units.
If this RCD is not into	egrated into the charging unit, it must be installed	in the upstream infrastructure.	
will not be present d	uring the charging phase.	and that shibber be rade carrents	
		ОК	
50 Charging unit			
		Rated supply current Integrated protec	tion Degree of protection Place of installation Charging connector Authentication
Wal	lbox	16 ., 32A with without	IP44, IP54 private Cable mounted without
Mal-	mounted charging unit	,, may manou	
- Tha	raina column		
stan	d-alone	4080A J with	IP44 public   Plug   with
<b></b>			
20			
Sate cent	e <b>llite system</b> ral unit + satellites	40 125A with	IP54 public Plug with
			ОК
The second secon			This icon allows a reactive pow er compensation unit to be
•			connected to a main or sub-distribution.
Capacitor			

Sapacitor Capacitor	•	e x	
Specify the rec	juired parameters inside the consume	er-circuit.	
	System configuration	TN-C I	
$\uparrow$	Type of switchgear	Circuit-breaker	
	Arrester type	None	
$\downarrow$	Type of connection	Cable/Line	
	Length [m]	3	
		Building transition	
	Arrester type	None	
	Type of switchgear Reactive power per stages [kvar]	25 <b>•</b>	
ŧ	Capacity modules	10	
	Modules switched on	6	
		Finish Cancel	
Dummy load			This icon can be used to define dummy loads and insert them in the netw ork diagram. They are used as a substitute model to map e.g. existing (sub-)netw orks, thus influencing the energy balance. In this circuit, no sw itchgear or cables/w ires are dimensioned.
🖫 Insert a c	lummy load	×	Because of the interrelation between nominal current and active
Add a dummy Specify the rec	<b>load</b> juired parameters inside the consume	r-circuit.	automatically leads to a corresponding adaptation of the value of
Ps	Nominal current [A] 100	•	
		[0,13.608,439]	
		Finish Cancel	
Overvoltage	protection		This icon can be used to insert surge arresters in the network diagram.
	are protection	x	
Arrester			
Specify the rec	uired parameters inside the arrester-		
I III	System configuration TN-S	i	
I I I I I I I I I I I I I I I I I I I	i ype of switchgear  Fuse with	Dase	
복			
		Einish Cancel	

## 5.2.2.4 Graphical editing of elements

2	<ul> <li>The "selection tool" can</li> <li>either be enabled on the tool bar or</li> <li>by disabling the icon selected in the library again, because in this case the selection tool is enabled automatically.</li> </ul>
Rotate counter-clockwiseRotate clockwiseCopyCopy elementCutRemove loadAdd favouriteProperties	<ul> <li>Besides using the edit options kept in the menu bar 19 and the tool bars in the Main window</li> <li>To Network design 19 you can also edit the elements using the context menu: place the mouse pointer on the element to be edited, and press the right mouse button.</li> <li>Using the context menu, it is possible to</li> <li>rotate complete parts of the netw ork diagram, i.e. system infeed, distribution boards and final circuits, counter-clockwise or clockwise, that is to set a different arrangement or alignment of the elements.</li> <li>to Copy, Cut and Paste complete elements of the netw ork diagram, i.e. system infeeds, distribution boards and final circuits. To do so, first select the corresponding element and then copy, cut or paste it via the context menu. After having cut or copied, you can call the context menu again at any other position in the netw ork diagram via the right mouse button, select Paste so that the element is selected for being placed (graphic "is hanging" at the mouse pointer) and then insert the element in the network diagram at the desired position by left-clicking at a suitable point (yellow rectangle).</li> <li>copy sub-elements of system infeeds, distribution boards and loads such as cables or certain sw itching devices, by selecting the sub-element can be inserted at any position in the network diagram and then inserting the sub-element by left-clicking at the desired position in the network diagram. The inserted element is additionally marked by a padlock symbol, i.e. it will not considered for automatic dimensioning.</li> <li>delete selected elements by selecting "Remove load" or "Remove sub-distribution board" or "Remove main distribution board", which are show n in the context menu depending on the type of element and "Add favourite" was selected, a window for entering a name and comment is opened. Favourites are automatically assigned to the group of system infeeds of sub-element and the element bia berdement).</li> <li>c Add a favourite. After an element and "Add fa</li></ul>
CB 1.18.2.3           Image: apple display="block">hit = 400 V           Spice           CL 1.18.2.3           Child Under display="block">Child Under display="block"/>Child Under di	Moving distributions w ithin the graphic: After having left-clicked a main or sub-distribution system, this distribution system is displayed in yellow w ith a blue frame and the mouse pointer turns into a drag icon. By keeping the left mouse button pressed, the distribution can now be moved as desired. Moving a selected distribution system is also possible directly in small steps using the arrow keys or, via the key combination Shift + arrow keys in larger steps.
LM4D <b>L 12</b> TN-5 Lh = 40 <sup>7</sup> 7 <sup>10</sup>	If two distributions are moved in such a way that they overlap each other graphically, this overlap is marked by a red-dotted line in order to point out that no electrical connection exists here.


# 5.3 Properties of circuits and equipment

#### Introduction to the properties and equipment dialogues

Each circuit in the network diagram, i.e. each system infeed, distribution and final circuit, is composed of several sub-elements. For each of these circuits as well as for each sub-element, the properties can be displayed when the corresponding selection has been made in the graphic:

- In the left part of the screen, below the Library and Hints section, the properties of the selected circuit are displayed and can in parts also be adapted there.
- When selecting a sub-element, its main properties are displayed below the circuit properties, and can in parts also be adapted there.
- By double-clicking a sub-element with the left mouse button or by calling the context menu via the right mouse button (→ Properties), it is moreover possible to open a new window with the equipment dialogue for the sub-element, displaying the detailed properties of this sub-element. In this dialogue, various settings can be made. These changes can be applied to all similar new elements by clicking the "As default" button. Defaults defined this way are saved beyond the program runtime and will therefore also be valid after a restart.

The equipment dialogues of the infeed and distribution equipment as well as of the overvoltage protection equipment each also provide the option to enable or disable automatic dimensioning of the selected equipment.

### Automatic dimensioning

By setting or removing the checkmark in this field, the selected sub-element can either be included in automatic dimensioning by the program or excluded from it. If the checkmark is removed, i.e. the element is excluded from automatic dimensioning, this is indicated in the equipment dialogue

and in the network diagram by a padlock symbol displayed next to the sub-element. How ever, this also means that for this element the properties set by the user will also remain if automatic dimensioning of the network is carried out.

In the following, the equipment dialogues and properties of the different operating elements will be described, showing the data which can be set in the respective dialogues.

### 5.3.1 Properties of circuits

Properties of circuits f	or infeed and distribution	
Properties Properties of circuit Circuit System configuration Simultaneity factor Separate protection	LVMD 1.1A.1   TN-5   1   1   without	<ul> <li>It is possible to change or select the</li> <li>designation</li> <li>system configuration</li> <li>simultaneity factor</li> <li>separate protection (only for feed-in circuits)</li> <li>target of dimensioning</li> <li>selectivity interval, if applicable.</li> </ul>
Target of dimensioning Selectivity interval As default	Backup protectior	

The **designation** assigned automatically and consecutively when the circuit is created (consecutive number and letter combination) can be changed as required.

In a selected infeed circuit, all 4 variants of the **system configuration** are provided for selection, i.e. it can be set whether the infeed circuit is to be created as TN-C, TN-S, IT or TT network. If there are several parallel infeeds, the system configuration selected for one of the infeed circuits will automatically be applied to all other existing and further added parallel infeeds.

For basic information about the different pow er system configurations, please refer to the section "Pow er Supply Systems, Connection to Earth" in the Technical Manual for the SIMARIS softw are tools, which you can access using the Help menu  $31 \rightarrow$  "Technical manual".

Depending on the selection in the infeed circuit, the system configuration options for distribution boards and final circuits will be restricted:

- Infeed circuit TN-S, IT or TT  $\rightarrow$  distribution boards will show the same system configuration as the infeed, which cannot be changed.
- Infeed circuit TN-C → TN-S or TN-C are possible as system configuration.

The info button linked to the "System configuration" field makes further information about this subject available, which is displayed in the next window.

The **simultaneity factor** is the ratio of maximum pow er required compared to installed capacity. It takes into account that often not all of the pow er consumers in a plant are operated simultaneously, and in case of simultaneous operation they are not alw ays operated under full load. The value range of this factor is to be set betw een 1 (= alw ays full load, i.e. 100 %) and 0 (= alw ays sw itched off). If the simultaneity factor is set to 0, the item of equipment will not be considered in automatic dimensioning and will therefore remain undimensioned.

In feed-in circuits of type 'neutral system infeed', or transformer or generator circuits, there is the option to protect parallel cables separately. These cables can either be determined by dimensioning or selected manually. A detailed description of how to create such protection and select it can be found in the section "Circuit properties for infeed circuits with separate protection of parallel cables".

As target of dimensioningBackup protection or Selectivity can be selected.

Backup protection means that the switching and protective devices that were automatically selected by SIMARIS design will protect themselves or will be protected by an upstream-connected switching device in case of a possible short circuit.

Selectivity means that current grading of the sw itching devices will be performed between the circuits during automatic dimensioning, current grading being applied from circuit to circuit. Selecting this setting does not necessarily result in a selective behaviour of the determined protective assemblies, since the behaviour of device combinations regarding selectivity can only be established by testing. In the professional version you can display information regarding the selectivity of the protective assemblies that were determined (see section View menu 21) and section Selectivity 13).

Clicking the info button opens a new window that contains further information on backup protection and selectivity.

The **Selectivity interval** can only be set if "Selectivity" has been set as the Target of dimensioning. From version 6.0 on, the default value is 1.0. Nevertheless, the user can set values between 1 and 3. It might be necessary to adapt this setting corresponding to the device combinations used and the short-circuit currents present in the configured network in order to allow for dimensioning. It might, for example, happen that when using fuse technology in combination with a large selectivity interval and low minimum short-circuit currents that suitable fuses cannot be determined to attain selective device tripping.

