Tutorial SIMARIS design

Software for efficient dimensioning of power distribution systems

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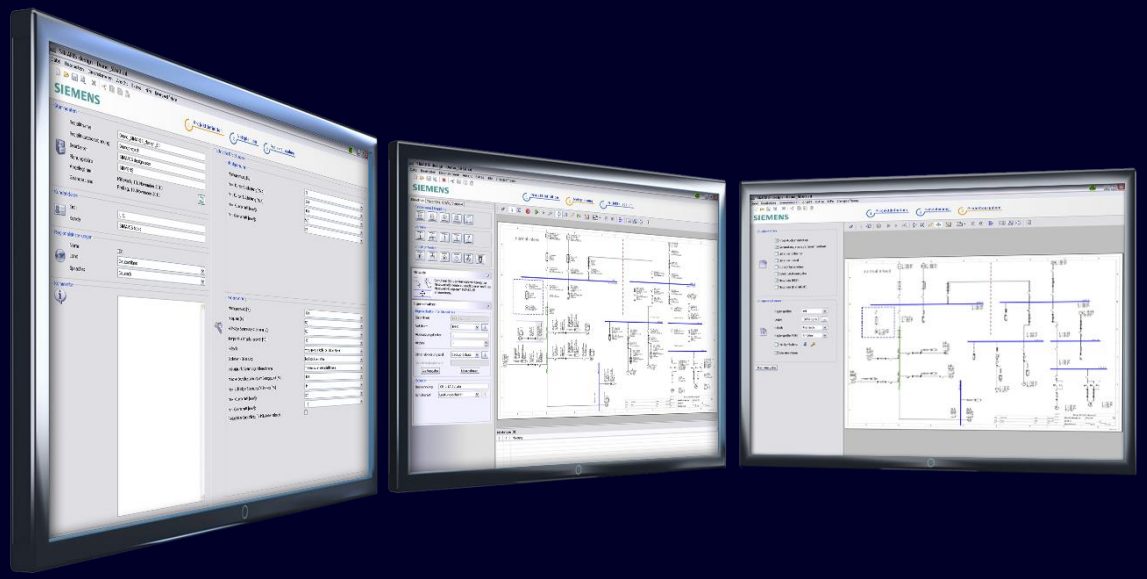
Tutorial SIMARIS design



Software for efficient dimensioning of power distribution systems

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Introduction
SIMARIS planning tools

The SIMARIS planning tools provide efficient support for dimensioning an electric power distribution system and determining the equipment and distribution boards for it.

SIMARIS design
for network calculation and dimensioning

SIMARIS project
for determining the space requirements of distribution boards, the budget and for generating specifications (bills of quantities) and BIM data

SIMARIS curves
to display tripping characteristics, as well as cut-off current characteristics and let-through energy curves

SIMARIS Online Toolbox with practical calculation tools for the daily business

SIMARIS busbarplan
for 3D-planning of busbar trunking systems

THE ADVANTAGES OF SIMARIS PLANNING TOOLS

- Intuitive and easy handling with user-friendly documentation options for the planning results
- End-to-end planning for all devices and systems from the medium-voltage level to the power consumer
- Automatic selection of matching components and distribution board systems
- High degree of planning reliability plus flexibility in the planning and implementation process

Introduction
SIMARIS design

SIMARIS design enables electric networks to be dimensioned which are based on real products ranging from the medium-voltage down to the load level including automatic selection of suitable equipment.

- The equipment is dimensioned according to the accepted rules of good installation practice and all applicable standards (VDE, IEC).
- Network operating modes and switching conditions can be defined as desired.
- Automatic selection of suitable equipment in radial networks
- Calculation of short-circuit currents, symmetrical load flows, voltage drops, and energy balances in radial networks
- Consideration of required personal, short-circuit, and overload protection
- Consideration of functional endurance as well as lightning and overvoltage protection possible
- Busbar trunking systems for power transmission and distribution can also be integrated in your planning.
- Isolated networks can be planned and displayed
- Distribution boards can be mapped as equivalent impedances which can be incorporated into the calculation, acting as substitutes for parts of the network which cannot yet be specified more precisely
- To document results, a wide variety of output options is provided, e.g. for analysis and optimization of the energy efficiency of the planned network
- One useful output variant is the export file of your project for further processing in **SIMARIS project**. This facilitates determining the space requirements for the distribution boards and makes it easy for you to create a basis for budget finding.

Introduction
Additional functions in SIMARIS design professional

START

In addition, SIMARIS design professional provides the following options:

- Thanks to the option to visualize and calculate parallel network operation, different power sources such as transformers and generators can be operated in the same network.
- In the context of automatic selectivity evaluation, selectivity thresholds are displayed in addition to the characteristic current-time curve and the corresponding envelope curves.
- Configuration of a switchover facility for emergency power supply is possible in sub-distributions
- Infeed on all distribution levels (e.g. transformer, generator, etc.)
- Automatic selection of suitable equipment in ring and meshed networks
- Calculation of short-circuit currents, asymmetrical load flows, voltage drops, and energy balances in ring and meshed networks.

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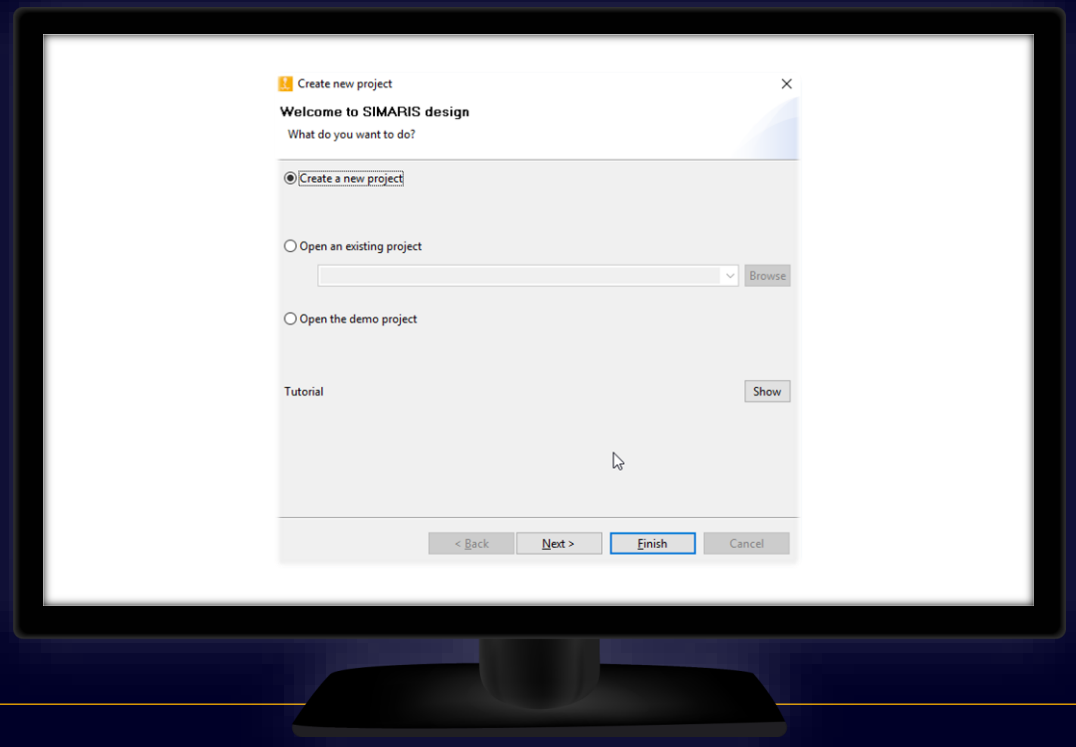
Getting Started
Project definition

Learn here, how to create a project and familiarize with the workflow from project definition to network design and project output.



After program start you have the following options:

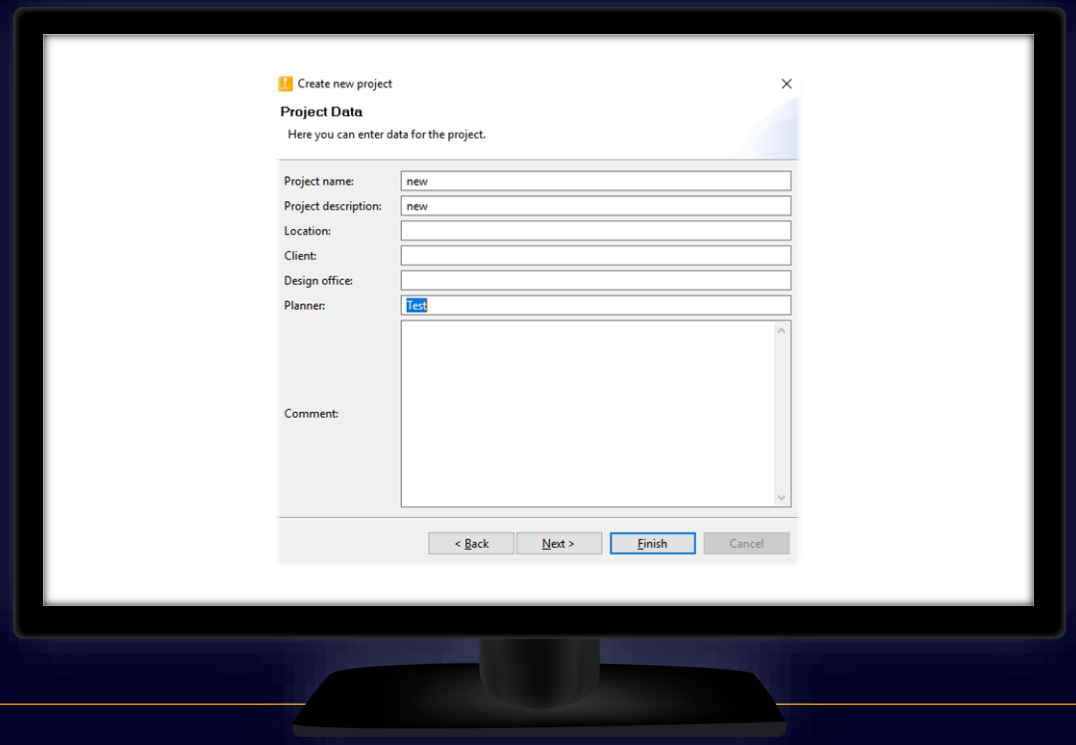
- Create a new project
- Open an existing project
- Open the demo project

When you select **"Create new project"** and click **"Next"** you can then…

Getting Started
Project definition

START

… enter master data for the project …



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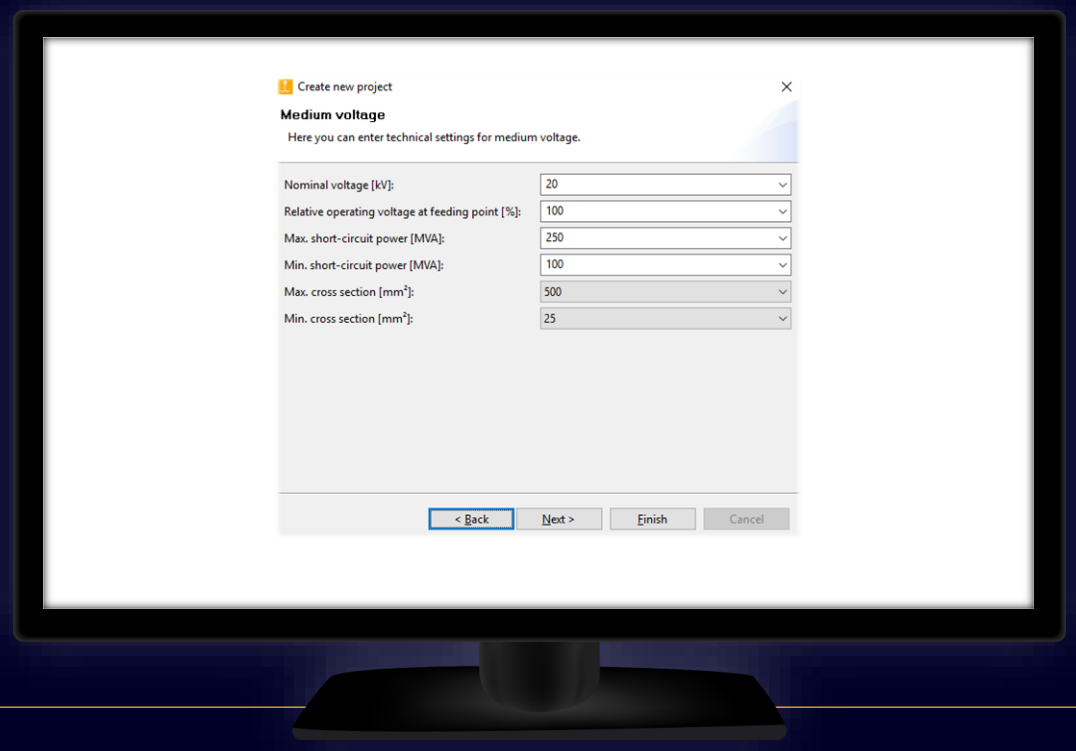
Getting Started
Project definition

START

…and select the low-voltage level.



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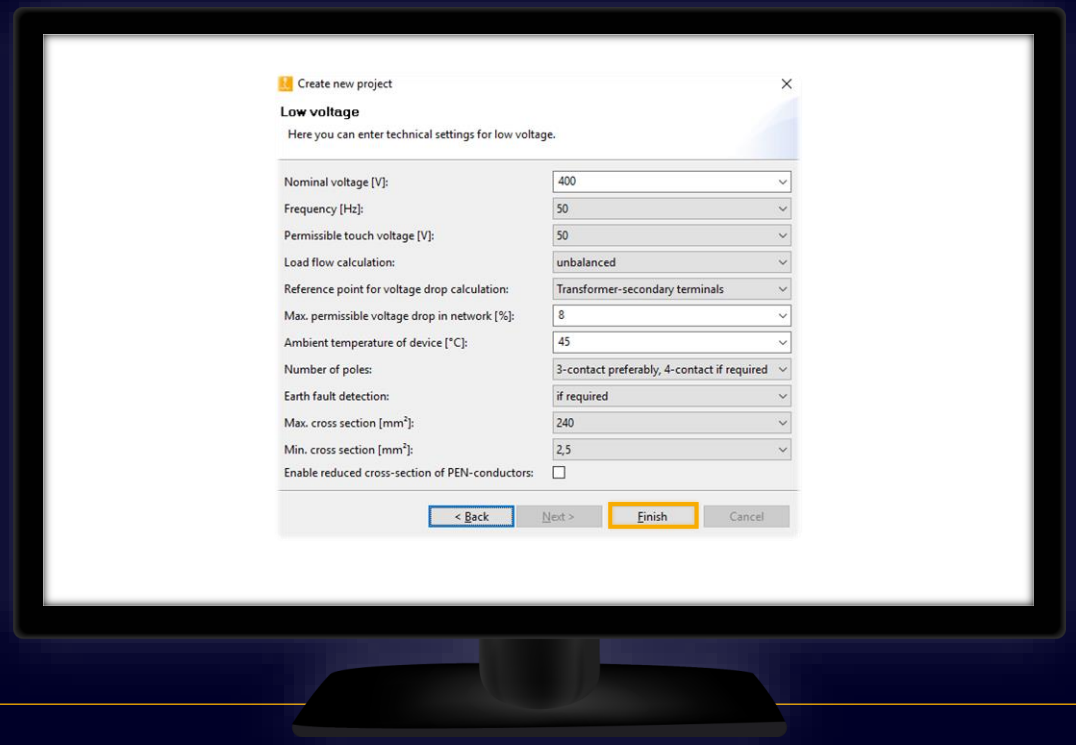
Getting Started
Project definition

START

…and select the low-voltage level.



To facilitate your choice, some data input fields have been pre-set with default values that can, however, be changed at any time by selecting appropriate data from the drop-down boxes.

By clicking the **"Finish" button**, you get to the program step "**Network Design**" and can start planning the network.

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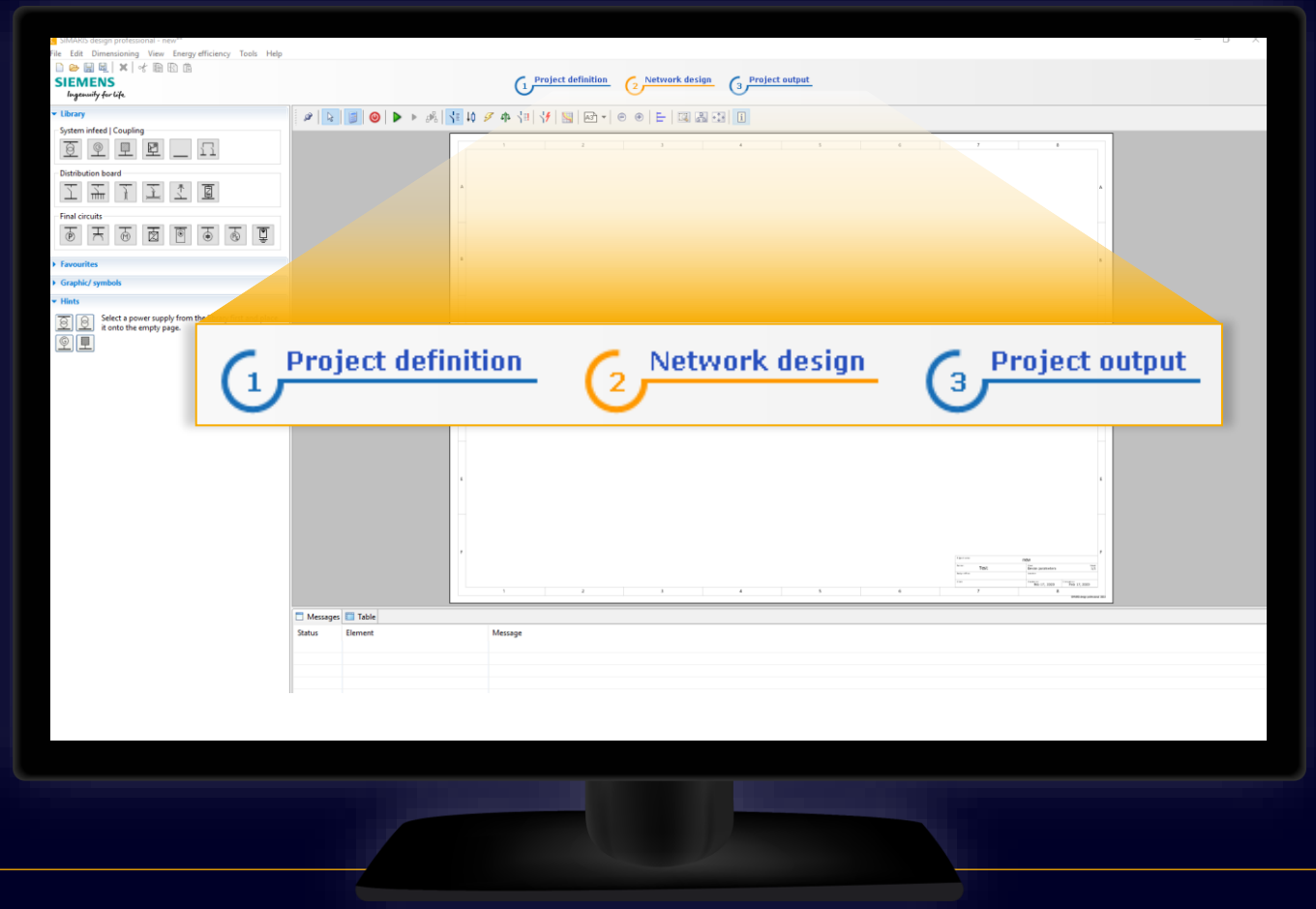
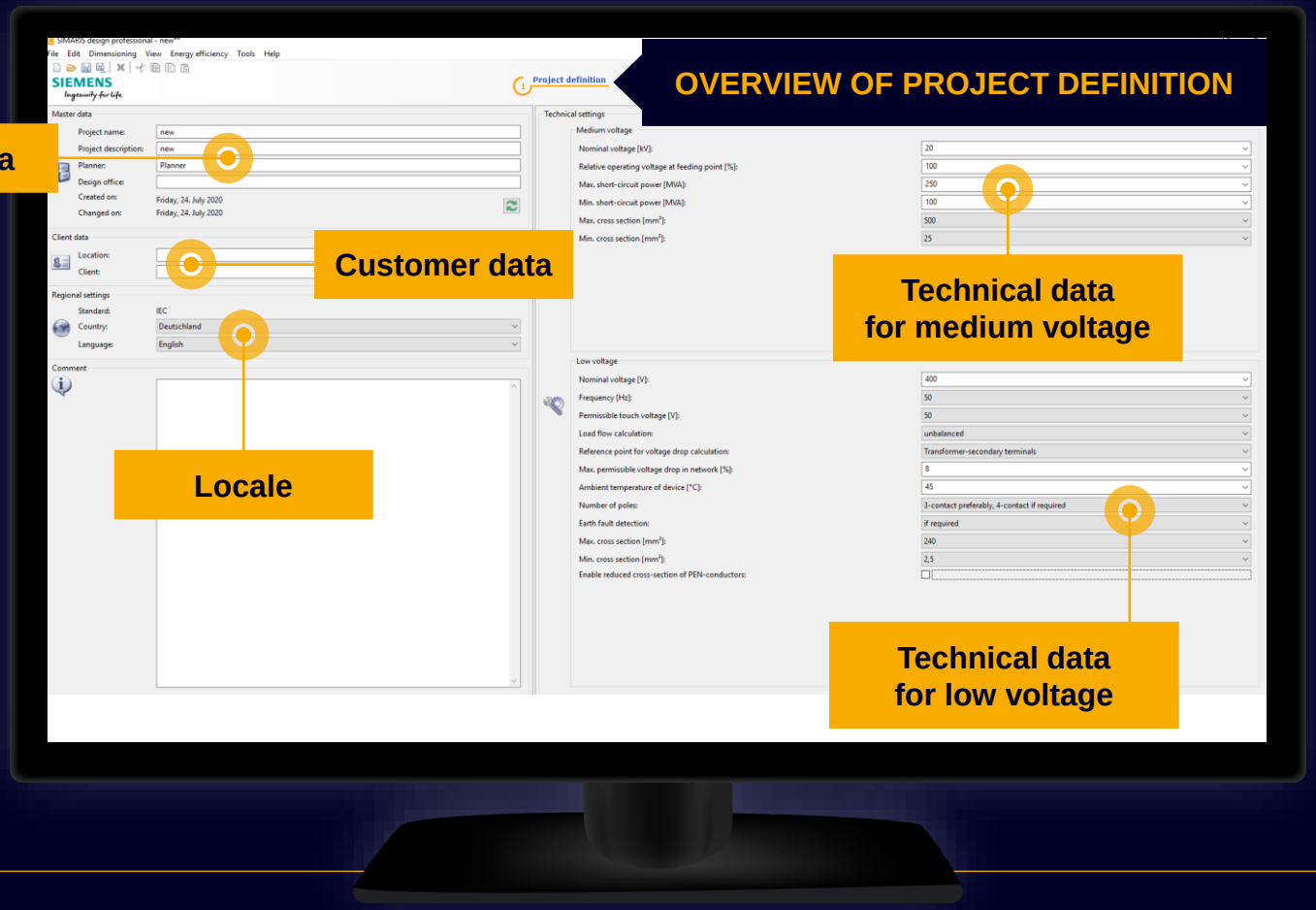
Getting Started
Project definition



Clicking the program steps on the navigation bar allows you to go to another step at any time you choose, while you are editing a project.

Getting Started
Project definition



This means that you can later view and modify the entries you made in the start wizard, when you are in the step **"Project definition".**

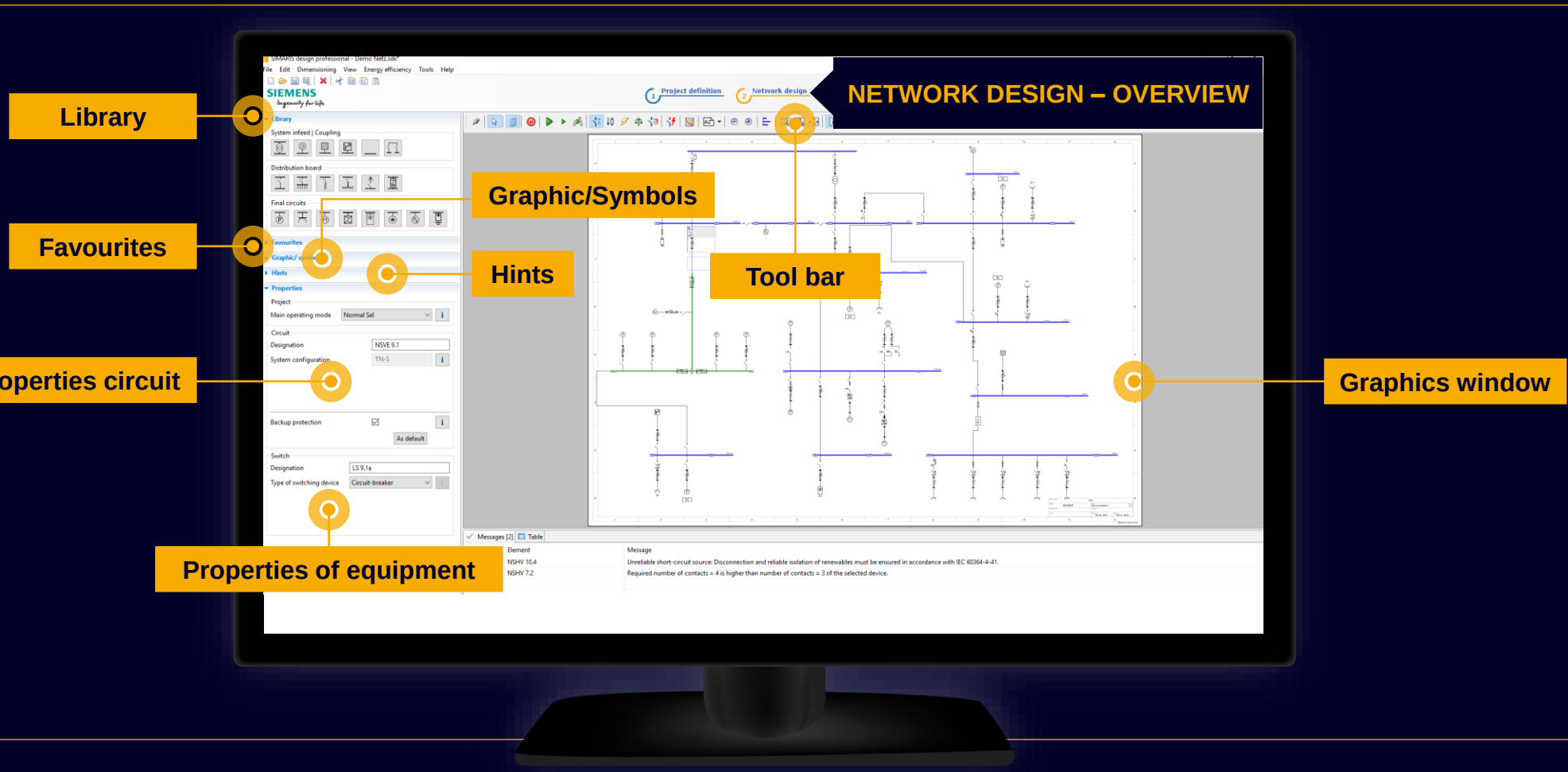
Introduction
Project definition

In this context, please note that the edited network must be redimensioned after every change in the technical settings.

In addition, you can "localise" the Regional settings made in the Project definition step, i.e. choose the country-specific product portfolio relevant for your planning by selecting a country and a language matching this country, or English as the project language.

All settings defined in this step – this includes both technical data and country and language settings – will be automatically saved for future projects, but can be changed again if necessary, which greatly facilitates working and collaborating at international projects.

Getting Started
Introduction to network design

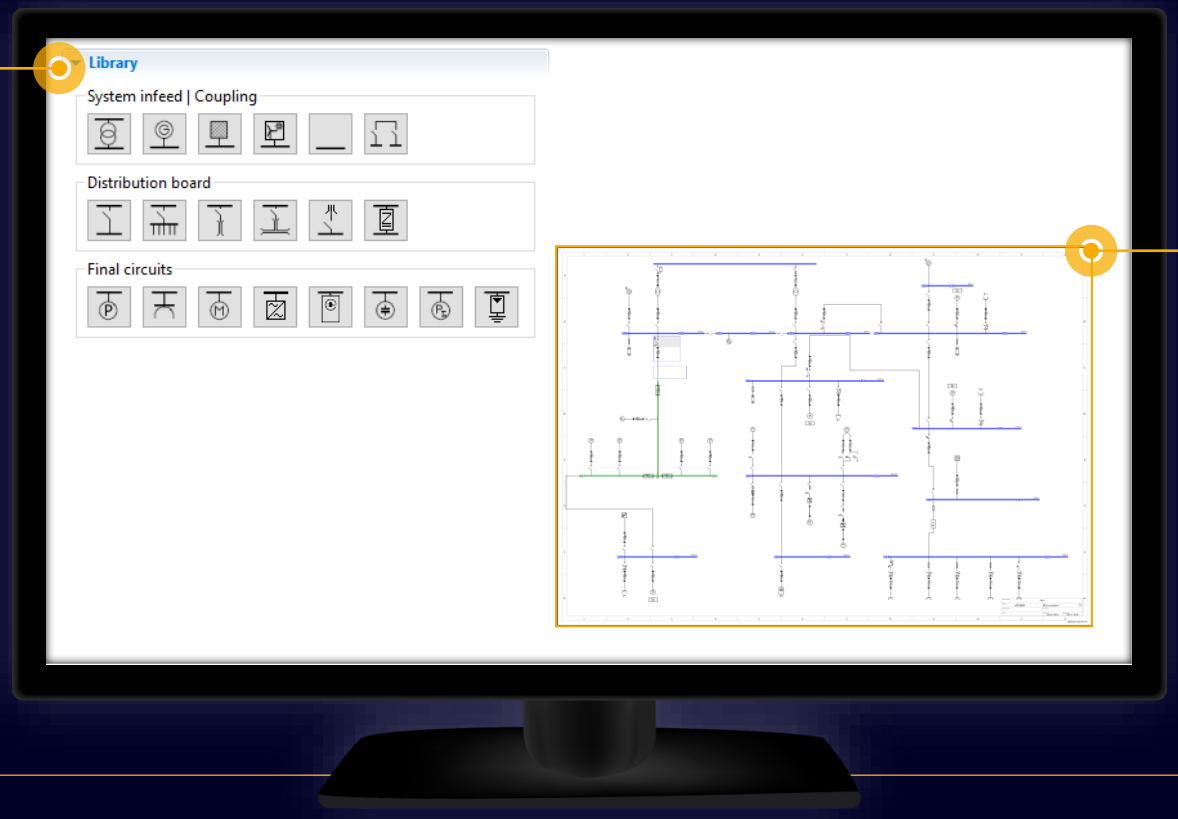


Getting Started
Introduction to network design

START

In the "Network design" step, there are the following sections:

The **Library** (top left) provides all elements required for creating a network diagram. You can either rely on Favourites, or integrate symbols into the network diagram.



The network diagram is built up in the **graphics window** (on the right of the screen display) from Library elements and/or Favourites.

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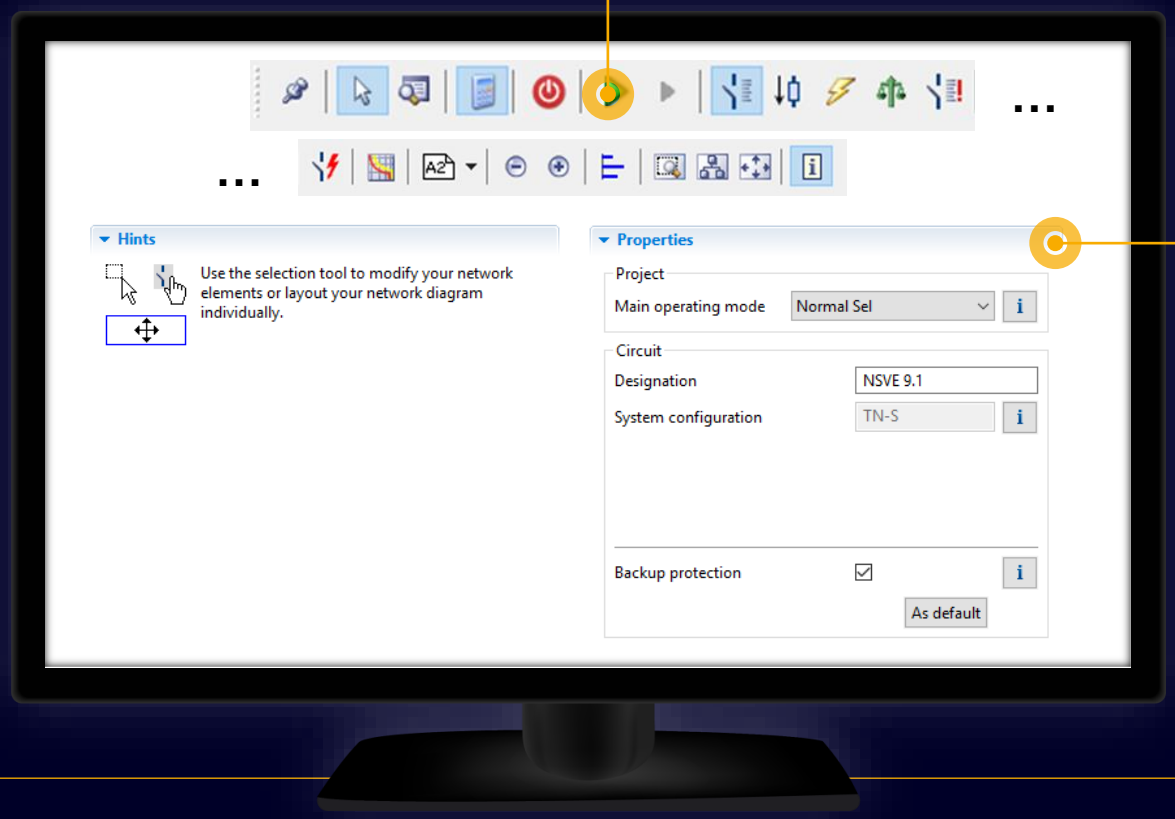
Getting Started
Introduction to network design

The tool bar above the graphics window contains all important functions for editing the network diagram.

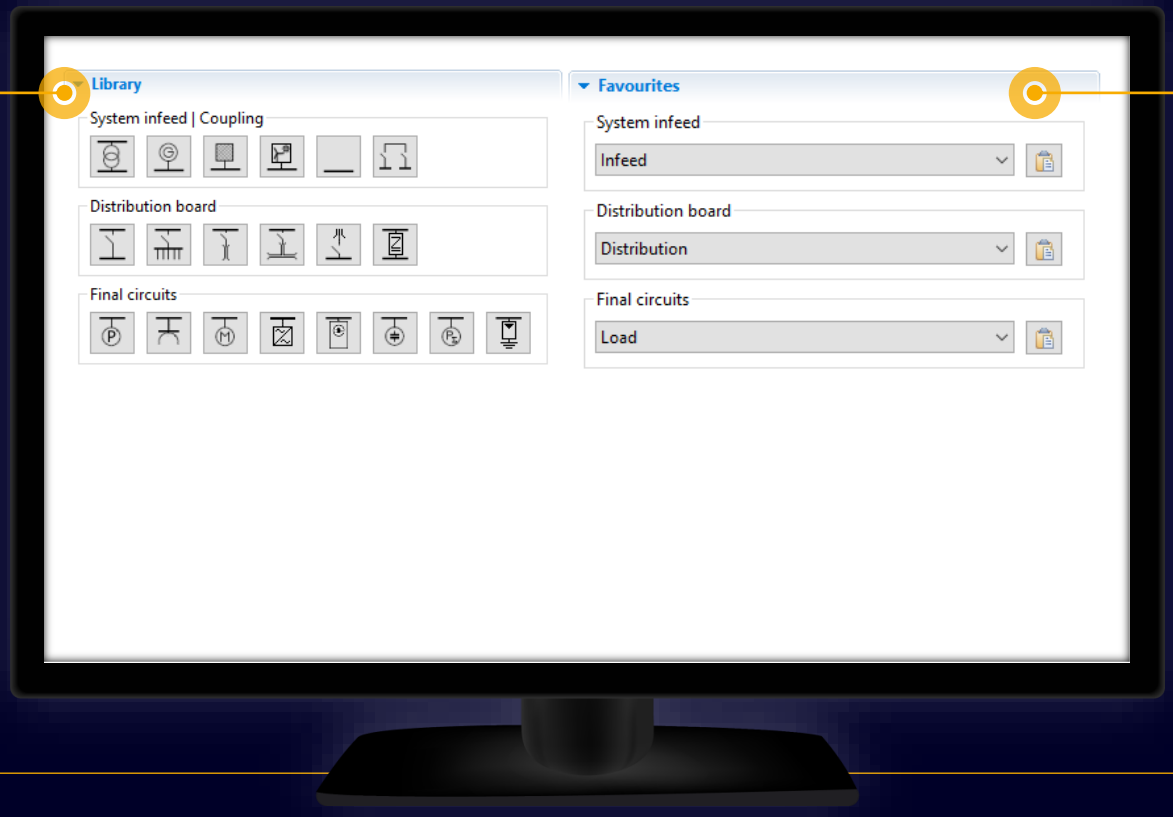


Hints and tips how to edit the network, and the **Properties** of the elements marked on the graphics, i.e. circuits and equipment, can be found below the Library on the left.
Thus you can easily and quickly view the most important information about the network diagram elements you are editing.