The "As default" button refers to the target of dimensioning and the selectivity interval. After a new project has been created, all the equipment added to the netw ork diagram is first created with the target of dimensioning "Backup protection". Though, if a circuit is selected and its target of dimensioning is set to "Selectivity" and the selectivity interval to 2, for example, and if the "As default" button is then pressed, all further equipment new ly inserted in the netw ork diagram will be created with these parameters. How ever, the equipment inserted before will keep its previous settings.

This can be changed by clicking the "Apply" button which also refers to the target of dimensioning and the selectivity interval, because this effects that the new settings made for an element will be applied to the entire network up to a possibly existing coupling.

More information about "Selectivity and Backup protection" can be found in the corresponding section in the Tedhnical Manual for the SIMARIS softw are tools, which you can access using the <u>Help menu</u>  $3h \rightarrow$  "Technical manual".

#### Circuit properties for infeed circuits with separate protection of parallel cables

<sup>50</sup> , Infeed: Tra	nsformer	a x
Add transfor	rmer juired parameters inside the infeed-circuit.	
ġ	System configuration TN-S	<u> </u>
↓	Type of switchgear Fuse with bas	e 💌
Ļ	Type of connection Cable/Line	<b></b>
	Busbar system Length [m]	<u> </u>
T T	Type of switchgear Fuse with bas	•
	Fir	ish Cancel

If you intend to equip the feed-in system using a netural system infeed, a transformer or generator with parallel cables and protect these cables separately, we recommend to do so immediately when creating the feed-in system by selecting the necessary switching devices, which are usually fuses, as 'Type of switchgear'.

Depending on whether you want to protect equipment separately at the beginning and end of a cable route, or merely at ist beginning, you must select this cable route at the beginning plue end or only at the beginning.

With couplings you cannot create separate protection of parallel cable routes.

Cables/wires       ✓         Designation       Instance dimensioning         Punctonal endurance       none         Conductor material       Cu         Conductor material       Cu         Conductor material       Cu         Conductor material       Cu         Cable designs       e.g. NYY, NCWY, NICY, NICY         Cable designs       e.g. NYY, NCWY, NICY, NICY         Type of cable       Single-core cable         Instalation type       B2         Reduction factor f tot       1         Temperatures [IC]       ΔU: 55; Ismin: 80         Cables per device       3         Number of runs       9         Unstale conductor [mm <sup>2</sup> ]       10         Cross section of PRN-conductors       Cross section of PRN-conductors         Cross section of PRN conductor [mm <sup>2</sup> ]       10         Cross section of PRN conductor [mm <sup>2</sup> ]       10         As default       CK	Splitting a cable route into several parallel cables may result from the dimensioning cycle of the netw ork diagram or be set manually. It is show n in the equipment dialogue in the "Number of cables" field and can also be set there. In this context it is also possible to select the number of cables per device, where the number of cables must be a multiple of the number of cables per device. Corresponding to the settings made at this point, protective devices are assigned to the cables. This means dependent on the number of cables determined or set and the number of cables per device, the number of protective devices required is established and assigned to the cables. This equipment dialogue can either be called up by double-clicking the cable route or by selecting the cable route and choosing → "Properties" from the context menu (right mouse button).
Properties         Properties of circuit         Circuit         Circuit         System configuration         TN-S         Simultaneity factor         1         Separate protection         without         upper         Target of dimensioning         Backup protectior         Selectivity interval         As default	As soon as you have selected the cable route of the feed-in system on the netw ork diagram, you can select seperate protection of parallel cables at the bottom left in the circuit properties. You can choose betw een seperate protection at the beginning of the cable route only, or at the beginning and end of the cable route.
Transformer 1.1.4.1 Sn = 1.500 kyA. dw = 6 Ss 200,4 k/Oxph5 2038264347001AA0 U/ +301 Lla.1a Prace with back Sn = 10 × 300 A 103 × 31443300 U/ +301 Lla.1 E80 U/ m C/L1 1.3.1 Catabiline E00 U/ +301 Lla.1b Prace with back E00 U/ +301 Lla.2b HI = 10 × 300 A HI = 10 × 10 × 10 × 10 × 10 × 10 × 10 × 10	<ul> <li>In analogy to the selection of separate protection made, the network diagram is displayed as follow s.</li> <li>The number of parallel cables can be selected in the equipment dialogue of the cable route, see description above.</li> <li>The number of sw itching devices is adapted to the number of cables accordingly, depneding on your selection.</li> <li>Attention: it is not possible to adapt separate protection by changing the number of sw itching devices, you must alw ays do so by changing the number of parallel cables.</li> <li>If "upper and low er" was selected, the sw itch labelling of the network diagram at the beginning and end of the cable route will be automatically matched to the number of parallel cables.</li> </ul>



Clicking the info button next to the "Separate protection" field, you can call up an information window, where

- schematic circuit diagrams are shown depicting the various options and
- a description is given as to which preconditions and assumptions make such a separate protection of parallel cables a reasonable and feasible solution.

### Separate protection



If there are two or more conductors connected with the same phase or terminal of an electric circuit (parallel connection), the allocation of the load current to the conductors has to be considered.

A consistent allocation can be expected, when parallel conductors

- are made from the same material
- have the same nominal cross section -
- have nearly the same length
- have no branching on the whole length of the circuit
- are enclosed in multi-core cables or in stranded single-core cables
- are enclosed in single-core cables trefoil or flat formation laid with a maximum cross section of 50mm<sup>2</sup> Cu or 70mm<sup>2</sup> Al or
- are enclosed in single-core cables trefoil or flat formation laid with a higher cross section than 50mm<sup>2</sup> Cu or 70mm<sup>2</sup> Al considering special installation parameters like a capable phase sequence and right arrangement of the different phase conductors.
- In case of an overload the current will be increased by the same proportion in all parallel conductors.

When these preconditions have been fulfilled it is possible to protect every parallel connected cable separately with a protective device from the same switch type and tripping unit. SIMARIS design requires that a separate cable protection complies with all these terms and conditions.

Basic information about the topic "Considering parallel cables in network calculations" can be found in the Technical Manual, which you can access using the <u>Help menu</u>  $3\uparrow$   $\rightarrow$  "Technical manual".

ОK

#### Properties of load circuits:

Properties of circuit       M 1.1A.1.1.2.8         Circuit       M 1.1A.1.1.2.8         System configuration       TN-S         Capacity factor       1         Quantity       1         Standard of MCB-selection       Icn (IEC 60898-1)         Target of dimensioning       Backup protec         Selectivity interval         As default       Apply	t is possible to change the system configuration, if applicable (in the case of a TN-C netw ork in the infeed circuit, see above) capacity factor quantity standard for MCB selection target of dimensioning selectivity interval, if applicable.

Information on the selection of the **system configuration** and **target of dimensioning** as well as on the possibly required setting of the **selectivity interval** can be found in the second last section (Circuit properties for infeed circuits and distribution circuits).

In the properties of the load circuit, the **capacity factor** is displayed instead of the simultaneity factor (which is used for infeed and distribution). By default, it is set to 1, but it can be set to values between 0 and 1. This factor defines the load under which the power consumers are generally operated (mostly no full load). The load current to considered in the upstream distribution will be reduced correspondingly.

Using the **"Quantity" field** the selected circuit can be duplicated any number of times and thus be factored into calculations accordingly. The multiplication is indicated by labelling the load with "3x", for example, in the network diagram. How ever, this multiplication of load circuits is **not**possible if these load circuits are connected to a busbar system, since such an installation is not possible ow ing to the lack of connection options for the tap-off units that w ould be required for such a solution.

Depending on the fact whether these electrical installations are accessible for ordinary persons or not, the selection of miniature circuit-breakers (MCBs) must follow different standards,

- for installations accessible by ordinary persons, IEC 60898,
- for installations inaccessible by ordinary persons, IEC 60947-2 is applicable.

You can make this selection in the load circuit properties depending on project requirements.

More information about this topic can be found in the section "Dimensioning the pow er system acc. to lcu or lcn" in the Technical Manual for the SIMARIS softw are tools, which you can access using the <u>Help menu</u>  $3^{2}$  "Technical manual".

# 5.3.2 Properties and equipment dialogue of medium-voltage switching devices

Properties of a medium-voltage switching device	
-Switch Designation MV-SD 1.1A.3 Switch type Switch-disconnector with fuses, MV	<ul> <li>It is possible to change the</li> <li>designation of the sw itch</li> <li>sw itch type.</li> </ul>
quipment dialogue of a medium-voltage switching devi	ce
Switch-disconnector with fuses, MV  Automatic dimensioning  Designation  MV-SD 1.1A.3  Nominal current switch [A] 200  Fuse  Catalog reference: SIB:3000613.25  In / Ia: 25 A / 63 kA  Utilization category: HHD  Catalog	<ul> <li>It is possible to change or define the</li> <li>designation</li> <li>primary rated current of the current transformers (if Circuit-breaker has been selected as Sw itch type).</li> <li>Moreover, the device established through automatic dimensioning can be replaced with a different device by selecting it in the catalogue.</li> </ul>
OK Cancel	<ul> <li>Regarding medium-voltage circuit breakers you can select either DMT (definite-time overcurrent protection) oer IDMT (inverse-time overcurrent protection) in the window "selectivity".</li> </ul>
Circuit-breaker of type L2  Automatic dimensioning  Designation MV-LS2 1.1A.3  Rated current [A] 630 Transformer type Standard current transformer  Primary rated current [A] 50  Secondary rated current [A] 1  Definite-time overcurrent-time relay  Catalog reference: 7S36101 Nominal current: 1A  Protective feature: DMT  OK Cancel	<ul> <li>For IDMT you can select the following characteristics:</li> <li>IEC inverse</li> <li>IEC very inverse</li> <li>IEC extreme inverse</li> <li>IEC long time inverse</li> </ul>