Getting Started
Introduction to network design

In the "**Network design**" step, you build up the network step by step with the aid of elements from the **Library**, this means

- System infeeds
- Couplings
- Distribution boards
- and final circuits.



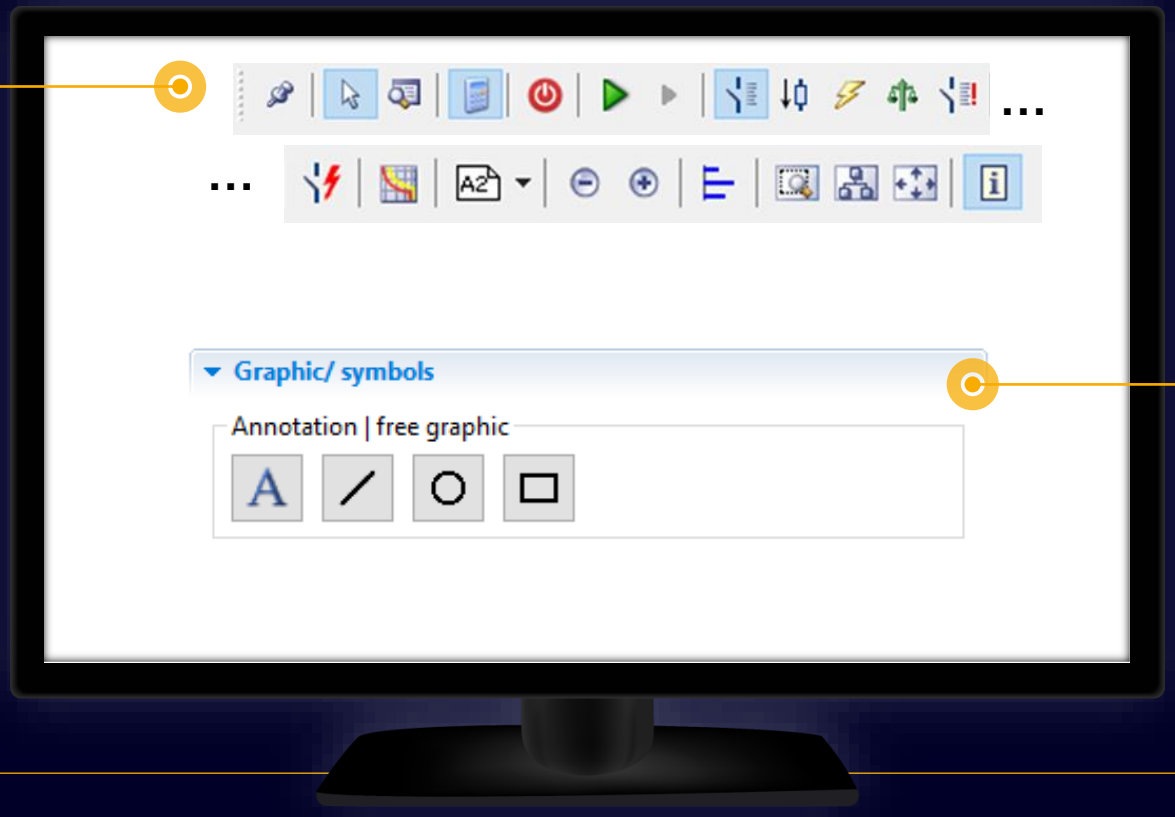
Elements saved as **Favourites** can also be used to build up the network diagram.

Getting Started
Introduction to network design

Tool bar

Various editing options for the network diagram, which can be called up

- using the tool bar,
- the menu,
- and sometimes the context menu (right mouse click) as well, support you in creating and editing a network diagram



It is also possible to add **graphic elements, symbols and annotations** to structure the network diagram and add suitable captions and labels.

Introduction
Introduction to network design

Please also refer to the sections "**How to create network elements**" and "**Working in the network diagram**" in "**Network Design**".

In the "**Network Design**" step, the components shown on the network diagram are automatically or manually dimensioned. More about this in "**Dimensioning**".

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Network design

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Network design

How to create network elements | System infeeds | Distribution board | Loads | Separate networks | Busbar systems and loads

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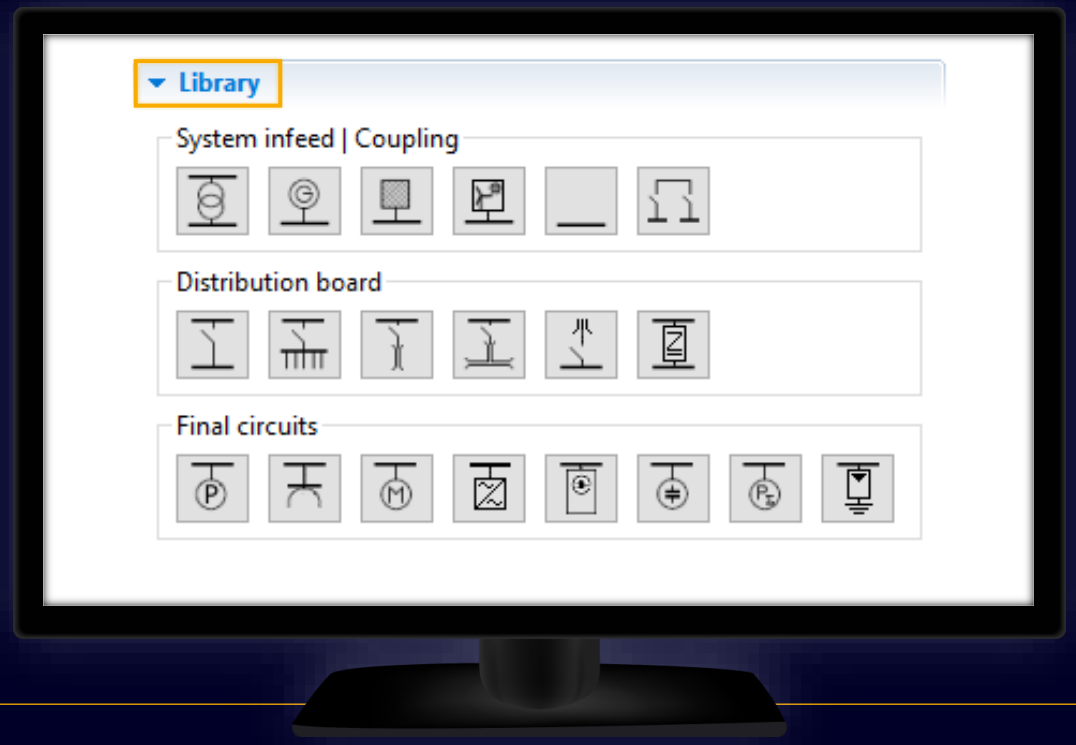
Network Design
How to create network elements

START

This is an easy, fast, and safe way to build up your network:



- To insert an element into the drawing please enable the desired icon in the **Library** on the left by clicking on it. The enabled icon is marked by a yellow frame.
- The meaning of the individual icons is explained in the tooltip, which can be displayed by hovering the mouse over this icon for a moment.

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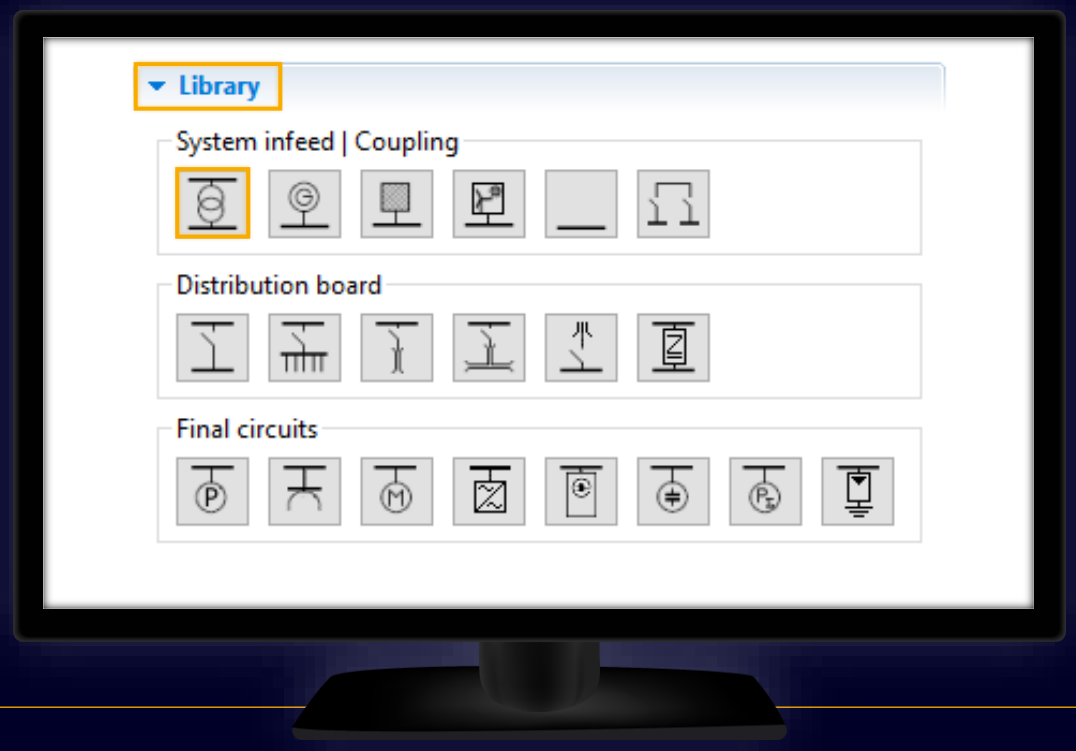
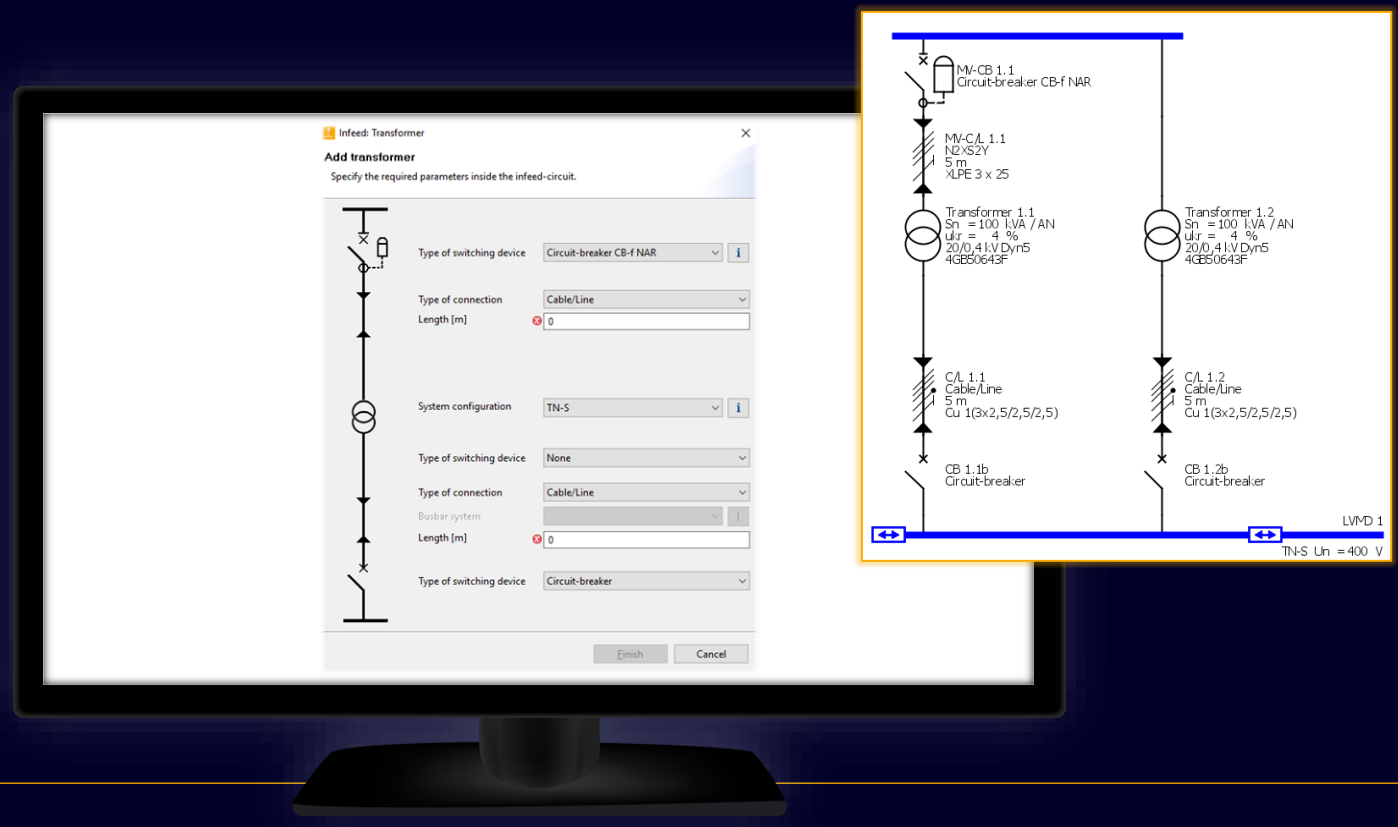
Network Design
How to create network elements – system infeeds

At first, enable an icon in the Library, e.g. for a **Transformer** (yellow frame visible).



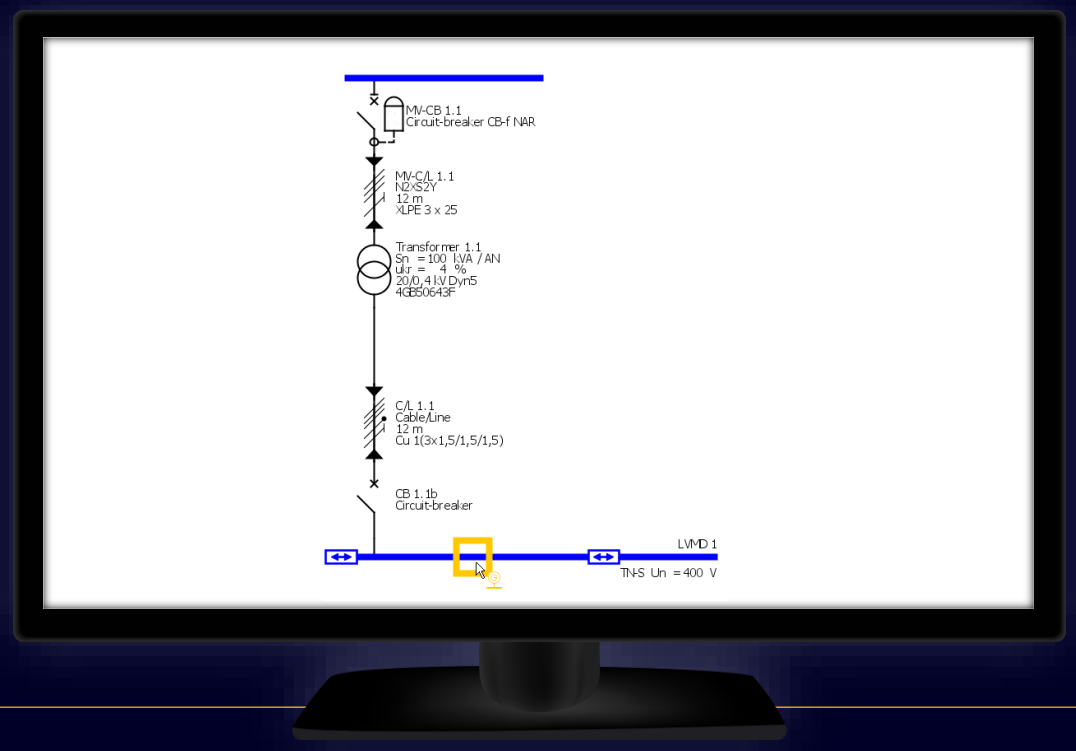
Network Design
How to create network elements – system infeeds

Result shown in the network diagram, when a transformer (without medium voltage) is created:



Network Design
How to create network elements – system infeeds

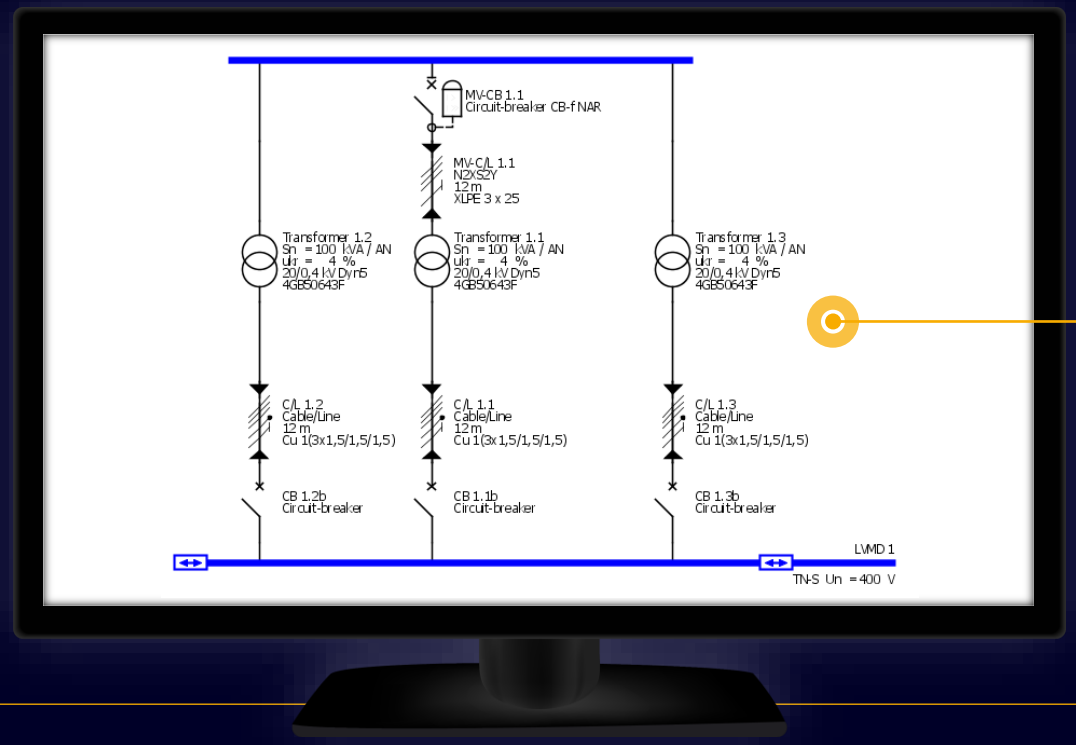
In principle, other types of infeed components are created in the same way.



Parallel infeed using several power sources can be mapped by placing more infeed components at an insert point on the busbar and specifying them in the dialog displayed afterwards.

Network Design
How to create network elements – system infeeds

A detailed description on how to create couplings can be found in the "Couplings" section.

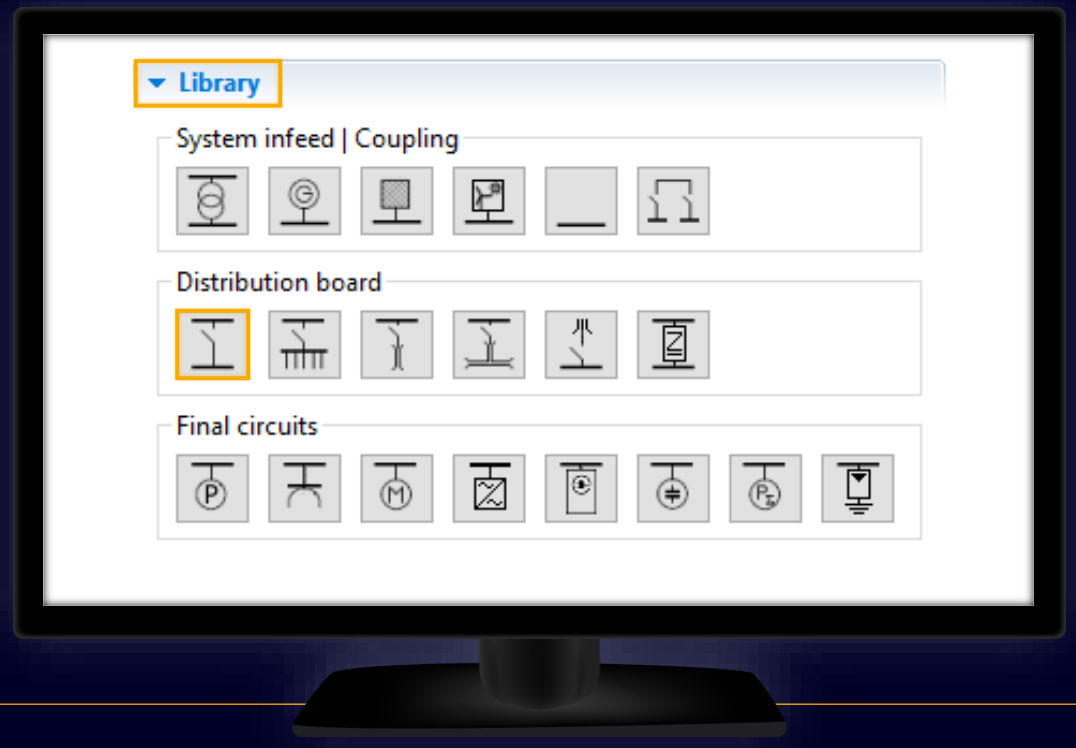


The result for linking infeed components is shown here.

Network Design

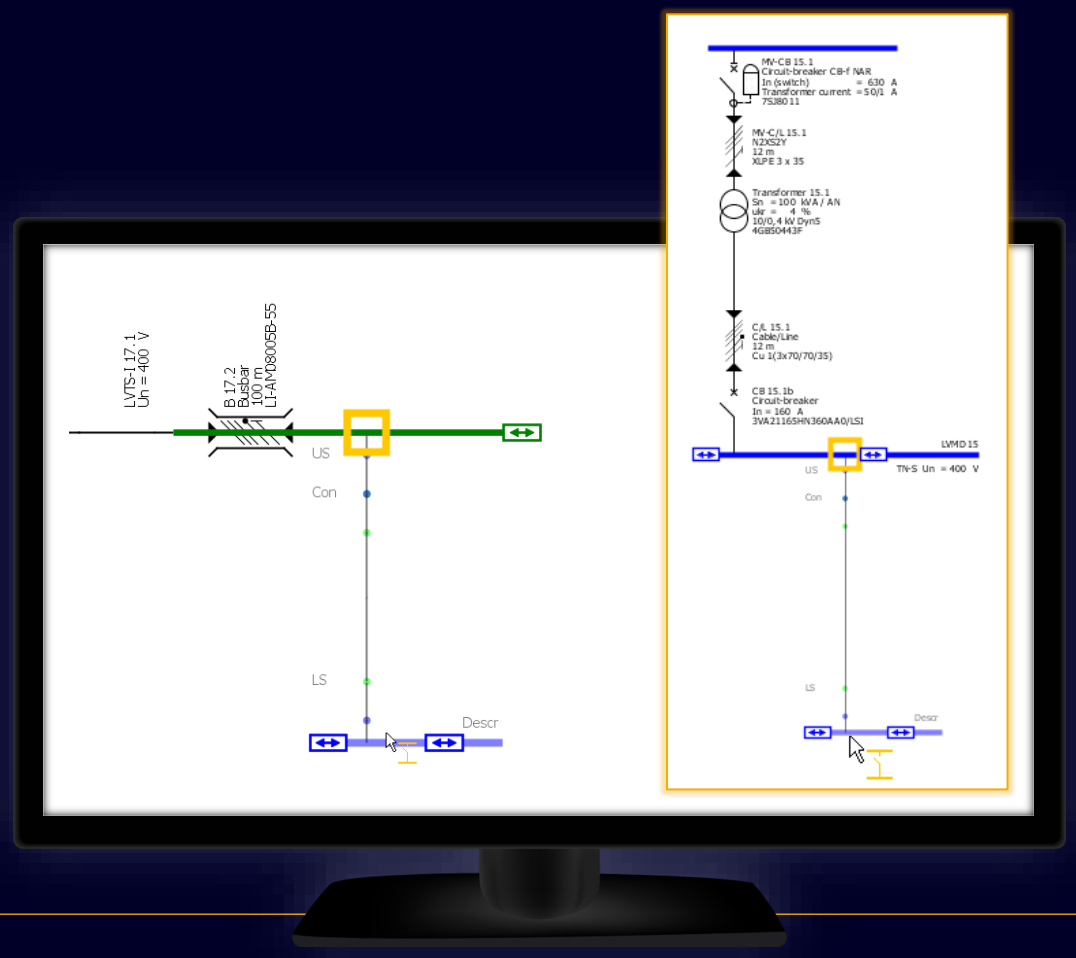
How to create network elements – distribution boards

Distribution boards are created in the same way: At first enable an icon in the **Library**, e.g. for a **sub-distribution board** (yellow frame visible).



Network Design

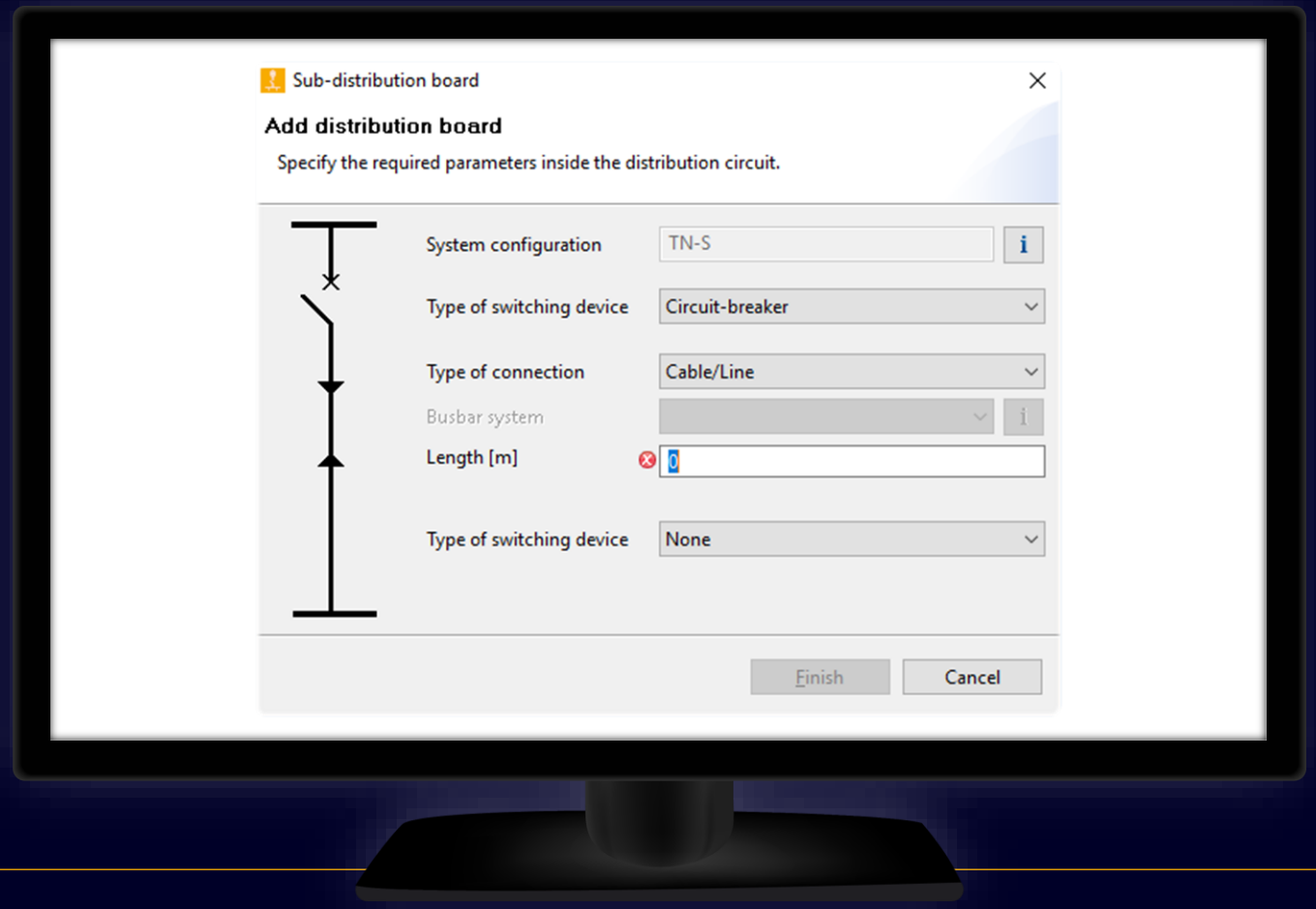
How to create network elements – distribution boards



- Possible insert points in the network diagram are marked by a **yellow rectangle**, when hovering the mouse over it.
- You can find insert points on the graphs representing **distribution boards (blue lines)** and the busbar **trunking systems (green lines).**
- To add elements, left-click such an insert point, keep the mouse key pressed and drag the mouse away from the insert point at a right angle to the blue or green line.
- After you release the mouse button, another dialog is automatically displayed, where you can specify parameters of the element that was just placed.

Network Design

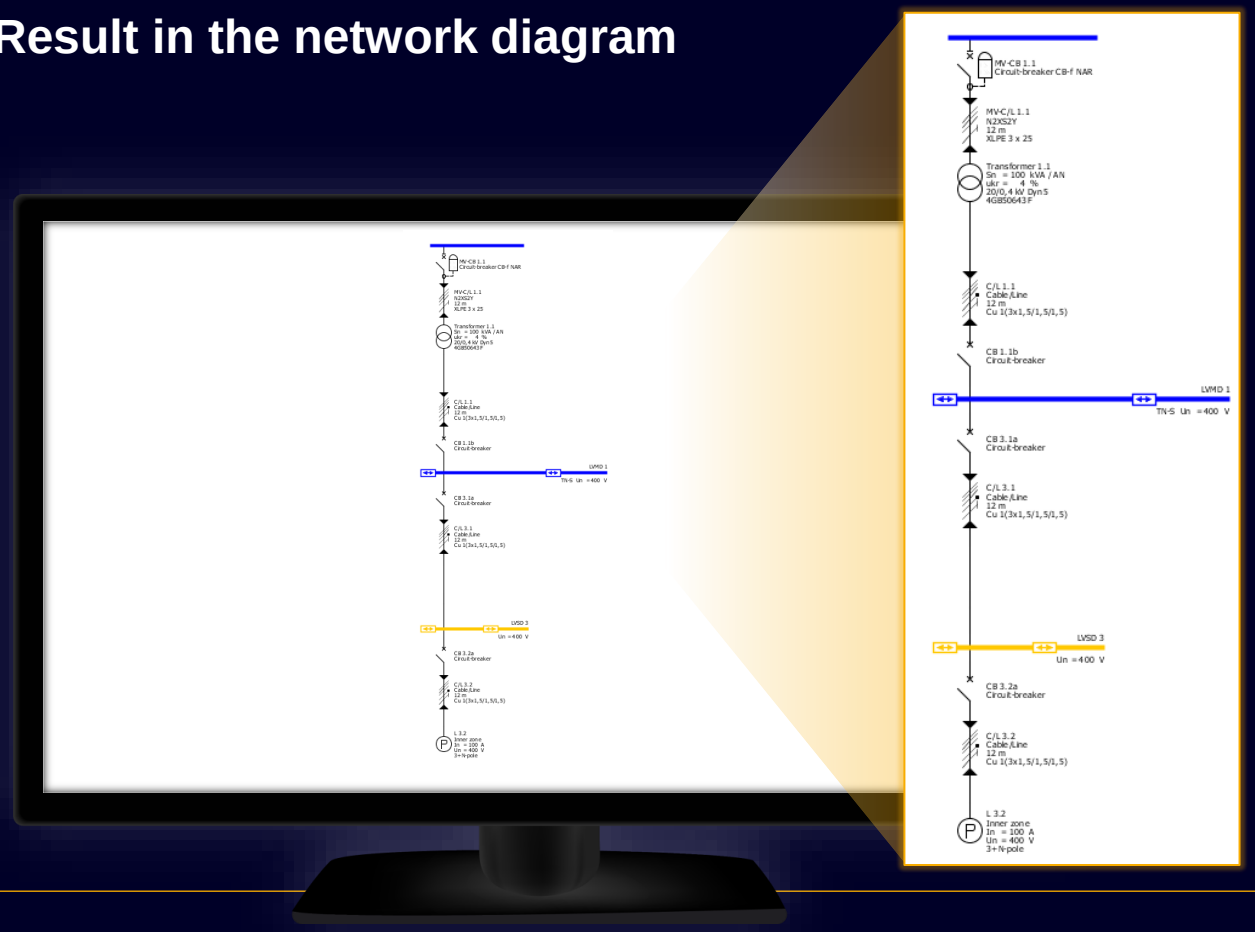
How to create network elements – distribution boards



Network Design

How to create network elements – distribution boards

Result in the network diagram

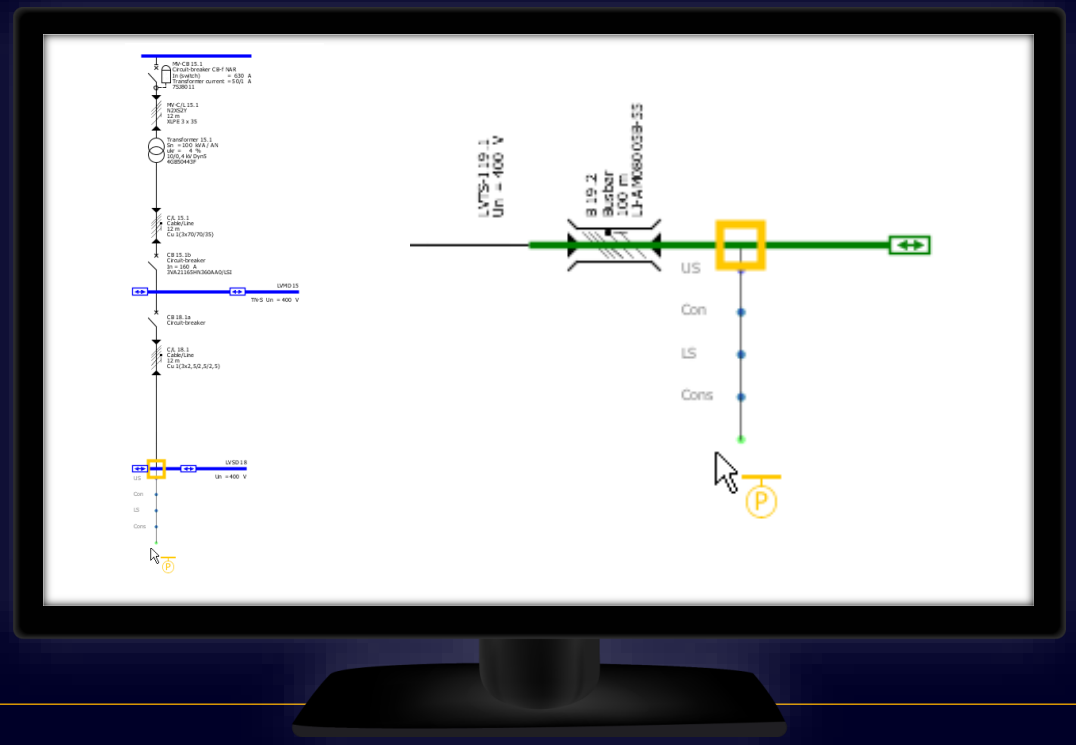


In principle, other distribution boards are created in the same way. A detailed description on how to add busbar trunking systems can be found in the "**Busbar systems and loads**" section.