# 5.3.3 Properties and equipment dialogue of medium-voltage cables / wires

Properties of a med	lium-voltage connection		
Cable Designation M Length [m] 3	4V-C/L 1.1A.3		<ul><li>It is possible to change the</li><li>designation of the cable</li><li>length.</li></ul>
Equipment dialogue	of a medium-voltage connection		
Cables/wires  Designation Cable building type Cable type Cross-section conductor [mm²] Conductor arrangement Installation type Reduction factor f tot Length [m]  As default	X V Automatic dimensioning MV-C/L 1.1A.3 N2XS2Y XLPE-cable 35 Single-core row Air 1 3 OK Cancel	s possible to cha designation cable building t type of cable cross-section conductor arra Installation type reduction facto length.	ange or define the type conductor angement e or f tot

# 5.3.4 Properties and equipment dialogue of transformers

Properties of a transformer		
Transformer Designation Rated power Sn [kVA] Rated short-circuit voltage ukr [%]	Transformer 1.1A.1 400  4 4 4 4	It is possible to change the designation rated pow er rated short-circuit voltage.
Equipment dialogue of a transformer		
Transformer            Pesignation          Manufacturer          SIEMENS          Product / Type          GEAFOL         Vector group          Dyn5         Fan mounted          Rated power Sn [kVA]         630         Short-circuit voltage ukr [%]         6.6         No-load loss P0 [kW]         11	ti is possible f designation manufact product / vector gruph fan moun rated pow rated shop short-circ no-load load	to change the on urer type oup ted ver Sn vrt-circuit voltage ukr cuit losses Pk oss P0.
Transformer         Designation         Transformer 1.1B.1         Manufacturer         Any entry         Product / Type         GEAFOL         Vector group         Dyn5         Fan mounted         Rated power Sn [kVA]         Short-circuit losses Pk [kW]         S         No-load loss P0 [kW]         Later	By setting the for Siemens the enter user-spiranges. But the automatic dimensional symbol will the becomes clear automatic dimensional symbol will the becomes clear automatic dimensional symbol will the becomes clear automatic dimensional symbol will the become show the becomes clear automatic dimensional symbol will the become show the becomes clear automatic dimensional symbol will the become show the becomes clear automatic dimensional symbol will the become show the become show the become show the becomes clear automatic dimensional symbol will the become show the become show the becomes clear automatic dimensional symbols.	e "Manufacturer" field to "Any entry", the stored value selection ransformers is disabled. This means that it is now possible to pecific transformer data. The tooltip displays possible value his also means that this transformer is excluded from mensioning, i.e. the checkmark at "Automatic dimensioning" is eplaced by the padlock symbol I next to it. This padlock teen also be displayed on the netw ork diagram so that it also ar in the overview that this element will not be included in mensioning.

# 5.3.5 Properties and equipment dialogue of generators

Properties of a generator	
Generator         Designation       Generator 1.1B1         Apparent power Sn [kVA]       420	<ul> <li>It is possible to change the</li> <li>designation</li> <li>apparent pow er Sn.</li> </ul>
Equipment dialogue of a generator	
✓ Automatic dimensioning           Designation         Generator 1.181           Manufacturer         SIEMENS           Apparent power Sn [kVA]         420           cos (φ)         0,8           xd" [%]         8,8           r1 [%]         1,6           Ik1D [kA]         3,42           Ik3D [kA]         1,9	<ul> <li>It is possible to change or set the</li> <li>designation</li> <li>manufacturer</li> <li>apparent pow er Sn.</li> </ul> If "Siemens" has been selected as manufacturer, all further properties are only displayed and cannot be changed (input fields are grey), because these are standard values referring to Siemens products: <ul> <li>pow er factor cos(φ)</li> <li>subtransient reactance xd"</li> <li>resistance in the positive phase-sequence system r1</li> <li>single-pole continuous short-circuit current lk1D</li> <li>three-pole continuous short-circuit current lk3D.</li> </ul>
Generator       Image: Constraint of the state of the st	By setting the "Manufacturer" field to "Any entry", the stored value selection is disabled. This means that it is now possible to enter user-specific generator data. The tooltip displays possible value ranges. But this also means that this generator is excluded from automatic dimensioning, i.e. the checkmark at "Automatic dimensioning" is removed or replaced by the padlock symbol I next to it. This padlock symbol will then also be displayed on the netw ork diagram so that it also becomes clear in the overview that this element will not be included in automatic dimensioning.

## 5.3.6 Properties and equipment dialogue of neutral network infeeds

	na cquipment alar	yac of ficultal fictwork fiffeeds
Properties of a neutral netwo	ork infeed	
Network infeed Designation Network Rated current [A] 250	work infeed	ssible to change the signation ed current
Equipment dialogue of a neut	ral network infeed	
Network infeed: Impedances           Designation           Rated current [A]           Impedances           Positive-phase-sequence impedance Z1max [mΩ]           Loop impedance Zs max [mΩ]           Loop impedance Zs min [mΩ]           Ratios           Ratio R1max/X1 max           Ratio R1min/X1min           Ratio Rs max / Xs max           Ratio Rs min / Xs min	Network infeed         250       •         1       50         1       25         100       50         50       •         1       •         1       •         1       •         1       •         0K       Cancel	<ul> <li>Depending on how the neutral netw ork infeed has been defined, via impedances, loop impedances or short-circuit currents, the corresponding data is displayed in the equipment dialogue window.</li> <li>When defining a neutral netw ork infeed via impedances, it is possible to set the</li> <li>designation</li> <li>In = nominal current</li> <li>maximum positive phase-sequence impedance Z1max</li> <li>minimum positive phase-sequence impedance Z1min</li> <li>maximum loop impedance Zsmax</li> <li>minimum loop impedance Zsmax</li> <li>minimum loop impedance Zsmin</li> <li>ratio of maximum resistance in the positive phase-sequence system to maximum reactance in the positive phase-sequence system (R1 max / X1 max)</li> <li>ratio of minimum loop impedance to maximum loop reactance (Rs max / Xs max)</li> <li>ratio of minimum loop impedance to minimum loop reactance (Rs max / Xs max)</li> <li>ratio of minimum loop impedance to minimum loop reactance (Rs max / Xs max)</li> <li>ratio of minimum loop impedance to minimum loop reactance (Rs max / Xs max)</li> <li>ratio of minimum loop impedance to minimum loop reactance (Rs max / Xs max)</li> <li>ratio of minimum loop impedance to minimum loop reactance (Rs max / Xs max)</li> </ul>
Network infeed: Loop impedance         Designation         Rated current [A]         Loop         Loop impedance [mΩ]         φ [°]         Loop         Ratio RD/R1         Ratio Ikmax/Ikmin	Network infeed           250           50           10           7           4           1	<ul> <li>When defining a neutral netw ork infeed via loop impedances, it is possible to set the</li> <li>designation</li> <li>In = nominal current</li> <li>Zs = loop impedance</li> <li>φ = phase angle</li> <li>R0 / R1 = ratio of resistance in the zero phase-sequence system to resistance in the positive phase-sequence system</li> <li>X0 / X1 = ratio of reactance in the zero phase-sequence system to reactance in the positive phase-sequence system</li> <li>IX0 / X1 = ratio of maximum to minimum short-circuit current.</li> </ul>
	OK Cancel	The values to be entered must be determined by measurement.

🐫 Network infeed: Short-circuit curre	nts 🔀	When defining a neutral netw ork infeed via short-circuit currents, it is
Designation	Network infeed	possible to set the
Rated current [A]	250	designation
Short-circuit currents(cos(φ) = 0.7)		In = nominal current
Ik3max [A]	10.000	Ik3max = maximum three-pole short-circuit current
Ik3min [A]	10.000	Ik3min = minimum three-pole short-circuit current
Ikimax [A]	10.000	Ik1max = maximum single-pole short-circuit current
Ik1min [A]	10.000	Ik1min = minimum single-pole short-circuit current.
	OK Cancel	For the values to be entered please consult your pow er supply netw ork operator and ask them about local conditions. If values are not available, you can expect lkmin/max = 10 kA for a service entrance w ith 250 A supply (= value taken from practical experience).
	nts XI	In the Drafessianal version it is mersever possible to get the phase
Designation	Network infeed	andles
Rated current [A]	250 🗸	$\sim 3 \text{ max} = phase angle of the maximum three note short circuit$
- Short-circuit currents		- φ shax - phase angle of the maximum timee-pole short-circuit
Ik3max [A] 10.000	• φ3max [°] -45	$\alpha$ 3 min = nhase angle of the minimum three-nole short-circuit
Ik3min [A] 10.000	φ3min [°] -45	current
Ik1max [A] 10.000	φ1max [°] -45	$\phi$ 1max = phase angle of the maximum single-pole short-circuit
Ik1min [A] 10.000	φ1min [°] -45	current
		φ 1min = phase angle of the minimum single-pole short-circuit
		current,
		though the expanded value range must be enabled for that (in the
		Tools menu $\rightarrow$ Settings $\rightarrow$ Editor settings).
	OK Cancel	

# 5.3.7 Properties and equipment dialogue of low-voltage cables / wires

Properties of a cable / w	ire connection at the low-voltage sid	le
_ Connection		It is possible to change the
Designation	C/L 1.1B.2	designation of the connection
Type of connection	Cable / ine	<ul> <li>length of the connection</li> </ul>
		The "Dueber suptor" field and the respective info button
Length [m]	180	cannot be selected, because it is not a busbar connection
Busbar system		but a cable or wire.
Equipment dialogue of a	cable / wire connection on the low-v	roltage side
50 Cables/wires	a x	It is possible to set, select or change the
		<ul> <li>automatic dimensioning</li> </ul>
Designation	NS-K/L 1.1A.1	designation
Eunctional endurance	none	functional endurance
i uncuonal endurance		material for conductor
Conductor material	Cu	insulating material
Insulating material	PVC70	cable designs
Cable designs	e.g. NYY, NYCWY, NYCY, NYKY	type of cable
Type of cable	Multi-core cable or light-plastic sheathed cables	Installation type
Installation type		I tot = reduction racio permissible voltage drop along the connecting line
		temperatures for voltage drop and tripping condition
Reduction factor f tot		cables per device
Permissible voltage drop/section [%]	4	<ul> <li>number of cables</li> </ul>
Temperatures [°C]	ΔU: 55; Ikmin: 80	length of the connection
Cables per device		longest fire area
Cables per device		cross section of phase conductor
Number of runs		if applicable, reduced cross section of PE or PEN conductor
Length [m]		(depending on the selected system configuration).
Longest fire area [m]	0	
Cross section of phase conductor [mm <sup>2</sup> ]	10	
Cross section of N conductor [mm²]	10	Buttons next to the "Functional endurance and "Temperature" fields
Cross section of PE conductor [mm²]	10	open the respective windows for the selection of relevant data and settings
As default	OK Cancel	
		Via the info buttons next to the fields "Functional endurance", "Installation type", "Reduction factor", "Temperature for voltage drop" and "Temperature for disconnection condition", further information about these issues is available, which is then displayed in another window. Descriptions and views referring to this topic can be found in this section below.
Functional endurance		
Functional endurance	Class	In the window which is displayed when you click the button next to the "Functional endurance" field, you can select whether the corresponding cable is to be laid
© none	© E30	ignoring the functional endurance criterion
Ilame-proof enclosure	E60	with a flame-proof enclosure
○ integrated	© E90	<ul> <li>or as a cable with integrated functional endurance</li> </ul>
		In addition, the functional endurance category can be selected.