Network Design

How to create network elements – distribution boards

Also loads are created in the similar way. Hereby you can connect them either directly to an infeed or to a distribution bord / busbar trunking system.

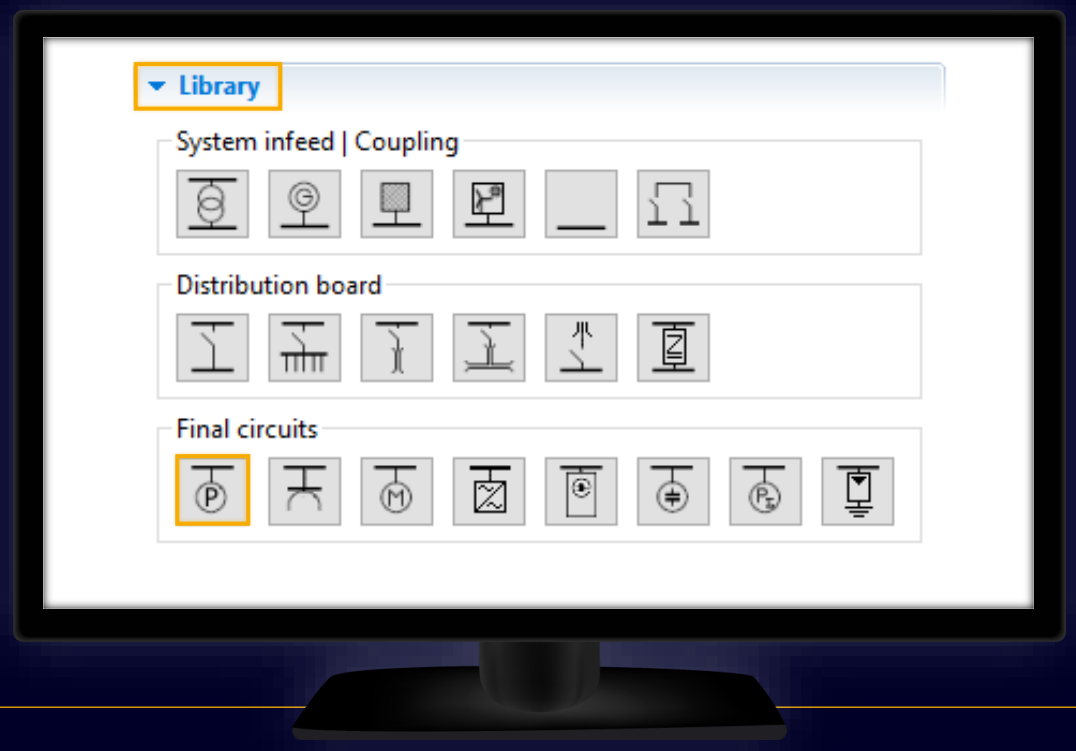


- Possible insert points in the network diagram are marked by a **yellow rectangle**, when hovering the mouse over it.
- You can find insert points on the graphs representing **distribution boards (blue lines)** and the **busbar trunking systems (green lines).**
- To add elements, left-click such an insert point, keep the mouse key pressed and drag the mouse away from the insert point at a right angle to the blue or green line.
- After you release the mouse button, another dialog is automatically displayed, where you can specify parameters of the element that was just placed.

Network Design
How to create network elements – loads

START

To add a stationary load, you must at first enable the corresponding icon in the Library again.



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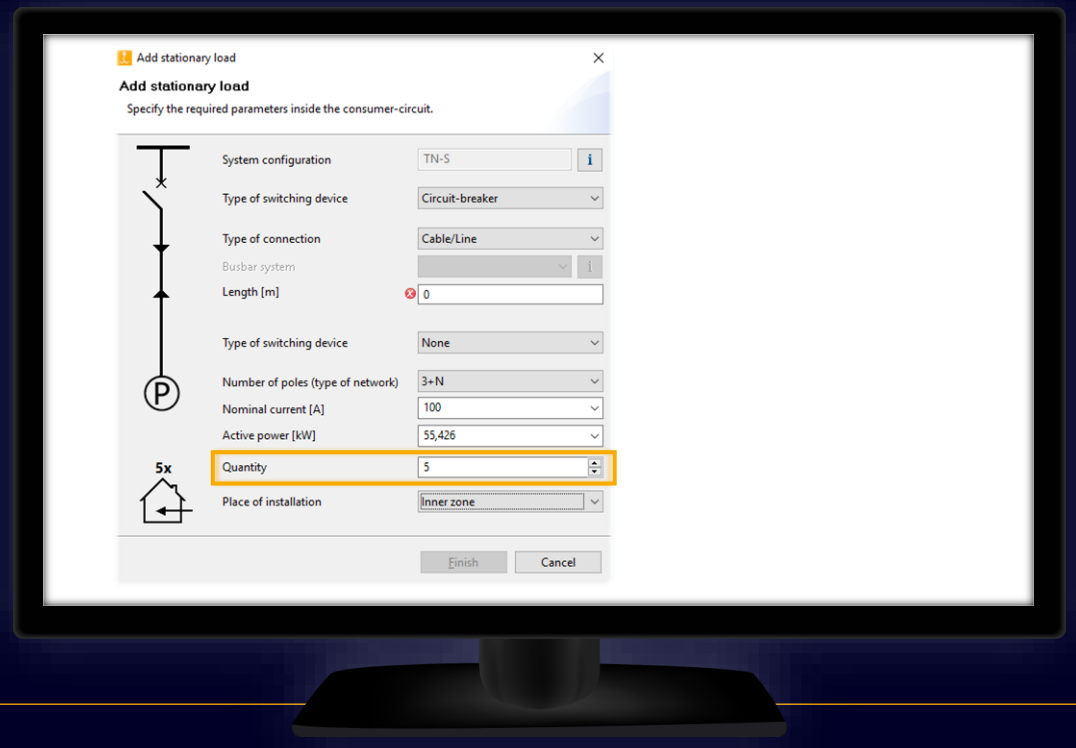
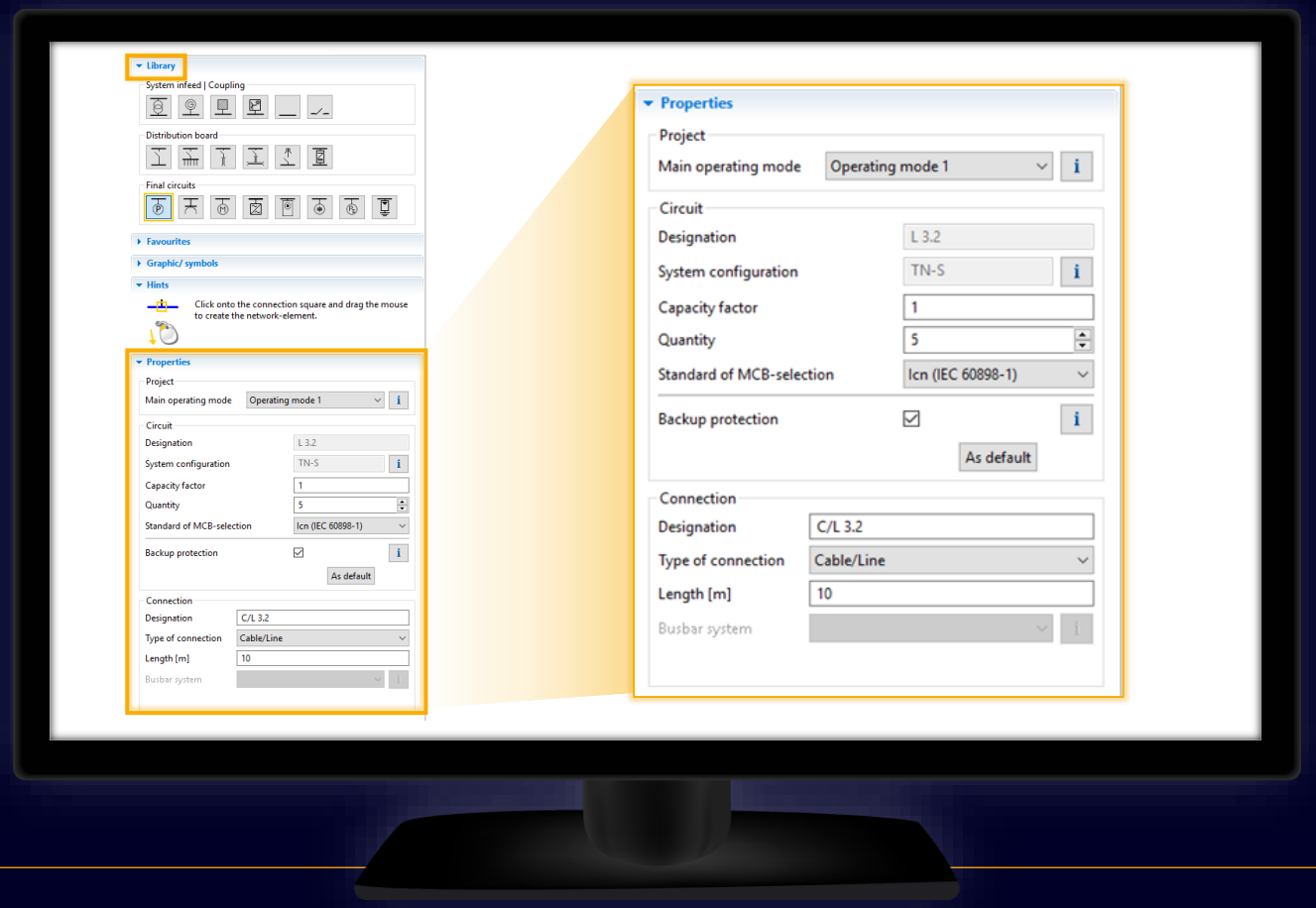
Network Design

How to create network elements – loads

When the element is placed at a suitable insert point on the network diagram, a dialog for specifying technical data for connecting the load circuit is displayed.



Network Design
How to create network elements – loads



To simplify planning work for larger projects and maintain a straightforward structure of the network diagram, you can create **load groups**

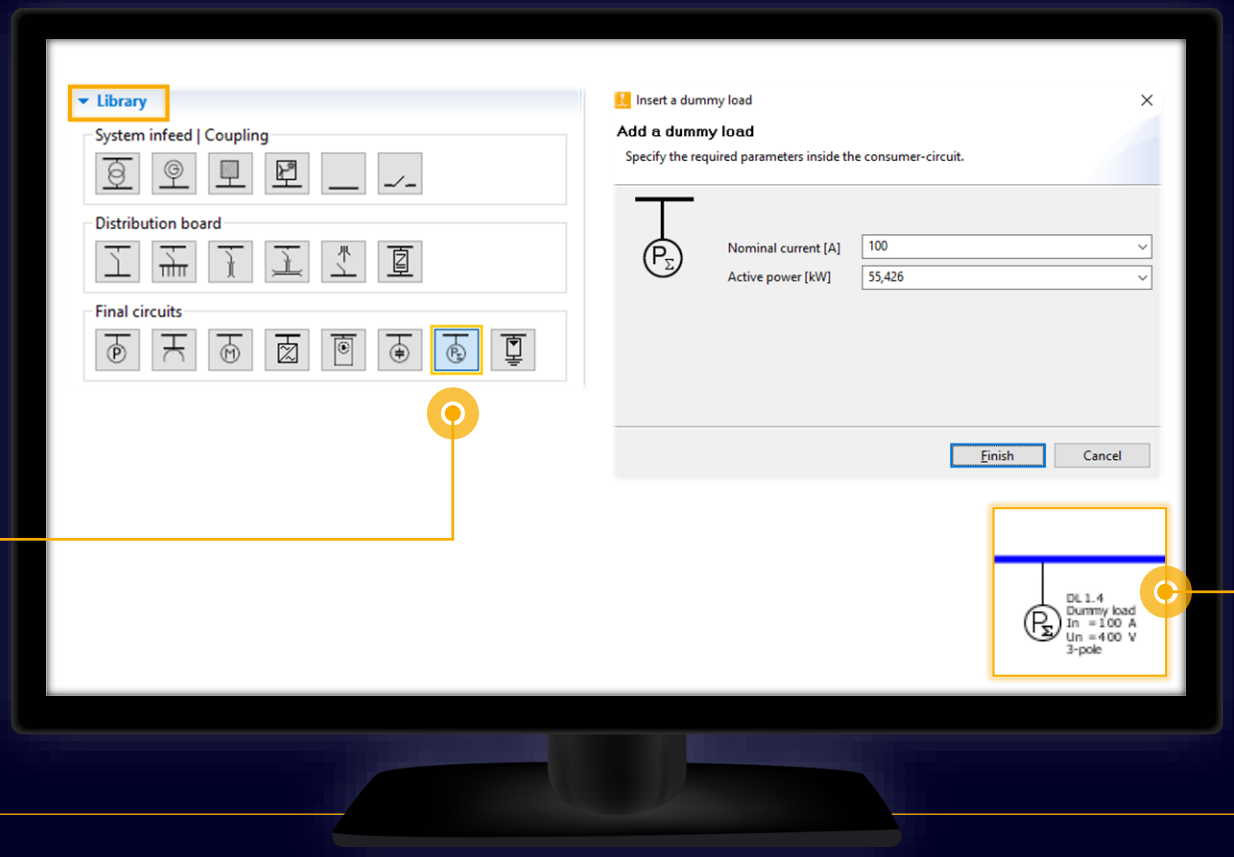
- by entering the desired number of identical loads into the specification immediately (see previous page)
- or later, by marking the corresponding element in the network diagram and modifying the quantity shown in the Properties dialog at the bottom left.

Network Design
How to create network elements – loads

The selected number of identical loads is of course marked in the network diagram and automatically factored in during a subsequent dimensioning cycle.

Network Design
How to create network elements – loads

If the data for the load circuits to be planned is not known in detail, you can still create them on the network diagram as **cumulated or dummy loads.**



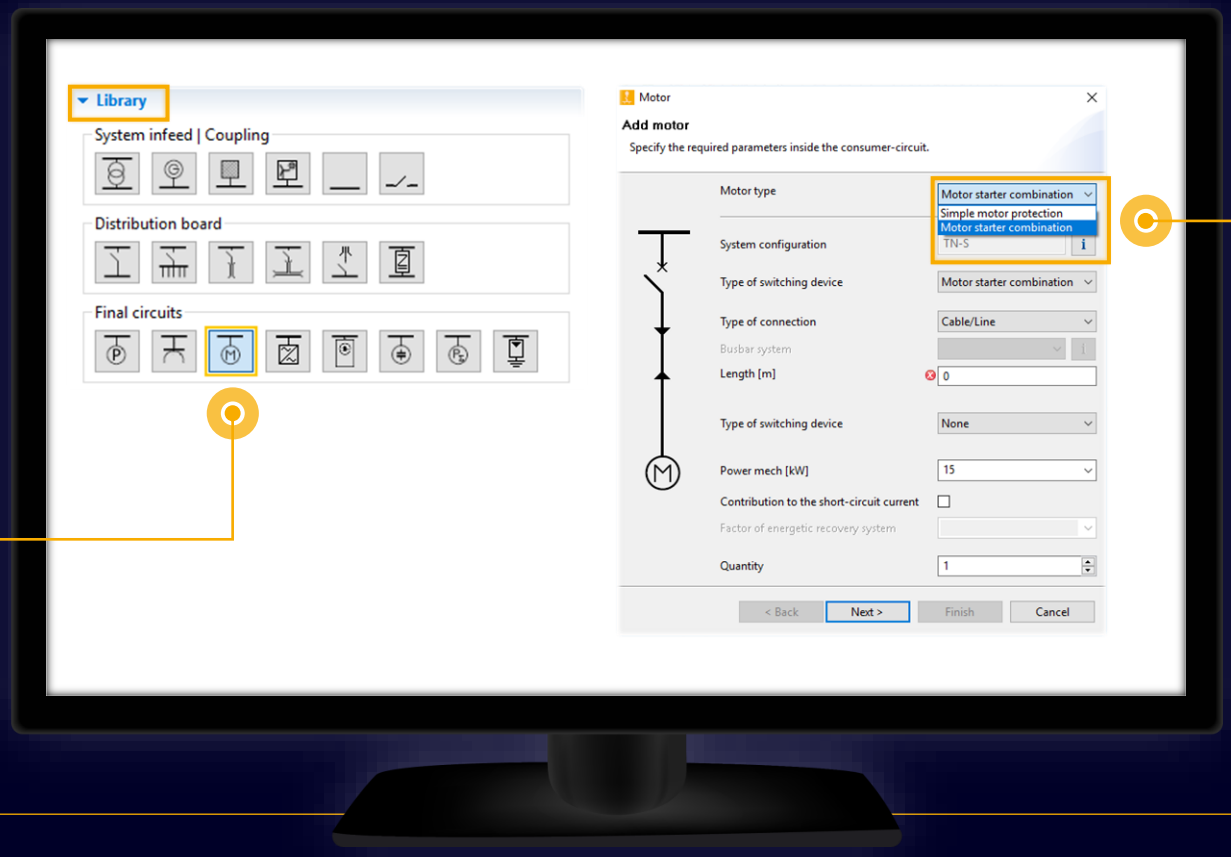
A dummy load is specified by its nominal current and the active power. Thus it also influences the energy balance during dimensioning. But switching devices or cables/lines are not dimensioned for a dummy load circuit!

Representation in the network diagram

Network Design

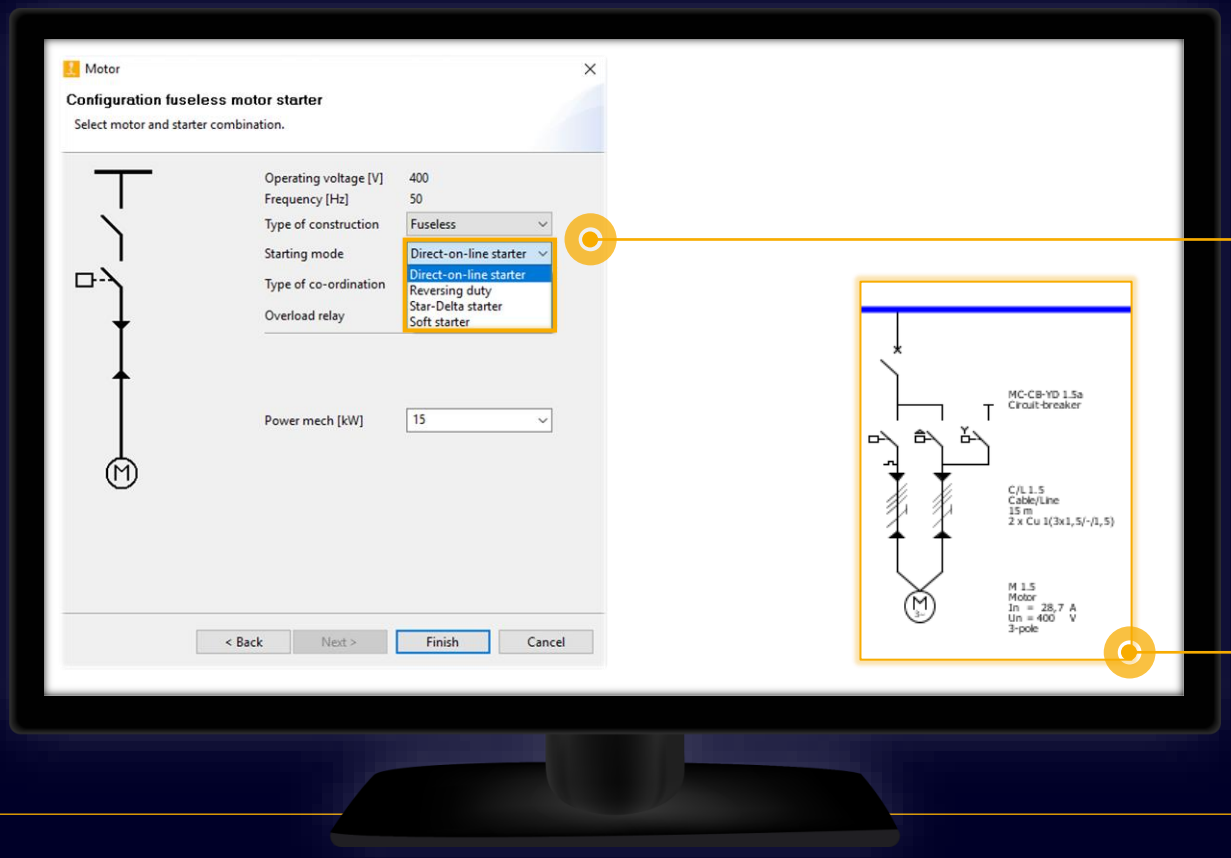
How to create network elements – loads

The "Motor" icon allows a **motor** or a **motor group** (several identical motors) to be connected to a main or sub-distribution board.



Besides mapping simple standard motor protection, you can also select and dimension **motor starter combinations** which are protected by circuit-breakers or fuses.

Network Design
How to create network elements – loads



If "**Motor starter combination**" was selected, the next dialog (Starting mode) allows to choose between

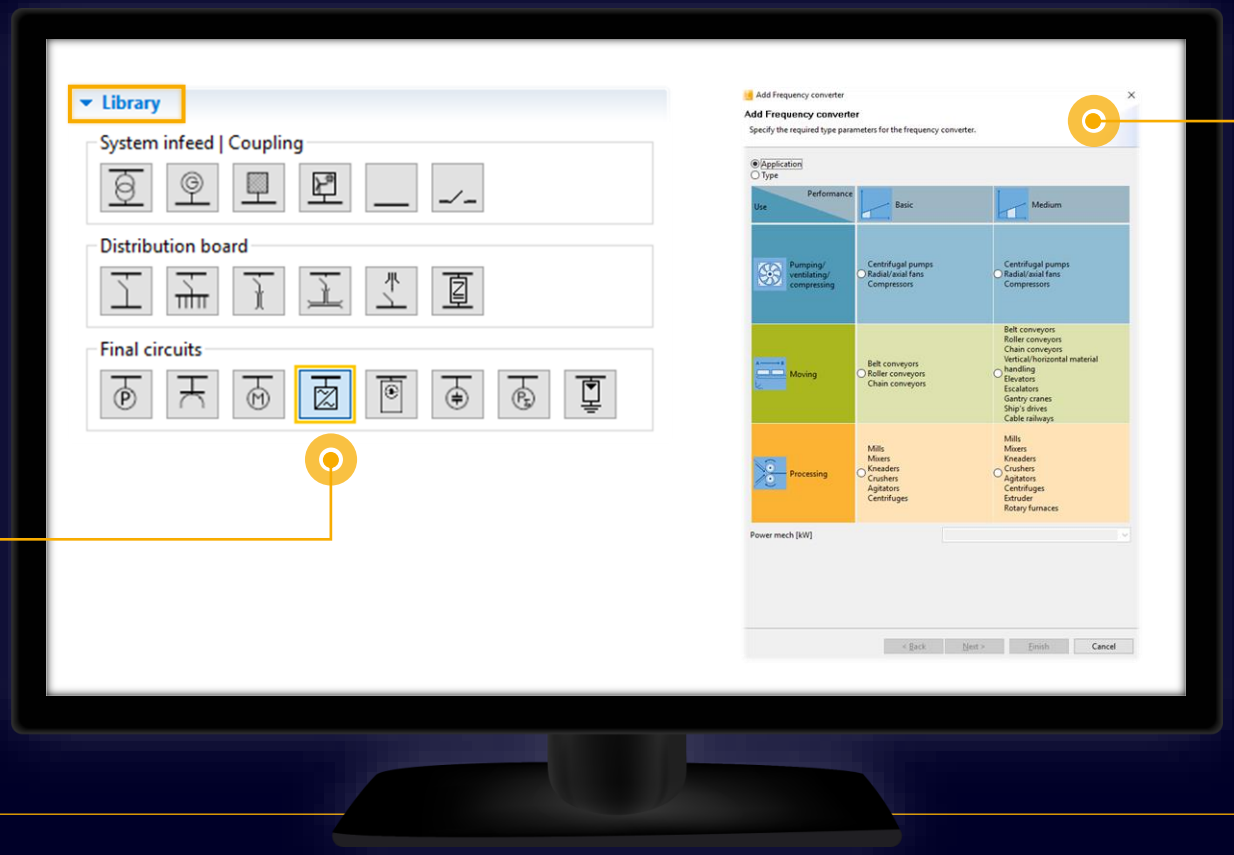
- Direct-on-line starter
- Starter for reversing mode
- Star-delta starter
- Soft starter

Representation of a star-delta starter on the network diagram

Network Design

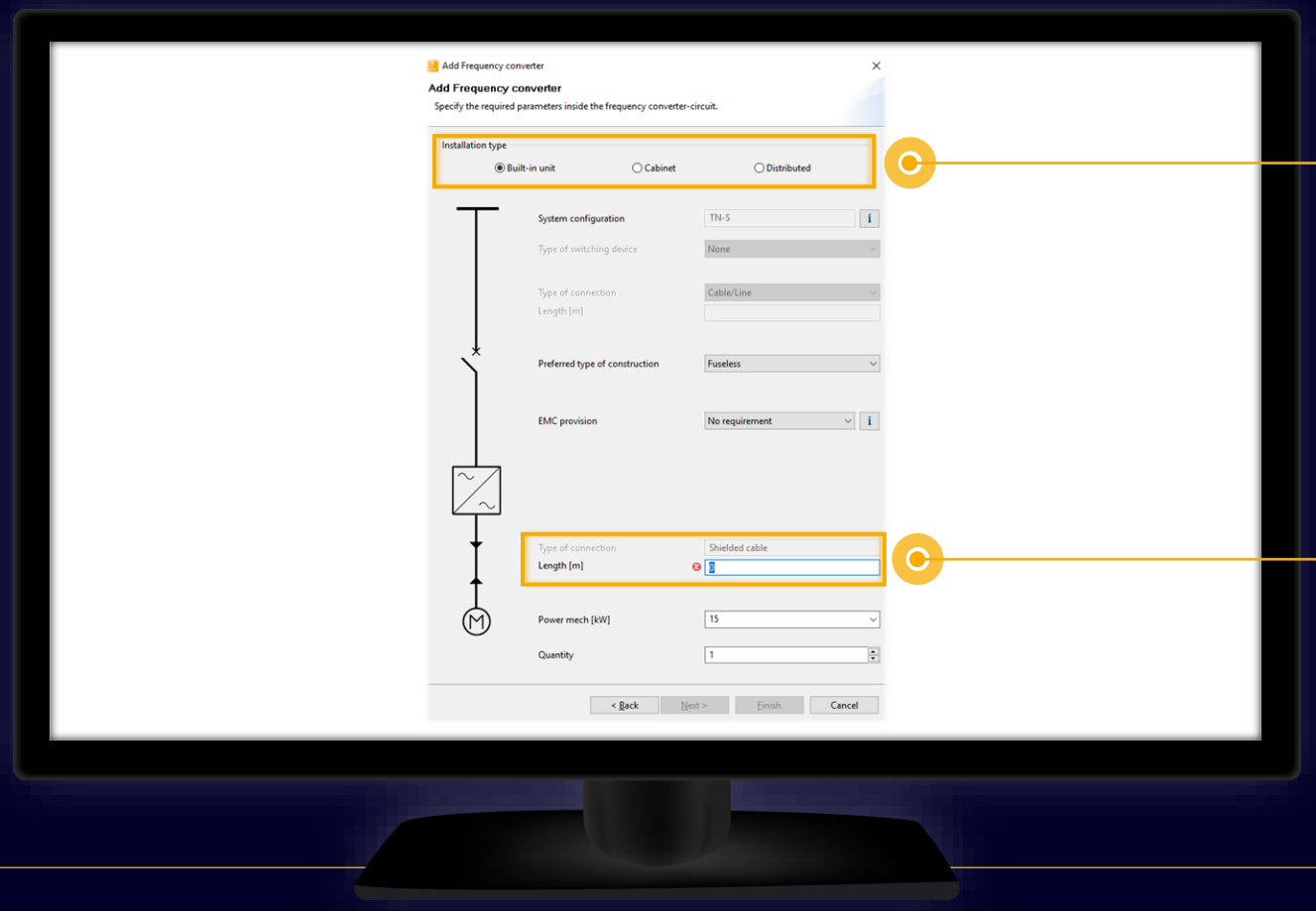
How to create network elements – loads

The "**Frequency converter**" icon allows a frequency converter to be connected to a main or sub-distribution board.



The type of **frequency converter** will be determined auto-matically by selection of classification, application and power.

Network Design
How to create network elements – loads



Having selected "Frequency converter" you can choose at **"type of construction"** between

- Built-in unit
- Cabinet unit

The **lengths** of the shielded cable between frequency converter and motor can be determined.

As cable cross-section the maximum connectable one is selected by default.

Network Design

How to create network elements – separated networks

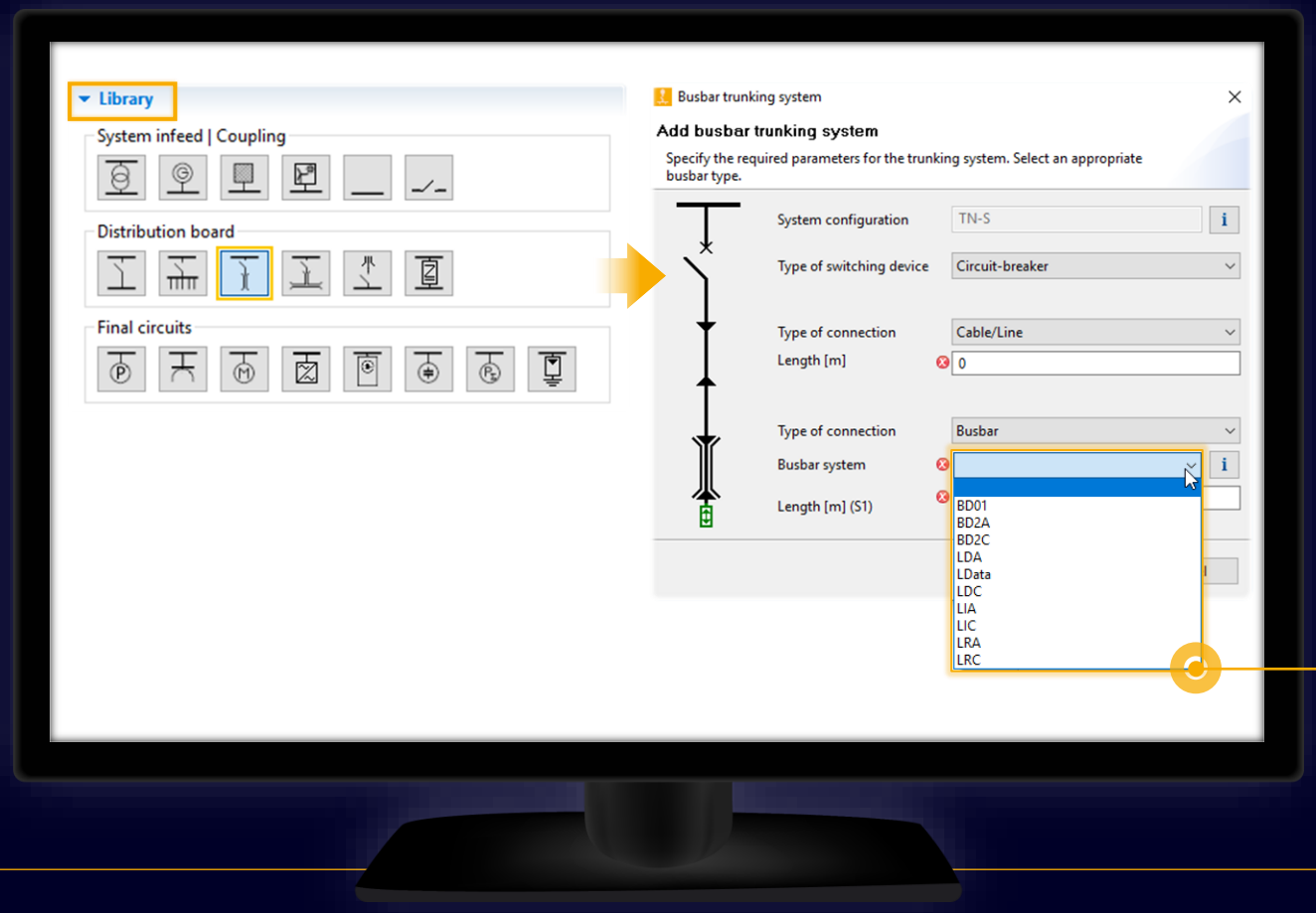
SIMARIS design professional allows to create several separate networks on the network diagram. The same medium-voltage specifications apply to these separate networks that were already made in the project definition.

Such **isolated networks** are either created within a project

- by building up individual networks separately,
- or by copying an existing network. To do so, place the mouse pointer on the main distribution board, call up the context menu (right mouse button), select "Copy" and then "Paste" in the context menu to place the network at the desired position on the network diagram with a left mouse click.

Network Design

How to create network elements – busbar systems and loads



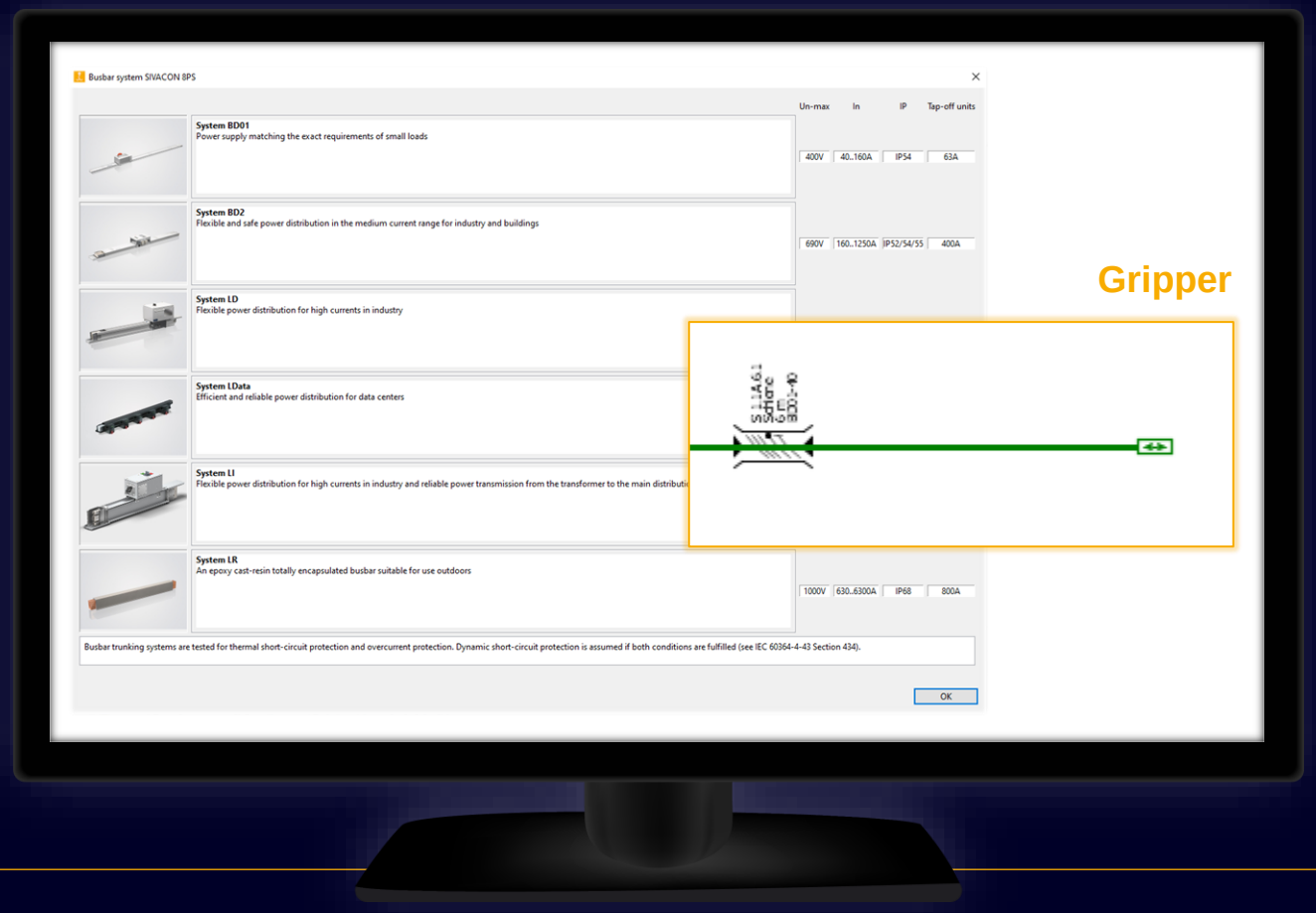
SIMARIS design also helps you integrate busbar systems for power transmission and distribution into your planning concept and displays them on the network diagram.