OK Cancel

#### Cabling/wiring system with functional endurance

Functional endurance is ensured if there is no short circuit and no current interruption in the cabling system during a fire test based on DIN 4102-12.

X

OK

The functional endurance classes E30, E60 and E90 are available for cabling/wiring systems.

#### Cables and wires with functional endurance

You can only select copper cables with EPR/XLPE insulation. Owing to the fact that heat dissipation is not affected, there are no special current carrying capacity values.

In addition, the temperature which corresponds to the selected functional endurance class will automatically be set for the longest fire area. It is derived from the standard temperature/time curve and used for calculating the voltage drop and the minimum fault current as tripping condition. This setting can also be adjusted manually. drop E30 E60 E90 E120

822°C 925°C 986°C 1029°C

#### Cables and wires in flame-proof enclosures

The current carrying capacity of such cables is similar to cables laid in hollow spaces. Owing to the reduced heat dissipation, installation type B2 is pre-selected. This setting can be adjusted manually.

In addition, a temperature of 150°C will automatically be set in the longest fire area for calculating the voltage drop and the minimum fault current as tripping condition. This setting can be adjusted manually.

Second Se 8 × Automatic dimensioning C/L 1.1A.1 Designation flame-proof enclosure, E60 i Functional endurance Cu • Conductor material PVC70 • Insulating material e.g. NYY, NYCWY, NYCY, NYKY • Cable designs Multi-core cable or light-plastic sheathed c Type of cable B2 i Installation type • 0,98 Reduction factor f tot • i 3.5 • Permissible voltage drop/section [%] ΔU: 65/400; Ikmin: 180/400 Temperatures [°C] 7 Number of runs • Length [m] 35 <u>A</u> 0 Longest fire area [m] 300 Cross section of phase conductor [mm<sup>2</sup>] • 300 • Cross section of N conductor [mm<sup>2</sup>] Cross section of PE conductor [mm<sup>2</sup>] 300 • As default ОК Cancel

You can call up more information about functional endurance using the info button next to the "Functional endurance" field.

Basic information about the functional endurance topic and its consideration in network design using SIMARIS software tools can be found in the Technical Manual, which you can access using the <u>Help menu</u>  $\exists \uparrow$   $\rightarrow$  "Technical manual".

As soon as you have made the selection as to "flame-proof enclosure" or "integrated functional endurance", the temperatures will be set to the recommended values. These values, how ever, can be called up clicking the "Temperatures" button and can be set manually, too, in the window which is then displayed.

If cables with integrated functional endurance were chosen (see above), only matching cable designs will then be available for selection in the "Cable type" field.

It is necessary for dimensioning to know the length of the longest fire area, since this value goes into the calculation as "the worst case". To this end, you must define the length of the longest fire

area in the appropriate data field, which is marked by 🗥 as long as the value "0" is show n there.





OK

Cancel

### **Reduction factor**

Veluee	
values Installation type	C
Insulating material	PVC70
Material for conductor	Cu
Type of cable	Multi-core cable or light-plastic sheathed cables
Factor ftot	1
To be defined by user	
Ambient temperature [°C]	30
Number of parallel cables	1
Image	Description
10 11111	~a a -
· ·	Single-layer on the wall or on the floor with c
Harmonics	Single-layer on the wall or on the floor with c
Harmonics     Harmonic content [%]	Image: Single-layer on the wall or on the floor with c       Image: Omega:

Adjusting the reduction factor based on the selected installation type is possible by clicking the Info button next to the "Reduction factor" field. In the window that is now displayed you can – besides adjusting the specification for the installation type – also enter data for the harmonic content, so that its impact on the reduction factor can then be taken into account in the calculation.

# 5.3.8 Properties and equipment dialogue of low-voltage busbar connections

Properties of a busbar	connection at the low-voltage side			
Connection		It is possible to change the		
Designation	B 1.1A.1.1	<ul> <li>designation of the busbar</li> <li>type of connection</li> </ul>		
Type of connection	Busbar 🗨	length of the connection through the busbar system		
Length [m]	60			
Busbar system	LDA I			
Equipment dialogue of a	a busbar connection at the low-voltage side			
Busbar connection         Designation         Functional endurance         Busbar system         Material for conductor         Mounting type         Degree of protection         Ie [A]         Busbar configuration         Reduction factor fitot:         Un-max [V]         Iz [A]         Icw [kA]         Permissible voltage drop/section [%]         Temperatures [°C]         Length [m]         Longest fire area [m]	<ul> <li>✓ Automatic dimensioning</li> <li>B 1.1A.1.1</li> <li>Flame-proof enclosure, E90</li> <li>BD2A</li> <li>I</li> <li>BD2A</li> <li>I</li> <li>BD2A</li> <li>I</li> <li>Al</li> <li>horizontal flat</li> <li>IP52</li> <li>I</li> <li>I60</li> <li>I</li> <li>I, L2, L3, N, ½PE</li> <li>I</li> <li>690</li> <li>100</li> <li>5,5</li> <li>I</li> <li>4</li> <li>✓</li> <li>L10</li> <li>I</li> <li>I00</li> <li>I</li> <li>O m</li> </ul>	<ul> <li>It is possible to set, select or change the</li> <li>designation</li> <li>functional endurance</li> <li>busbar system</li> <li>material for conductor</li> <li>mounting type</li> <li>degree of protection</li> <li>le = rated current</li> <li>busbar configuration</li> <li>f tot = reduction factor</li> <li>permissible voltage drop/connection</li> <li>temperatures for calculating the voltage drop and disconnect condition</li> <li>length of the connection through the busbar system</li> <li>longest fire area</li> </ul> Moreover, the values <ul> <li>Un max = maximum rated voltage</li> <li>Iz = permissible load</li> <li>lcw = rated short-time withstand current</li> </ul>		
	OK Cancel	The info buttons next to the "Functional endurance", "Busbar system" and "Reduction factor" fields allow further information about these topics to be called up and displayed in another w indow.		
Functional endurance		Having clicked the "Functional endurance" button, you can select in the window then		
Туре	Class	displayed, w hether the respective busbar line is to get a flame-proof enclosure or not.		
<ul> <li>none</li> <li>flame-proof enclosure</li> </ul>	⊚ E60 ○ E90	In addition, the fuantional endurance class w hich is required can be set here.		
OK       Cancel         OK       Cancel    Note: Functional endurance can only be factored in for busbar systems for pow er transmission in SIMARIS design, meaning on the BD2, LD and LX systems. If you have previously selected another busbar system the respective line, your selection will automatically be rejected and changed to a busbar system w hich meets the functional endurance classification.				

Busbar system with functional endurance         Functional endurance is ensured if there is no short circuit and no current interruption in the busbar trunking system during a fire test based on DIN 4102-12.         In line with the tests performed, flame-proof enclosures for busbar systems are available in functional endurance classes E60 and E90.	As soon as you have made the selection "flame-proof enclosure", the temperatures will be set to the recommended values. These values, how ever, can be called up clicking the "Temperatures" button and can be set manually in the window which opens after clicking this button. Using the info buttons next to the "Functional endurance" field, you can call up a brief explanation of this topic. Basic information about the functional endurance topic and its consideration in
SIMARIS design takes account of the reduced current carrying capacity of busbars in flame-proof enclosures as a result of a reduced heat dissipation by applying special current carrying capacity values.         In addition, a temperature of 400°C will automatically be set in the longest fire area for calculating the voltage drop and the minimum fault current as tripping condition. This setting can be adjusted manually.         OK	network design using SIMARIS software tools can be found in the Technical Manual, which you can access using the <u>Help menu</u> [3↑] → "Technical manual".
Factor ftot selection       ×         To be defined by user       Ambient temperature [°C]       35         Factor ftot       1         OK       Cancel	In the window of the "Reduction factor" info button, you can moreover set the ambient temperature which is to be included in the calculation of the reduction factor. This will be adapted automatically based on your specification and displayed in the same window. How ever, if you have selected a flame-proof enclosure for the busbar line, the reduction factor will be determined by the program and cannot be set manually any more.
Temperatures       Image: Constraint of the second se	In the window that is displayed, when the "Temperatures" button is clicked, you can set the temperature to be used for calculating the voltage drop as well as the temperature for the disconnection condition. If you have selected "functional endurance" for the busbar line, you can additionally select the temperature for the voltage drop and the disconnect condition which is to be assumed in case of fire.
Image: Second	<ul> <li>If a flame-proof enclosure w as selected in the "Functional endurance" field, an appropriate area must be selected in the "Longest fire area" field, since this value goes into the calculation as the "w orst case".</li> <li>The setting is made w ith the tw o sliders. In the tw o fields below the sliders,</li> <li>the beginning of the longest fire area referred to the beginning of the entire busbar line</li> <li>and the length of the longest fire area will be show n as values.</li> </ul>

<sup>50</sup> Longest fire area						8	×
<b>.</b>	200 m		<b>4</b> 7	60 m			
	(	1					-
		Longest fire a Begin (m) Length (m)	area 141,818 76,909				
					ОК	Cancel	

If two busbar lines are lined up in the network diagram, a common fire area may be defined for them, i.e. across the connecting point of the second busbar line.

## 5.3.9 Properties and equipment dialogue of low-voltage switching devices

Properties of a low-voltage switching device	
Switch Designation CB 1.1A.2a Switch type Circuit-breaker	<pre>It is possible to change the designation of the sw itch sw itch type.</pre>
Equipment dialogue of a low-voltage switching device	
Circuit-breaker, LV       Image: Automatic dimensioning         Designation       CB 1.1A.2a         Earth fault detection:       if required         Circuit-breaker       Image: Catalog reference:         Catalog reference:       3VL47401DC360AA0         In / Icu:       400 A / 55 kA         Protective feature:       LI         RCD       Catalog reference:         In / IAn      /	<ul> <li>It is possible to change or select the</li> <li>designation</li> <li>earth fault detection.</li> </ul> In the case of dimensioned devices and supplementary devices, this window also displays their order numbers and technical data. By clicking the "Catalog" button, a new window is opened, displaying further technical data of the dimensioned switching device. It is also possible to change the data displayed there and thus select a different switching device by clicking the "OK" button. Another way to change the suggested device, e.g. to a device from a different product group, is the selection via the product groups tree displayed in the left part of the catalogue window. A device selected in this way must then be specified with technical data via the attributes displayed on the right and can finally be applied by clicking the "OK" button.
Code number: 70.47402DC266A457  Code number: 70.47402DC266A457  Code number: 70.47402DC266A457  Code number: 70.47402DC266A457  Code number: 70.47402DC266A45  Code number: 70.47402DC266	<ul> <li>General handling of a catalogue:</li> <li>In the left part of the window you can select the required switching device type within the product groups, which you can then specify with the help of the attributes displayed to the right and apply to your network diagram by clicking the "OK" button.</li> <li>Another option is to search specifically for a particular device by entering the body of or the entire order number in the search field at the top left. If searching with an order number body, the corresponding branch of the product tree is activated and the suitable attributes are displayed on the right and are already selected as far as possible according to the order number body.</li> <li>Furthermore, the catalogue provides the option to save frequently used switching devices as favourites to be able to quickly add them to a network diagram later.</li> </ul>

# 5.3.10 Properties and equipment dialogue of equivalent electric circuits

Properties of an equivalent electric circuit (impedance)

There are no properties displayed for such circuits.

Equipment dialogue of an equivalent electric circuit (impedance)

Sequival Equival	ent electric circuit (	impedance)	It is possible to change the
	Designation	Z 1.1B.1.4.2	designation
Ľ	Z1 Z0 N-conductor Z0 PE(N)-conductor	R1 [mΩ]         100         X1 [mΩ]         100           R0 [mΩ]         100         X0 [mΩ]         100           R0 [mΩ]         100         X0 [mΩ]         100           Γ         Impedances voltage drop relevant         Impedances         Impedances	<ul> <li>zero or positive phase-sequence system of the phases, N and PE(N) conductors</li> <li>specification w hether the voltage drop across the equivalent impedance is relevant for the overall calculation</li> <li>specification w hether the equivalent impedance is relevant for a short-circuit.</li> </ul>
		✓ Impedances short-circuit relevant           ✓ Impedances short-circuit relevant           OK         Cancel	Formula symbols used: R0 = resistance in the zero phase-sequence system R1 = resistance in the positive phase-sequence system X0 = reactance in the zero phase-sequence system X1 = reactance in the positive phase-sequence system Z0 = impedance of the zero phase-sequence system Z1 = impedance of the positive phase-sequence system

## 5.3.11 Properties and equipment dialogue of a stationary load

y load	
L 1.1B.2.1 180 99,766 Inner zone	<ul> <li>It is possible to change the</li> <li>designation</li> <li>rated current</li> <li>active pow er</li> <li>place of installation.</li> </ul>
stationary load	It is possible to change or set the
1.18.27         3+N         1-L2-L3-N         180         99,766         0,8         400         1         1         Technetice	<ul> <li>designation</li> <li>number of poles (type of netw ork) and thus the phases or vice versa</li> <li>In = nominal current</li> <li>P = active pow er, electric.</li> <li>cos(φ) = pow er factor</li> <li>Un = nominal voltage</li> <li>ai = capacity factor</li> <li>type of load, ind./cap.</li> <li>place of installation.</li> </ul>
	y load L 1.1B.2.1 180 99,766 Inner zone stationary load

### Explanation:

-

Cancel

The capacity factor ai describes the load share w hich is taken into account in the energy balance of the netw ork. The protective device and the cable/busbar are rated for nominal current, how ever, upstream devices/cables/busbars... transformers only taking account of this factor. This means that the capacity factor correlates with the simultaneity factor referred to the load. If a capacity factor (ai) is selected for the loads and a simultaneity factor (gi) at distribution board level, these factors are multiplied in the energy report.

## 5.3.12 Properties and equipment dialogue of motors

OK

Place of installation

As default

Inner zone

+

Properties of a mo	tor			
_ Motor			It is possible to change or set the	
Designation	M 1.1B.1.4.1		designation	
Motor type	Motor starter combination	-	<ul> <li>motor type</li> <li>type of construction, if applicable</li> </ul>	
Type of construction	Fuseless	-	starting mode, if applicable	
Starting mode	Direct-on-line starter	-	Pmech = mechanical pow er	
Power mech [kW]	18,5	-		
_ Motor				
Designation	M 1.1B.1.4.1			
Motor type	Motor starter combination	-		
Type of construction	Fuseless	-		
Starting mode	Direct-on-line starter	-		
Power mech [kW]	18,5	-		
L				

#### Equipment dialogues of motors

Motor	_		×		
Designation	M 1.1B.1.4.1				
Motor type	Simple motor protecti	Simple motor protection			
Type of construction			Ţ		
Starting mode			<b>v</b>		
Type of co-ordination			✓ i		
Overload relay			7		
Power mech [kW]	18,5 💌	Nominal voltage [V]	400 💌		
Nominal current [A]	37,087 🔹				
cos (φ)	0,8 💌	Efficiency η	0,9 💌		
Starting current ratio	5 🗸	R/X ratio	0,42 💌		
Startup class	Class 10 💌	i			
Capacity factor ai		1			
Factor of energetic reco	very system	1			
As default		ОК	Cancel		

Designation	M 1.1B.1.4.1		
Motor type	Motor starter combina	ation	•
ype of construction	Fuseless		-
Starting mode	Direct-on-line starter		•
Type of co-ordination	Type 1		<b>→</b> i
Overload relay	none		▼
Power mech [kW]	18,5 🗸	Nominal voltage [V]	400 💌
Nominal current [A]	35,549 💌		
tos (φ)	0,83 💌	Efficiency η	0,905 💌
Starting current ratio	5 🗸	R/X ratio	0,42 💌
Startup class	Class 10 -	i	
Capacity factor ai		1	
=actor of energetic reco	very system	1	
L L C M			
As default		OK	Cancel
R Info start	up class		×
Startup class a	up class	0047-4-1	×
Startup class a	up class	0947-4-1	×
Startup class a	up class ccording to IEC 6 Normal startu;	0947-4-1 o time up to 10 sec	×
Startup class a Class 10 Class 20	up class ccording to IEC 6 Normal startup Startup time u	0947-4-1 o time up to 10 sec up to 20 sec in heavy-o	duty
Startup class a Class 10 Class 20 environments Class 30	up class ccording to IEC 6 Normal startup Startup time u Startup time u	0947-4-1 o time up to 10 sec up to 20 sec in heavy-o up to 30 sec in heavy-o	Juty duty

Depending on the type of motor, the setting options differ; see examples on the left.

It is possible to change or set the

- designation
- motor type
- type of construction
- starting mode
- type of co-ordination
- overload relay
- Pmech = active pow er, mechanical
- Un = nominal voltage
- In = nominal current
- cos(φ) = pow er factor
- η = efficiency
- starting current ratio
- R/X ratio = resistance / reactance
- startup class
- capacity factor ai
- factor of energetic recovery system.

The info button linked to the "Type of co-ordination" field, makes further information about this subject available and displays it in another window. This information can also be found in the section Adding final circuits <sup>64</sup> which describes, among other things, how to add motors to the network diagram.

#### Explanation:

The capacity factor ai describes the load share which is taken into account in the energy balance of the network. The protective device and the cable/busbar are rated for nominal current, how ever, upstream devices/cables/busbars... transformers only taking account of this factor. This means that the capacity factor correlates with the simultaneity factor referred to the load.

If a capacity factor (ai) is selected for the loads and a simultaneity factor (gi) at distribution board level, these factors are multiplied in the energy report.

Via the info button next to the "Startup class" field, further information about this issue is available and displayed in another window.

# 5.3.13 Properties and equipment dialogue of frequency converters

Properties of a frequency converter

Properties Properties of circuit Circuit System configuration Capacity factor Quantity	FC 1.1B.4     TN-S   i     1	It is possible to change or set the Capacity factor Quantity Target of dimensioning Selectivity interval, if applicable Designation
Target of dimensioning Selectivity interval As default	Backup protection	
Frequency converter Designation FC 1.1B.4		

		X	
stallation type	© Cabinet		It is possible to change or set the Installation type
Properties of circuit		*	
Upper switching device		*	Performance
Primary connection		*	
Protective device frequency converter		*	
Frequency converter parameters		*	
	Automatic dimensioning		
Jesignation	FC 1.18.4		
lse lerformance	Moving Basic		
MC provision	No requirement	- j	
Dverload profile			
Frequency converter			
Catalog reference: 6SL32101PE233UL0			
In (LO) / Iq 32 A / 65 kA			
Size FSC		Catalog	
Frequency converter Type G120			
Secondary connection		×	
Secondary connection		¥	
(Motor		Ŷ	
	ОК	Cancel	

# 5.3.14 Properties and equipment dialogue of switching devices of motor starter combinations

Properties of an u	pper switching device in a motor starter o	combination
Switch Designation Switch type	MC-CB-DS 1.1B.1.4.1a Motor starter combination	<ul> <li>It is possible to change or select the</li> <li>designation</li> <li>sw itch type.</li> </ul>
Equipment dialogu	ue of an upper switching device of a motor         ubination       X         C-CB-DS 1.1B.1.4.1a       •         e combination which can not be modified.       •	starter combination         It is possible to change the         designation         Since motor starter combinations are type-tested device combinations w hich must not be changed, the technical data of the dimensioned sw itching devices are only displayed.         In contrast to other equipment dialogues for sw itching devices, therefore only the combination's designation can be changed in this equipment dialogue once it has been selected and dimensioned (direct on-line starter, reversing mode, star-delta starter or soft starter). It is not possible to call up a catalog to change the selected devices.