First, enable the "Busbar trunking system" icon in the Library,

- place the system at a suitable connection/insert point,
- specify the data that is still missing
- And select the matching busbar system

Network Design

How to create network elements – busbar systems and loads



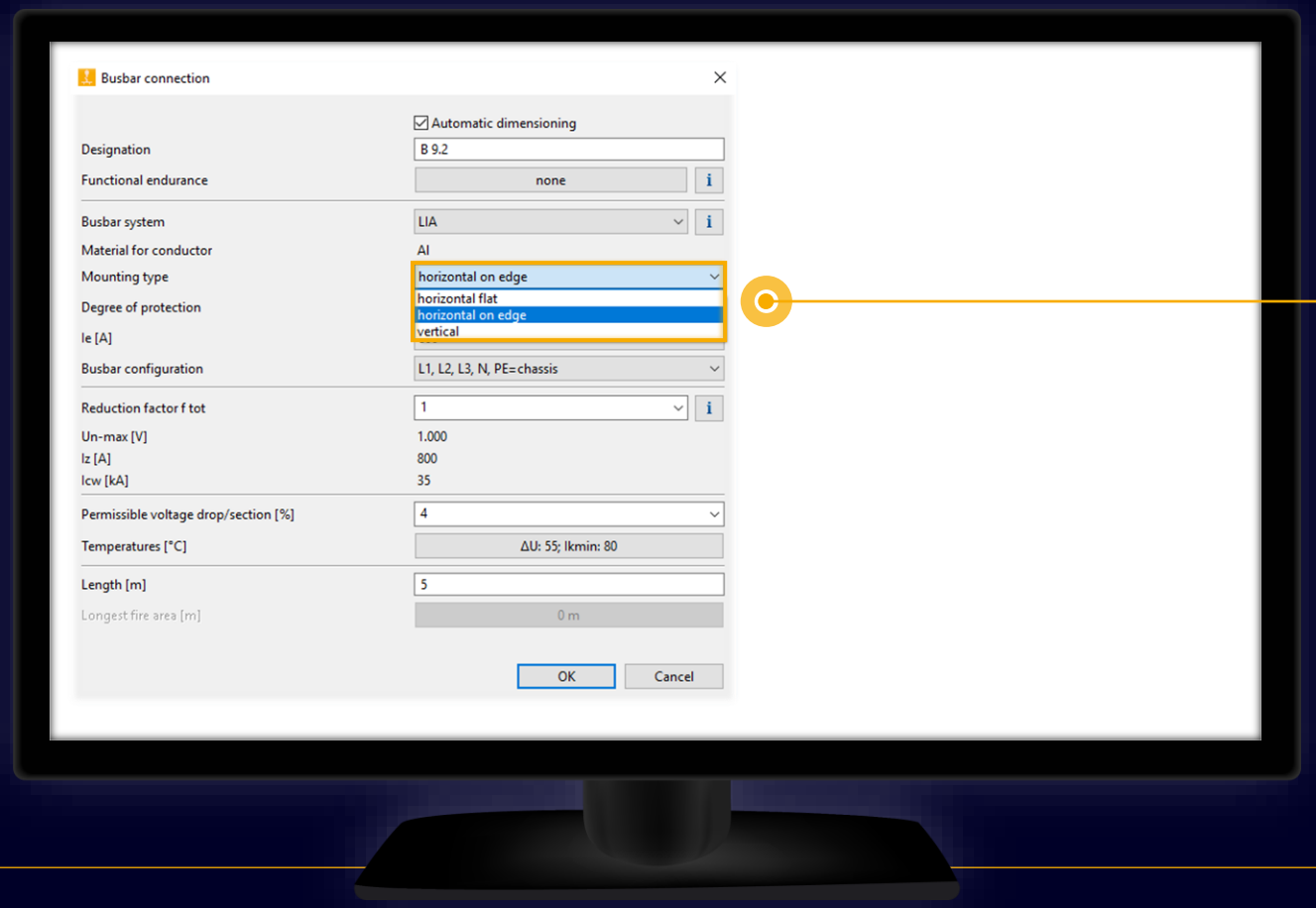
Having selected the busbar trunking system and defined its length, you can graphically edit it on the network diagram, e.g. by dragging the gripper with the mouse, thus elongating the busbar in the diagram.

ATTENTION

This elongation is just a graphical representation. The real busbar length, which is to be considered in network design, can only be changed in the Properties.

Network Design

How to create network elements – busbar systems and loads

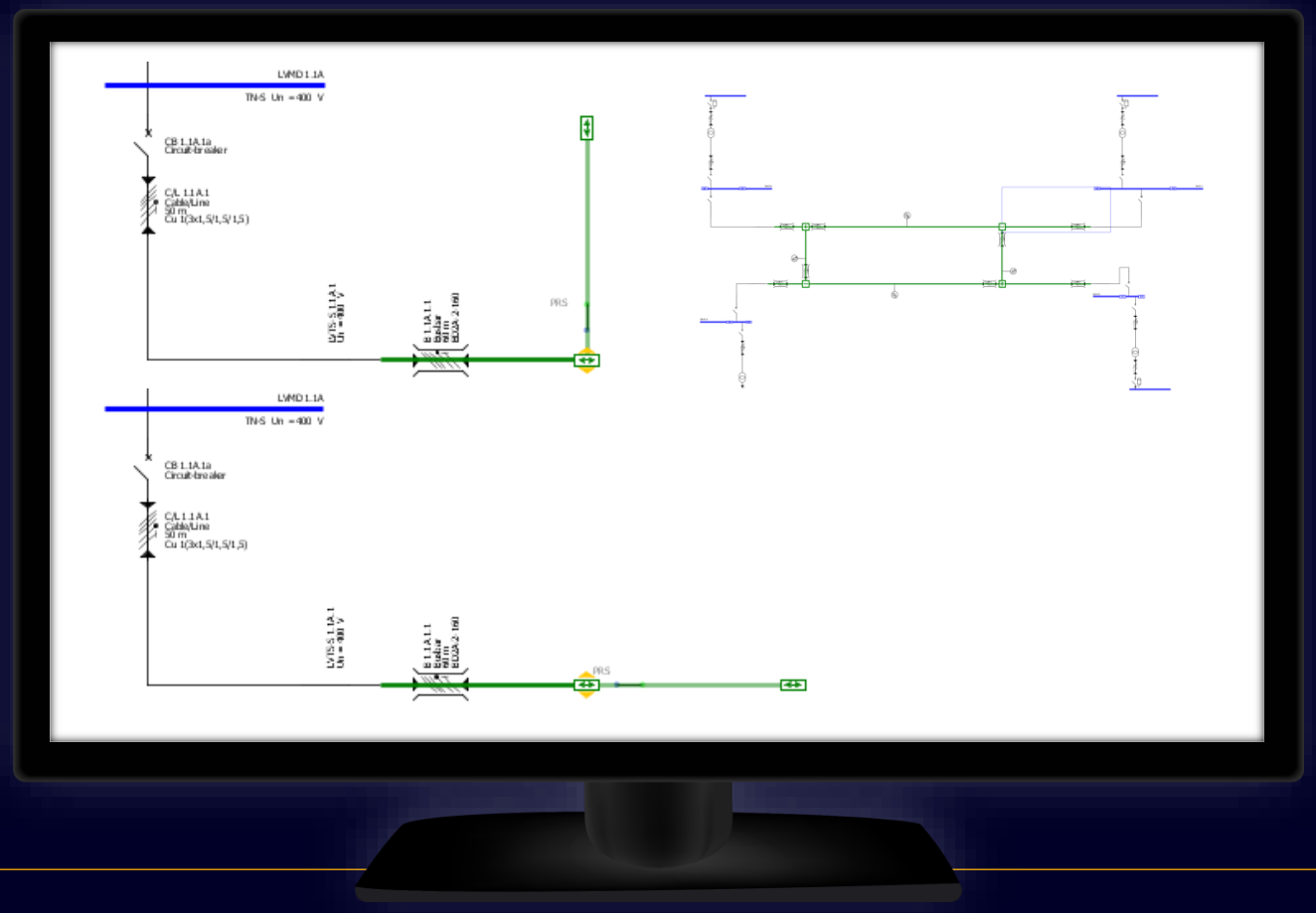


More busbar properties, such as degree of protection and mounting type, can be modified at any time.
To do so, position the mouse pointer on the item of equipment to be edited, e.g. the busbar, so that

- you can either change the equipment properties directly which are displayed on screen to the bottom left of the network diagram,
- or call up detailed properties using the context menu (right-click) and make the desired changes
in the dialog now displayed according to project requirements.

Network Design

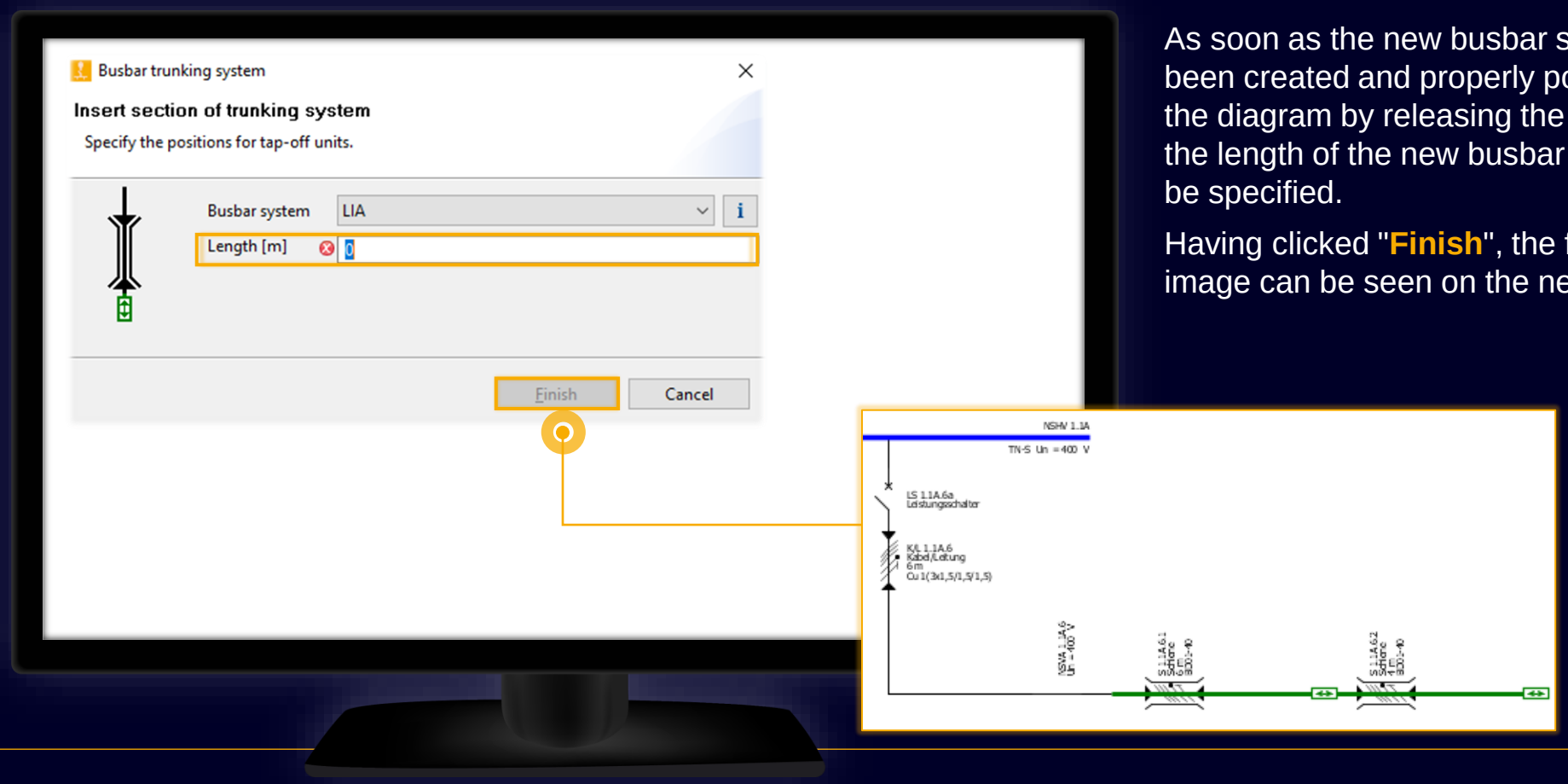
How to create network elements – busbar systems and loads



- As required, you can also **add more busbar sections** of the same system by first dragging the gripper vertically to the busbar which was drawn.
- Then, **the new busbar section can be aligned in the same direction as the original one** by dragging the mouse towards the elongated line of the first busbar while keeping the mouse button pressed.

Network Design

How to create network elements – busbar systems and loads

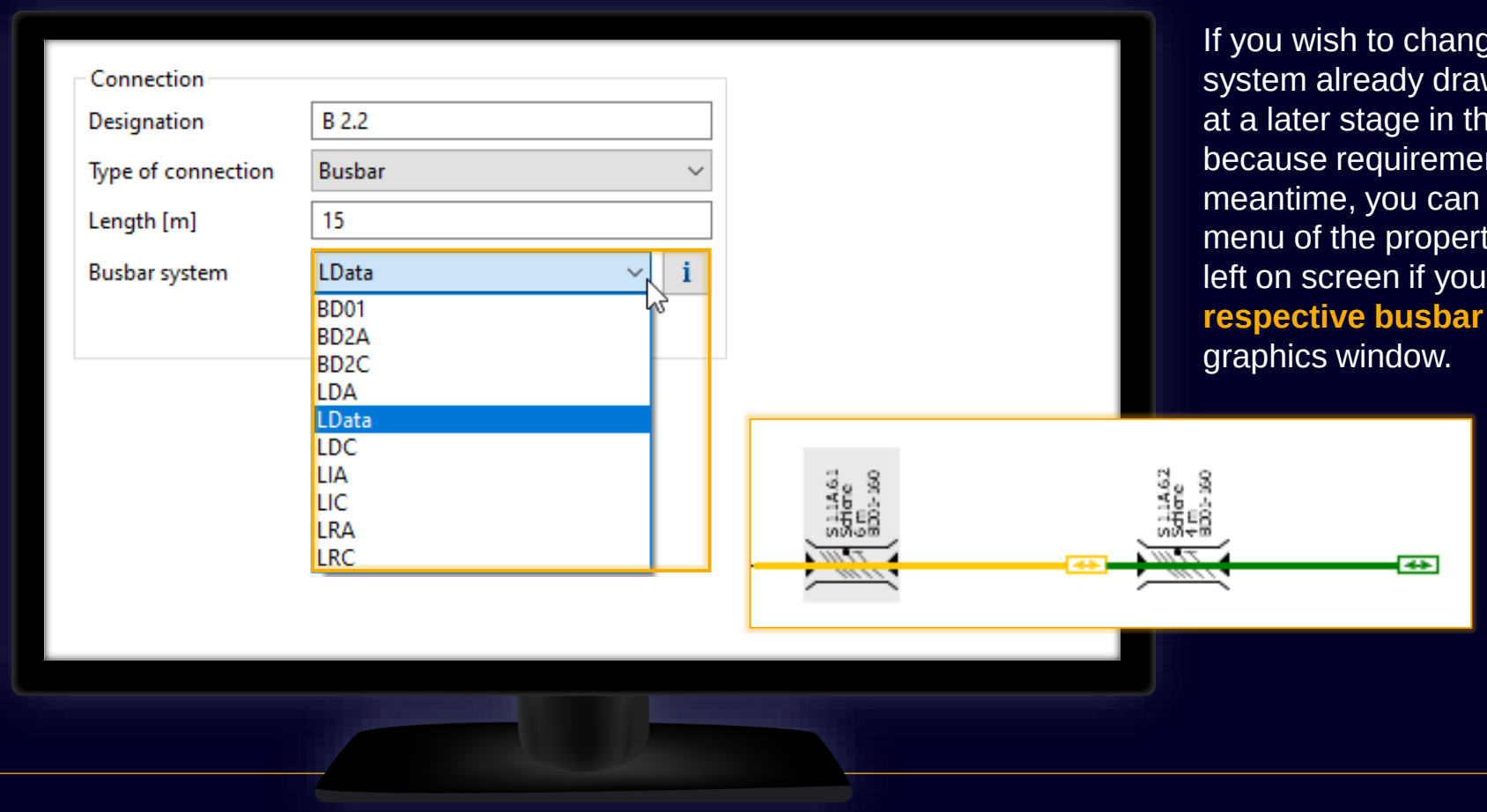


As soon as the new busbar section has been created and properly positioned on the diagram by releasing the mouse button, the length of the new busbar section must be specified.

Having clicked "**Finish**", the following image can be seen on the network diagram.