## 5.3.15 Properties and equipment dialogue of charging units

Properties of a charging unit					
Charging unit Designation Nominal current of connector [A]	CU 1.1A.1.1.6 32 Overvoltage proteined	It is possible to change/specify the         designation         nominal current of connector In.			
Equipment dialogue for a charging unit					
Charging unit         Designation         Type of charging unit         Integrated protection         Number of poles (type of network)         Phases         Nominal current of connector [A]         cos (φ)         Capacity factor ai         Type of load, ind./cap.         Place of installation	CU1.1A.1.1.6         wallbox         with integrated protection         3+N         L1-L2-L3-N         32         1         Capacitive         private		<ul> <li>It is possible to change or set the</li> <li>designation</li> <li>charging unit type</li> <li>selection w. or w/o integrated protection</li> <li>number of poles</li> <li>phases</li> <li>nominal current of connector In</li> <li>pow er factor cos(φ)</li> <li>capacity factor ai</li> <li>inductive/capacitive load</li> <li>place of installation.</li> </ul>		

## **5.3.16 Properties and equipment dialogue of capacitors**

### Properties of a capacitor

Capacitor Designation Reactive power per stages [k Capacity modules Modules switched on	C 1.1A.2 [25] [10] [6]	It is po de re nu m	ossible to change/specify the esignation active pow er per stage (=module) umber of capacity modules odules sw itched on.
Equipment dialogue of a	a capacitor	× × × ×	It is possible to change or set the designation Q = reactive pow er per stage number of capacity modules modules sw itched on Un = nominal voltage nominal frequency pow er loss.

## 5.3.17 Properties and equipment dialogue of dummy loads

Properties of a d	ummy load		
Load Designation Rated current Active power	DL 1.1A.3.1 [A] 300 [kW] 166,277	•	It is possible to change the designation In = nominal current P = active pow er, electric.
Equipment dialog	jue of a dummy load		
Pummy load         Designation         Nominal current [A]         Active power [kW]         cos (φ)         Type of load, ind./cap.	DL 1.1A.3.1 300 166,277 0,8 Inductive	Equipm It is poss desig in = 1 P = a cos( type	nent dialogue of a dummy load sible to change or set the signation nominal current active pow er, electric. $g(\phi) = pow er factor$ e of load, ind./cap.
cos (φ) Type of load, ind./cap. As default	0,8 Inductive OK	Cancel	r(φ) = pow er factor e of load, ind./cap.

# 5.3.18 Properties and equipment dialogue of lightning current and overvoltage protection devices

Properties of a lightning current and overvoltage protection device				
Arrester         Designation Fuse       FSO 1.1A.1.2a2         Switch type       Fuse with base         Designation       LCA 1.1A.1.2a         Arrester type       Standard	It is possible to change the designationfuse switch type arrester name arrester type			
Environment dialegue of elightning surrent and everyelters protection device				

Equipment dialogue of alightning current and overvoltage protection device



## 5.4 Dimensioning and message list

## 5.4.1 Introduction

Having selected and placed the elements required for the project to be planned on the network diagram, you can start dimensioning. To be able to run a dimensioning process, it is first of all necessary to define the operating modes for the network, because all sw itching and protective devices with pow er sources contained in the circuits as well as all couplings are considered open directly after their creation, and therefore a current flow through the equipment is not possible. Only after the user has set the status of the individual sw itching and protective devices depending on the operating mode in such a way that a current flow is possible, calculations, dimensioning and testing will be possible in SIMARIS design.

The operating modes can be defined

- either directly via the either
- or by starting dimensioning of the entire netw ork via the 🔛 icon, because this also starts the dialogue for defining the operating modes.
  - To dimension single circuits or subnetworks, it is not only necessary to select the corresponding elements in the network diagram but

also to define the operating modes via the icon in advance, because these icons only become active when the operating modes have been defined, i.e. a current flow through the elements is possible. These icons will, of course, also be active after dimensioning of the entire network has been completed, because this also included the definition of the operating modes.

## 5.4.2 Dialogue of the operating modes



	<ul> <li>The "Operating modes" dialogue show s all settable sw itching devices of the project, w hich are all open at first. You can now change the states of the infeed circuits and couplings here, i.e. define the sw itch positions required for the respective operating mode. This means that the sw itches show n in the Operating modes dialogue are used to connect or disconnect circuits depending on the operating mode.</li> <li>Operating modes can be activated / deactivated in order to show calculation results of the separate operation modes. Caution:When starting the automatic dimensioning, only activated operating modes are taken into account.</li> <li>In the professional version, sub-distribution systems can be sw itched, too, provided that they are additionally supplied by a directed coupling.</li> <li>All other circuits are considered as alw ays closed.</li> <li>Starting from the first operating modes dialogue so that a copy of the respective operating mode is created, for w hich you can then define a new designation and make sw itch settings that differ from the operating mode w hich was defined first.</li> <li>More operating modes can be defined that way.</li> <li>By clicking the "Delete" button, the respective operating mode is deleted from the dialogue.</li> <li>Non-permissible combinations of sw itch positions are signalled by red error messages, e.g. Switch state not supported!</li> </ul>
NSHV 1.1A	<ul> <li>Notes:</li> <li>As every operating mode is evaluated during calculation, the calculation w orkload increases w ith the number of defined sw itching states. You should therefore take care that no identical operating modes are defined. The program does not check w hether identical operating modes have been created.</li> <li>If there are tw o sw itches in a circuit (upstream and dow nstream of the cable/busbar), the dialogue displays only one sw itch; as a series connection is given here, it is irrelevant for the calculation w hich of the tw o sw itches is open.</li> <li>Complex netw orks designed w ith SIMARIS design professional may possibly lead to the problem that some cross connections of couplings cannot be displayed graphically in the dialogue any more. In this case, connections are symbolised by tw o triangles/arrow s w hich are marked w ith an identical number. The arrow s indicate the direction of current flow .</li> </ul>

## 5.4.3 Dimensioning

	The prerequisite for dimensioning equipment is
	a current flow in at least one operating mode
☑ Automatic dimensioning	and the selected option "Automatic dimensioning" for the equipment to be dimensioned.
	Equipment marked by the padlock symbol will not be considered for automatic dimensioning; also see the explanation in the section <u>Properties of circuits and equipment</u> [73] of the equipment dialogues.
	There are three buttons for the automatic dimensioning of the following items of equipment: transformers, generators, switching and protective devices, cables and busbars.
	By clicking the "Dimension all circuits" icon, dimensioning of the entire created netw ork is started. If no operating modes have been defined yet, this can be done within the scope of dimensioning because the Operating modes dialogue is started automatically at the beginning of the dimensioning process. The dimensioning result can not only be the determination of the required data but also messages indicating various problems during the dimensioning process, w hich will be explained in the follow ing section.
	By clicking the "Dimension circuit" icon, the circuit currently selected in the network diagram is dimensioned.
<b>₽</b> 2	By clicking the "Dimension selected sub-netw ork" icon, the circuit currently selected in the netw ork diagram and all dow nstream circuits are dimensioned, except for directed couplings.
Note on the dimensioning of busbar systems	<ul> <li>Busbar systems are tested for thermal short-circuit strength and overload protection. Dynamic short-circuit strength is present if both attributes are fulfilled (see IEC 60364-4-43 Clause 434). Dynamic short-circuit strength is not tested.</li> <li>For a "Note on the dimensioning of 8PS busbar systems", please refer to the corresponding section of the Technical Manual for the SIMARIS softw are tools which you can access using the Help menu 31 → "Technical manual".</li> </ul>
dimensioning of pow er transmission and pow er distribution lines	For an "Overview of pow er transmission and pow er distribution lines", please refer to the corresponding section of of the Technical Manual for the SIMARIS softw are tools which you can access using the <u>Help menu</u> $\exists \uparrow \rightarrow$ "Technical manual".
Calculation standards	The "Standards for calculations in SIMARIS design" are listed in the corresponding section in the Technical Manual for the SIMARIS software tools which you can access using the Help menu $3^{+}$ "Technical manual".
Additional protection by RCDsin accordance with DIN V DE 0100-410 (IEC 60364-4-41)	Explanations on the "Additional protection by RRCDs"in accordance with DIN VDE 0100-410 (IEC 60364-4-41) and national deviations from this standard can be found in the corresponding chapter of the Technical Manual for the SIMARIS planning tools which you can access using the <u>Help menu</u> $\boxed{3}$ $\rightarrow$ "Technical manual".

## 5.4.4 Message list

Dimensioning can produce four types of status messages displayed in the message list below the network diagram; essential characteristics of these messages have already been described in the section Message list 47 (Network design user interface  $\rightarrow$  Message list).

Status	Element	Message
8	M 1.1A.1.1.2.6	Overload protection not fulfilled. Ibs = 11.396A > Iz = 11.1A
8	M 1.1A.1.1.2.6	Overload protection not fulfilled. Iz = $11.1A < I2/1.45 = 11.4A$
8	M 1.1A.1.1.2.6	Overload protection not fulfilled. Iz = 11.1A < IR = 11.4A
Δ	LVSD 1.1C.1.2.1	Required number of contacts = 4 is higher than number of contacts = 3 of the selected device.
1	Network 1.1	The dimensioned medium-voltage devices have to be checked for permitted use in the appropriate switchboard.

?	Circuits are contained in the projects which were not or cannot be checked (e.g. unloaded circuits).
8	There are errors in the project.
~	All circuits were checked and there are no faulty circuits. Warnings, notes and dimensioning errors are not separately recorded and associated to this node.
Primar If there If there How e list itse	ily, the icon for circuits w hich w ere not or cannot be checked w ill be displayed here. e are no such circuits, the "error" icon w ill be displayed. e are no errors either, the netw ork diagram w ill be classified as OK w ith a green checkmark. ver, possibly existing w arnings, info messages and dimensioning errors w ill be ignored. This means they must be checked in the elf and follow ed up and/or corrected by appropriate action in the configuration itself.
In the list itse	elf, the follow ing icons are displayed which indicate the kind or status of the problem or error involved:
?	General messages and information is displayed if circuits are contained in the projects which were not or cannot be checked (e.g. unloaded circuits).
8	Error messages result in the abortion of the calculation/dimensioning process. This means these errors must be corrected by changing the arrangement of elements or by changing property settings (on the left of the network diagram) or in the equipmenet dialogue of the respective element in such a way that dimensioning is then possible.
Δ	Warning messages indicate that default settings or standards have not been observed. This means that a dimensioning run was performed, but it must be ensured that the additional requirements as detailed in the existing warning messages are met. Therefore, the user should solve the existing problems by changing the configuration or the settings.
٠	Dimensioning errors indicate an unsuccessful dimensioning process. Here, it is also necessary to change the configuration and the settings to make dimensioning possible. The reason for such dimensioning errors may as well be the error messages listed, for example, if the transformer capacity is not sufficient, or a suitable switching device was not found.
i	Information messages contain general information or hints on the elements and thus support the user in checking his configuration, e.g. with regard to completeness.

Apart from the icon w hich indicates the status of the message, the

- designation of the respective element
- and the message text

are displayed.

When a message is selected in the message list, the graphic of the netw ork diagram focuses on this element and it is pre-selected.



If several messages exist for one element, they are highlighted in grey in the message list as soon as one of these messages or the element in the network diagram has been selected.

Double-clicking on the message opens the equipment dialogue of the respective element for a fast correction of the faulty state.

# 6 Output and Data Transfer

# 6.1 Output types and options

# 6.1.1 General information

Documentation types			To p	repare the output, <b>select</b> the output types which you require for imentation of your project in the list at the top left.
	Project documenta	tion	The resp	follow ing section of this Help will explain the contents of the ective output types in more detail.
	Device list, sorted b	by distribution		
	Device settings			
	List of busbars			
	List of cables			
	Short-circuit curren	its		
	Selectivity documer	ntation		
	Network diagram (F	PDF)		
	Network diagram (D	DWG/DXF)		
	SIMARIS exchange	file (SX)		
-Output op	otions		Som	e output types allow further individual settings to be made in the
			be fo	ut options. A description of these individual setting options can bund in the follow ing sections in the context of the output type
	Paper size:	A4 💌	desc	ription.
	Logo:	D:\Program file		
	Cables:	Metric		
:=	Paper size PDF:	Original		
	include symbols:	â 🔎		
	Current View			
	C Current View			
	C Current View			


# 6.1.2 Output types

#### Output of a project documentation

Denn, (BHAR B., design, 50 SBRARIS vola	SIEMENS Project documentation oreated with SIMARIS design professional	<ul> <li>When the output type "Project documentation" is selected, it is possible to select</li> <li>the paper size (A4 or Letter)</li> <li>the integration of a company logo (.png, .jpg or .jpeg format).</li> <li>the type of cable data specification (Metric or AWG/ kcmil).</li> </ul>
Macher data	Version (6.02 (06-08-2010) Subrevicion: 1686 © SIEMENIS AG 2008. All rightsre œrved. http://www.siemen.scom/dmaris	<ul> <li>This output type comprises</li> <li>a cover sheet stating the master data, customer data and comment on the project</li> <li>an overview of the general presettings and network</li> </ul>
Projectname :	Demo_SMARIS_design_90	parameters as well as those made for medium and low
Projectides clip ion:	Demoprojeci	voltage
Billor:	SMARB design user	a graphical representation of the network operating
Planning office :	SIEMENS	modes defined for the network calculation as well as for
Crealed al:	Thursday, 1. March 2007	dimensioning
Changed al:	Friday, 13, Augus I 2010	a device list subdivided in the categories
Customer data		<ul> <li>pow er sources</li> <li>multiple (kingen</li> </ul>
CIIy:	L.E.	
Cus bmer:	SMARE kols	<ul> <li>– connections and busbar trunking systems</li> </ul>
Comment		<ul> <li>equivalent impedances</li> <li>Loads</li> <li>These categories are each further subdivided according to the device types included in the project and appertaining to the respective category.</li> <li>a list of the used formula symbols with explanations</li> </ul>
ins simple ne work was c	reak u io usindhisifak sone 's aktes on SikARISidesigh S	<ul> <li>a list of the standards used for the calculation.</li> <li>The complete document is output in a modifiable .rtf format and automatically opens your installed w ord processing program. The file generated in this w ay can then be saved; this can also be done in the Word format (.doc) w hich considerably decreases the file volume.</li> </ul>

Output of a device list, sorted by distribution		
CLIBBUD         CLIBBUD         CLIBBUD           AMC 11         CLIBBUD         CLIBBUT           VAND 118         SERVE-203.         SERVE-203.           VAND 11A         SAVETINCES         SAVETINCES           VAND 11B         SAVETINCES         SAVETINCES           VAND 11B	All Type Database Construction of the advance of th	<ul> <li>This output type generates a table listing all dimensioned sw itching devices as well as transformers and generators and for these the follow ing information:</li> <li>designation of the distribution board (from the network diagram) to which the item of equipment is assigned</li> <li>Order number</li> <li>details on the device type</li> <li>required quantity.</li> <li>required quantity</li> </ul>
USD 118.1 34_52301A601 USD 118.1 344530 USD 118.1 344430 USD 118.1 344401FA10 USD 118.1 34271610E33 USD 118.2 34270810C33	Seldth-disconcert with luce 1 Pice with base 1 Croat-trade 3 DMAD Non-automatic CB 1 Croat-trader 1 DMAD Chout-breaker 1	The list is created in .csv format and automatically opened with a program suitable for displaying, e.g. Microsoft Excel.

Output of device settings	
Contraction 2004 (Model)         PIR         PIR         Contraction 3004         Long 100         Long 10	<ul> <li>This form of data output creates a list of medium-voltage protective devices and a list of low -voltage protective devices in w hich all relevant settings of those devices included in the netw ork diagram are listed.</li> <li>The list contains the follow ing information:</li> <li>designation from the netw ork diagram</li> <li>Order number</li> <li>Settings relevant to the respective device type</li> </ul>

The list is created in csy format and automatically opened with a program suitable for displaying e.g.
Microsoft Excel.

#### Output of a list of busbars Designation Catalog refer Length [m] LV-B 1.1A.1 LDC2423 15 LV-B 1.1A.2 LDC2423 13 B 1.1A.1 LDC2423 60 B 1.1A.1 LDC2623 35 B 1.1A.2 LDC2623 15 This output type generates a table listing all dimensioned busbar systems and for these the following information: Designation taken from the netw ork diagram order number (only body!) B 1.1A.3 B 1.1A.2 BD2C-3-315 BD2C-3-400 10 length in m 8 The list is created in .csv format and automatically opened with a program suitable for data display, e.g. Microsoft Excel.

Output of a list of cables	
$\label{eq:constraints} \hline \begin{array}{ c c c c c c c c c c c c c c c c c c c$	When the output type "List of cables" is selected, it is possible to select the type of cable data specification (Metric or AWG/kcmil).
	<ul> <li>This output type generates a table listing all dimensioned cables and for these the follow ing information:</li> <li>Designation taken from the netw ork diagram</li> <li>cross section in mm<sup>2</sup> or aw g/kcmil</li> <li>type of cable</li> <li>length in m</li> <li>quantity</li> </ul>

Output of short-circuit currents	
	This output type generates a table listing <ul> <li>the relevant short-circuit currents</li> <li>respective phase angles</li> <li>impedances</li> <li>reactances</li> <li>loop impedances</li> <li>for all dimensioned items of equipment.</li> </ul> The list is created in .csv format and automatically opened with a program suitable for data display, e.g. Microsoft Excel.

Output of selectivity	
	<ul> <li>When the output type "Selectivity documentation" is selected, it is possible to select</li> <li>the paper size (A4 or Letter)</li> <li>the integration of a company logo (.png, .jpg or .jpeg format).</li> </ul>
	With this output type, a data sheet is generated for each configured and dimensioned switching device, as far as possible, containing
ann na daoga milleofa angaranana kitarika	<ul> <li>the designation of the circuit to which the device belongs</li> <li>the designation of the device in the netw ork diagram</li> <li>the selectivity evaluation (fully selective, partially selective) → only with SIMARIS design professional</li> <li>the sw itch settings</li> </ul>
	a chart with the tripping characteristic of the respective sw itching device with the tolerance bands the envelope curves of the upstream and dow nstream protective devices the specification lkmin and lkmax
	the selectivity limits → only with SIMARIS design professional The last page of this output shows the disclaimer, wherein the devices which were not considered within the selectivity evaluation are listed.
	The selectivity document is output in a modifiable rtf format and automatically opens your installed w ord processing program. The thus created file can then be saved; this can also be done in the Word format (.doc) w hich considerably decreases the file volume. Depending on the printer w hich is available, the document may be output in colours or black&w hite. The corresponding setting options can be found in the Tools menu $\rightarrow$ Settings $\rightarrow$ Selectivity Settings $\rightarrow$ I-t diagram printer colours.

Output of a network diagram (PDF)	
	<ul> <li>When the output type "Netw ork diagram (PDF)" is selected, it is possible to select</li> <li>the paper size of the .pdf</li> <li>the representation of the padlock and key symbols</li> <li>the changeover to the output of all views (not only the currently displayed view).</li> </ul> For the selection of the paper size of the .pdf, the selected original size (format selected for the netw ork diagram) as well as the formats A4 landscape and portrait, A3 landscape and portrait, A2 landscape, A1 landscape and A0 landscape are provided for selection. If a smaller/different format than the set original format is selected, the netw ork diagram is spread over several pages which add up to the overall graphic again when being properly apposed. If necessary, a .pdf created in original size can also be spread over several pages when being printed out so that the overall graphic can be displayed with a sufficient font size by apposing the individual pages. This data output generates a .pdf file which contains the entire netw ork diagram. By changing the netw ork diagram view it is possible to generate netw ork images with different technical data, or by selection the "All wiews" and the output of all possible views (data output section to contain the output of all possible views (data output section).
	Solution of the view of option to generate the entirely of an possible view of (standard view of and the view of defined using the <u>Tools menu</u> <sup>2</sup> B → "Settings" → "Configurable Network Diagram Output"). By additionally activating the "Selectivity" icon when the .pdf file is generated, the markings displayed in the graphics in green and yellow (only in the professional version) of the fully and partially selective elements will also be output, i.e. they will be visible in the PDF. To display the created .pdf file, a suitable program must be installed which will then be started automatically.

# Output of a network diagram (DWG/DXF) This output option allows to generate .dw g or .dxf files w hich contain the current network diagram and the currently enabled single-line diagram view . More single-line diagrams can either be separately selected by enabling the desired view and starting data output, Or, all views (standard views and the view defined using the <u>Tools menu</u> [25] → "Settings" → "Configurable Netw ork Diagram Output") can be generated at once by selecting "All views" and starting the output. All of these files can be read into CAD or CAE tools for display or further processing. If the "Selectivity" icon is activated w hen this output is generated, the green and yellow markings indicating fully and partially selective elements will be displayed, but they will not be included in the exported .dw g and .dfx file.

# Output of the SIMARIS transfer file (SX) In this output, you can create an export file (filename.sx) which contains all relevant data of the dimensioned items of equipment which are necessary for further editing the project with SIMARIS project. This means that you can easily and quickly create a specification of w ork and services and determine a budget for the pow er distribution plant configured in SIMARIS design by importing this file into SIMARIS project.

## 6.2 Data transfer

#### Data transfer to SIMARIS project

To determine a budget and also the space requirements for a pow er distribution plant dimensioned with SIMARIS design professional, you can create a transfer file *filename.sx* with SIMARIS design by selecting the output type "SIMARIS exchange file (SX)", starting the export by clicking the "Start Output" button and saving the file in the desired path. The thus created file can then be imported in SIMARIS project.

Procedure in SIMARIS project: Directly select "Import from SIMARIS design" in the start wizard when starting the program or, if the program is open, via the menu item Project → Import from SIMARIS design and then select a SIMARIS design file with the extension .sx by clicking the "Brow se..." button. By clicking the "Next" button, the SIMARIS design file is imported and when subsequently clicking the "Finish" button the corresponding view s and lists are created. Depending on the size of the project, this process might take some time. Based on the data applied from SIMARIS design, the required plants are directly generated, listed in the project tree and displayed in the program step "System Planning" as parts list or front view. Unrecognized components are marked or listed correspondingly. Detected protective devices at outgoing feeders of busbar systems are transferred to the respective tap-off units.

Subsequently, the individual, automatically generated plants can be post-processed as required.

# 7 Technical Background of the Systems

#### 7.1 Medium voltage switching and protective devices

If you select a transformer with medium voltage as infeed, dimensioning of the medium-voltage switching devices, as selected, is based on one of the follow ing devices offered by Siemens:

- medium-voltage circuit-breakers
- 7SJ6, 7SJ82 medium-voltage protective devices
- Reyrolle 7SR11/12 medium-voltage protection devices
- switch disconnectors with medium-voltage fuses (SIBA).

#### 7.2 Generators

Generators are primarily dimensioned on the basis of preset technical data. You can, how ever, replace this technical data, e.g. by entering manufacturer-specific data.

As dimensioning result, you will obtain the technical data for generator rating, which you can use as a basis for product procurement.

#### 7.3 Transformers

Transformer dimensioning is primarily based on those transformers which are available from Siemens. You can, how ever, use transformers from other manufacturers in your planning, by entering their technical data as transformer properties.

SIMARIS design currently provides GEAFOL 4GB cast-resin transformers for dimensioning. The technology package for Brazil contains local transformer data, type designations, and technical data.

#### 7.4 Low voltage switching and protective devices

Dimensioning relies on the comprehensive low voltage product portfolio of switching and protective devices offered by Siemens. This means, you will obtain a list containing the specific order numbers of the devices suggested as dimensioning result. Since the product portfolio varies from region to region, the specific devices will always be determined on the basis of the portfolio that is

assigned to the selected country setting. This may not include all of the product groups listed below .

The follow ing product groups are kept in SIMARIS design:

- air circuit-breakers, type SENTRON 3WL, 3WN and 3WT
- moulded-case circuit-breakers, type SENTRON 3VL, 3VT and 3RV
- moulded-case circuit-breaker, type 3VA1 up to 160 A, 3VA2 up to 630 A
- circuit-breakers for motor protection, 3VU
- compact feeder, 3RA6 direct starter
- SENTRON 3KA, 3KD, 3KE, 3KL and 3KT switch disconnectors
- ERGON sw itch disconnectors
- S32 sw itch disconnectors
- SENTRON 3KM sw itch disconnectors w ith fuses
- ERGONFUSE sw itch disconnectors w ith fuses
- SENTRON 3NP fuse sw itch disconnectors
- SENTRON 3NJ in-line fuse sw itch disconnectors
- miniature circuit-breakers, type 5SJ, 5SL, 5SY, 5SX, 5SP and 5SQ
- residual current protective devices, type 5SM, 5SU and 5SV
- fuse bases, type 5SD, 5SF, 5SG
- 3NH fuse bases
- 3NA fuses
- 5SA, 5SB, 5SC, 5SD8 and 5SE fuse links
- 5SD7 lightning and overvoltage protection devices
- 3LD2 sw itch-disconnector

•

Detailed product data can be found in the corresponding catalogues of I BT LV.

# 7.5 Cables

The cables configured when creating the network diagram are only factored in electrically when a dimensioning process is performed in SIMARIS design. This means that lists of cables required for the project will be output, but only with their standard designations, not with specific order numbers.

You can choose between the output of cable data specification in metric form acc. to German standard or acc. to American standard (AWG = American Wire Gauge) in kcmil.

Note: 1 kcmil  $\approx$  0.5067 mm<sup>2</sup>  $\rightarrow$  2 kcmil  $\approx$  1 mm<sup>2</sup>

### 7.6 Busbar systems

In SIMARIS design, the busbar systems required for creating the netw ork diagram are configured and dimensioned on the basis of the product portfolio and technical data of **SIVACON 8PS** busbar trunking systems. These busbar trunking systems can meet all load demands reliably and safely with a complete product range for the use from 25 A up to 6,300 A. Their high short-circuit rating and low fire load as well as type-tested connections to SIVACON sw itchgear and GEAFOL transformers ensure highest safety. The systems require little space, allow for a clear netw ork design and can be installed quickly and retrofitted or adapted without any problems. The system also comprises communication-capable components. Improved safety is ensured via the high short-circuit rating, the low fire load and also via the type testing.

BD01 system	<ul> <li>For the pow er supply of electrical tools in w orkshops as w ell as lighting systems.</li> <li>Use from 40 A up to 160 A</li> <li>Rated operating voltage U<sub>e max</sub> 400 V</li> <li>Degree of protection up to IP55</li> </ul>
BD2 system	<ul> <li>For pow er transmission and distribution in the medium-voltage range in office buildings and transfer lines in all industrial application areas.</li> <li>Use from 160 A up to 1,250 A</li> <li>Rated operating voltage U<sub>e max</sub> 690 V</li> <li>Degree of protection up to IP55</li> </ul>
LDsystem	<ul> <li>For pow er distribution and transmission of high currents in exhibition halls, in the automotive industry, heavy industry and on ships.</li> <li>Use from 1,100 A up to 5,000 A</li> <li>Rated operating voltage U<sub>e max</sub> 1000 V</li> <li>Degree of protection IP34/IP54</li> </ul>
LIsystem	<ul> <li>flexible pow er distribution for high currents in the industry and safe pow er transmission from the transformer to the main distribution in buildings</li> <li>Use from 1,100 A up to 5,000 A</li> <li>Rated operating voltage U<sub>e max</sub> 1000 V</li> <li>Degree of protection up to IP55</li> </ul>
LX system	<ul> <li>Use from 800 A up to 6,300 A</li> <li>Rated operating voltage</li> <li>Degree of protection up to IP55U<sub>e max</sub> 690 V</li> <li>Degree of protection up to IP55</li> </ul>
LRsystem	<ul> <li>Epoxy cast-resin version; the compact design for open air use.</li> <li>Use from 630 A to 6,300 A</li> <li>Rated operating voltage U<sub>e max</sub> 1000 V</li> <li>Degree of protection IP68</li> </ul>



The overview states the designations of the various components of a busbar trunking system taking the BD2 system as an example.



### 7.7 Distribution boards

SIMARIS design only considers the busbar trunking systems directly as distribution boards (see section <u>Busbar systems</u> [116]). The required low - voltage sw itchboards and distribution boards are only considered for dimensioning with regard to the required devices or loads. This means you will not obtain any specific order numbers from SIMARIS design that would refer to the distribution boards necessary for plant design. This information can, how ever, easily be obtained by exporting your project and then processing it in SIMARIS project, as described in the section <u>Data transfer</u> [114].

### 7.8 Loads

Loads are only considered in SIMARIS design on the basis of the technical data preset or calculated. The data to be entered for specifying loads vary according to the type of load. For more specific information about this topic, please refer to the section <u>Adding final circuits</u> <sup>64</sup> and also<u>Properties and equipment dialogue of equivalent electric circuits</u> <sup>93</sup> to <u>Properties and equipment dialogue of lightning current and overvoltage protection devices</u> <sup>10</sup> , which decribe the equipment dialogues for loads.

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