Network Design

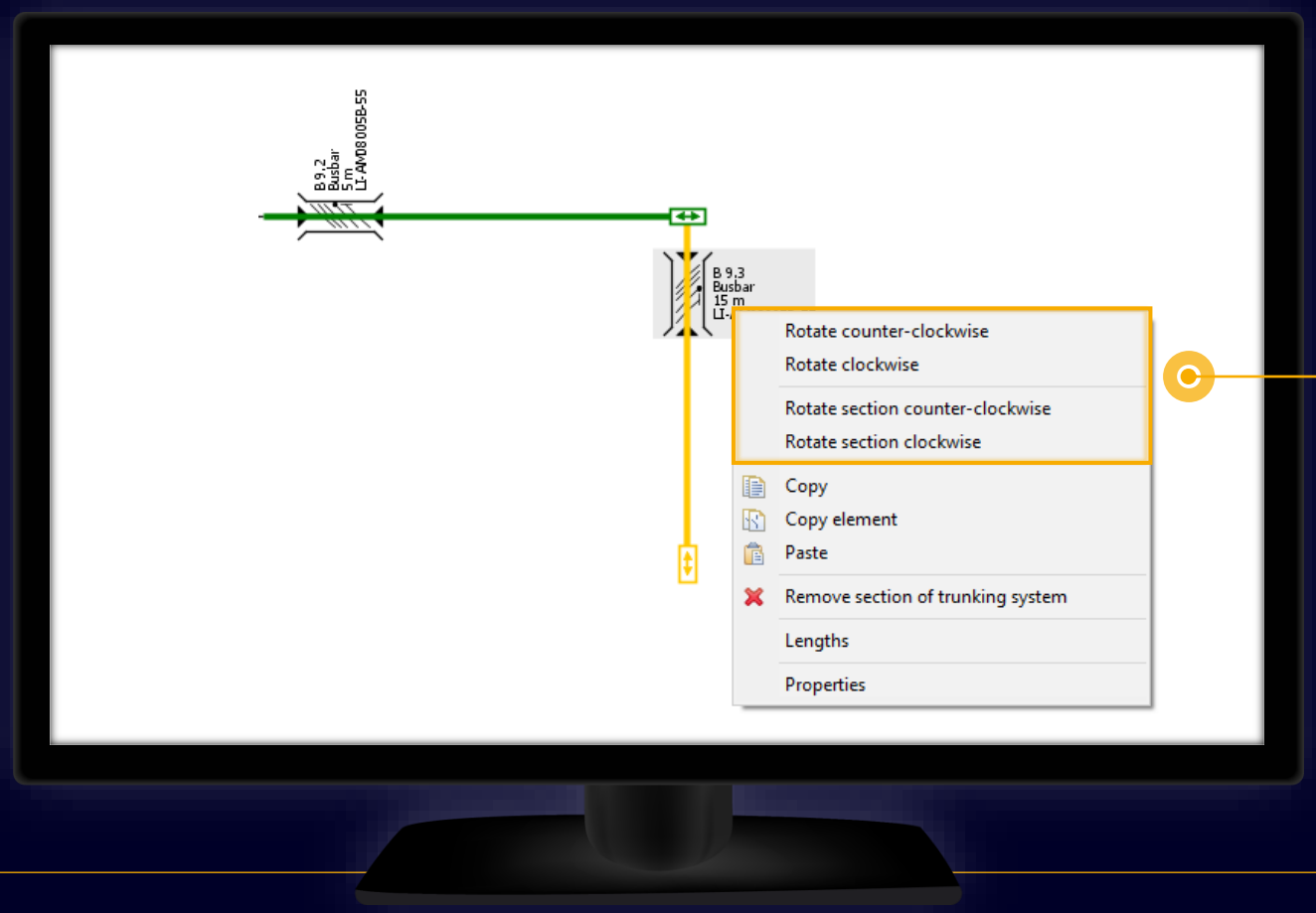
How to create network elements – busbar systems and loads



If you wish to change the type of a busbar system already drawn on the network diagram at a later stage in the planning process, because requirements have changed in the meantime, you can do so in the drop-down menu of the properties displayed at the bottom left on screen if you have marked the **respective busbar (yellow line)** in the graphics window.

Network Design

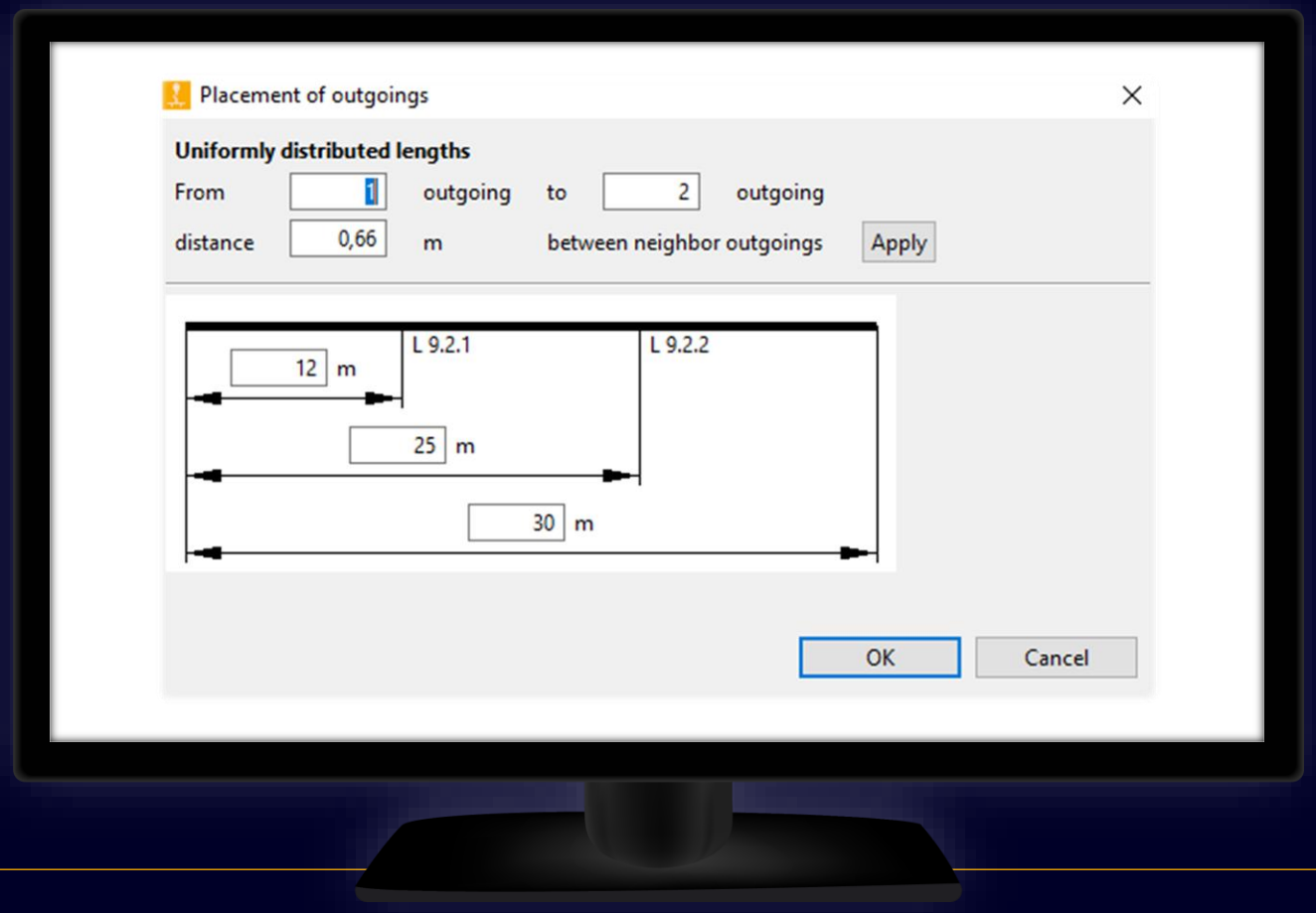
How to create network elements – busbar systems and loads



You can also adjust the **graphical layout of busbars** by calling up the corresponding functions for rotating the marked section, or rotating the entire busbar layout, from the context menu with a right mouse click.

Network Design

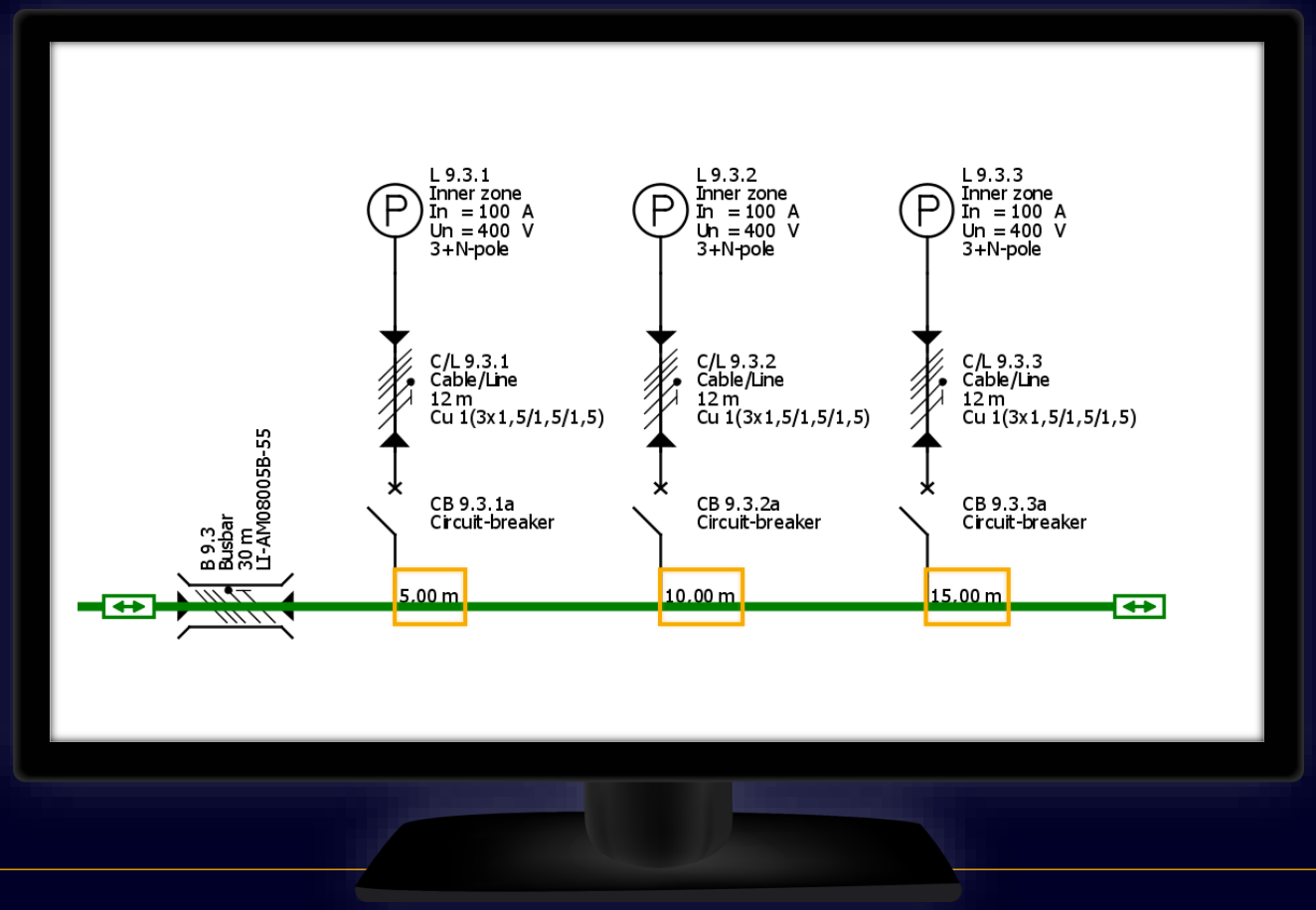
How to create network elements – busbar systems and loads



- After you have added and specified busbar trunking systems, load circuits can be connected to the busbars in the manner described above.
- If you connect more than one load circuit, the distance of circuits from the starting point of the busbar section must be defined for every load circuit.

Network Design

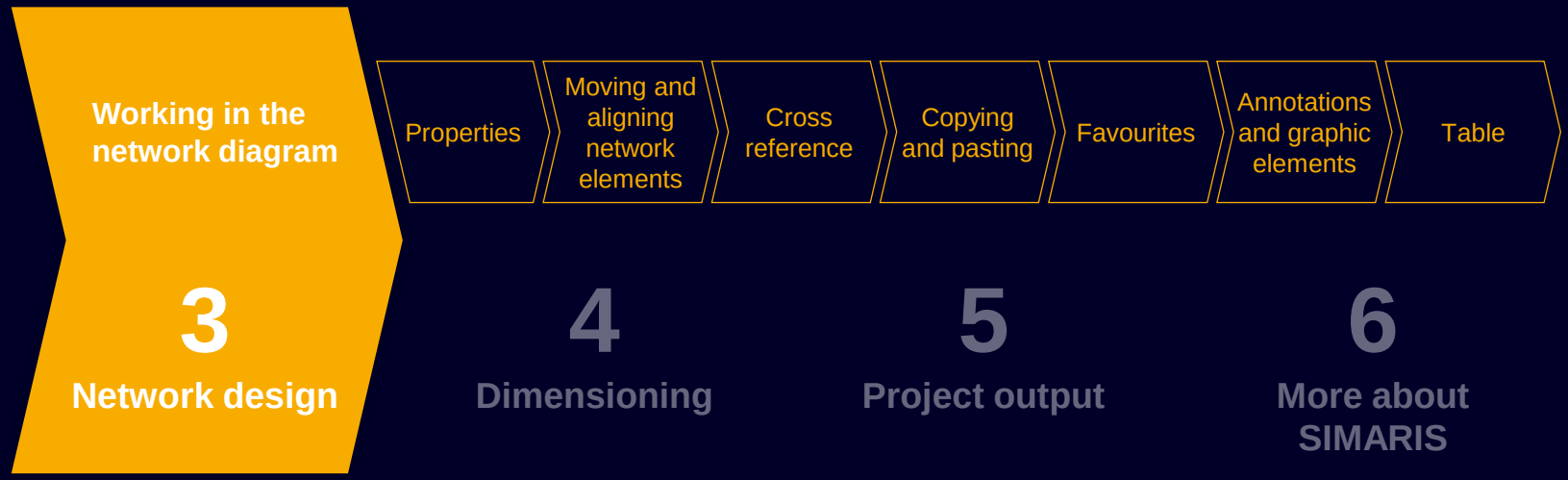
How to create network elements – busbar systems and loads



The real distances are indicated in the graphics as busbar labels.

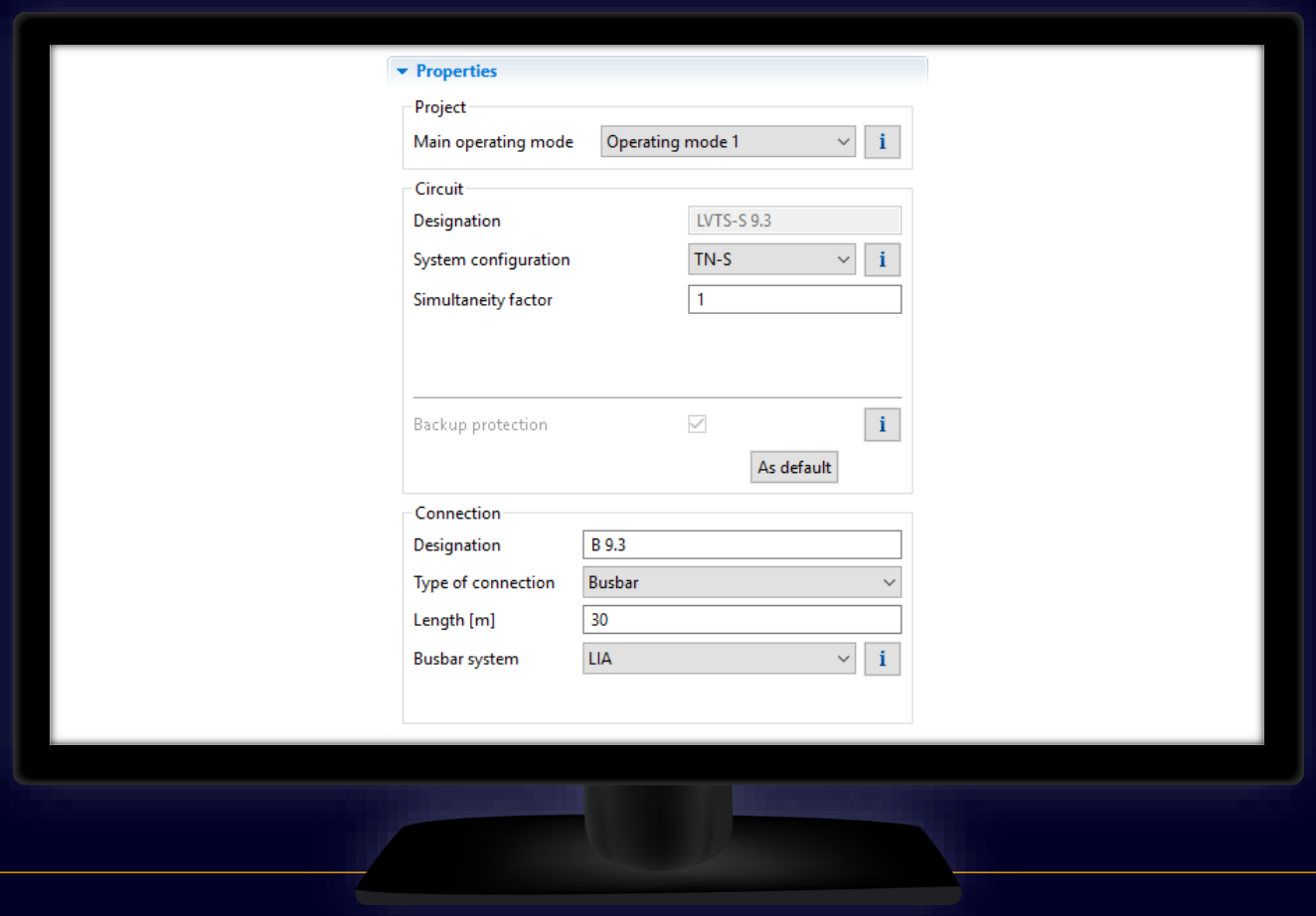
START

Network design



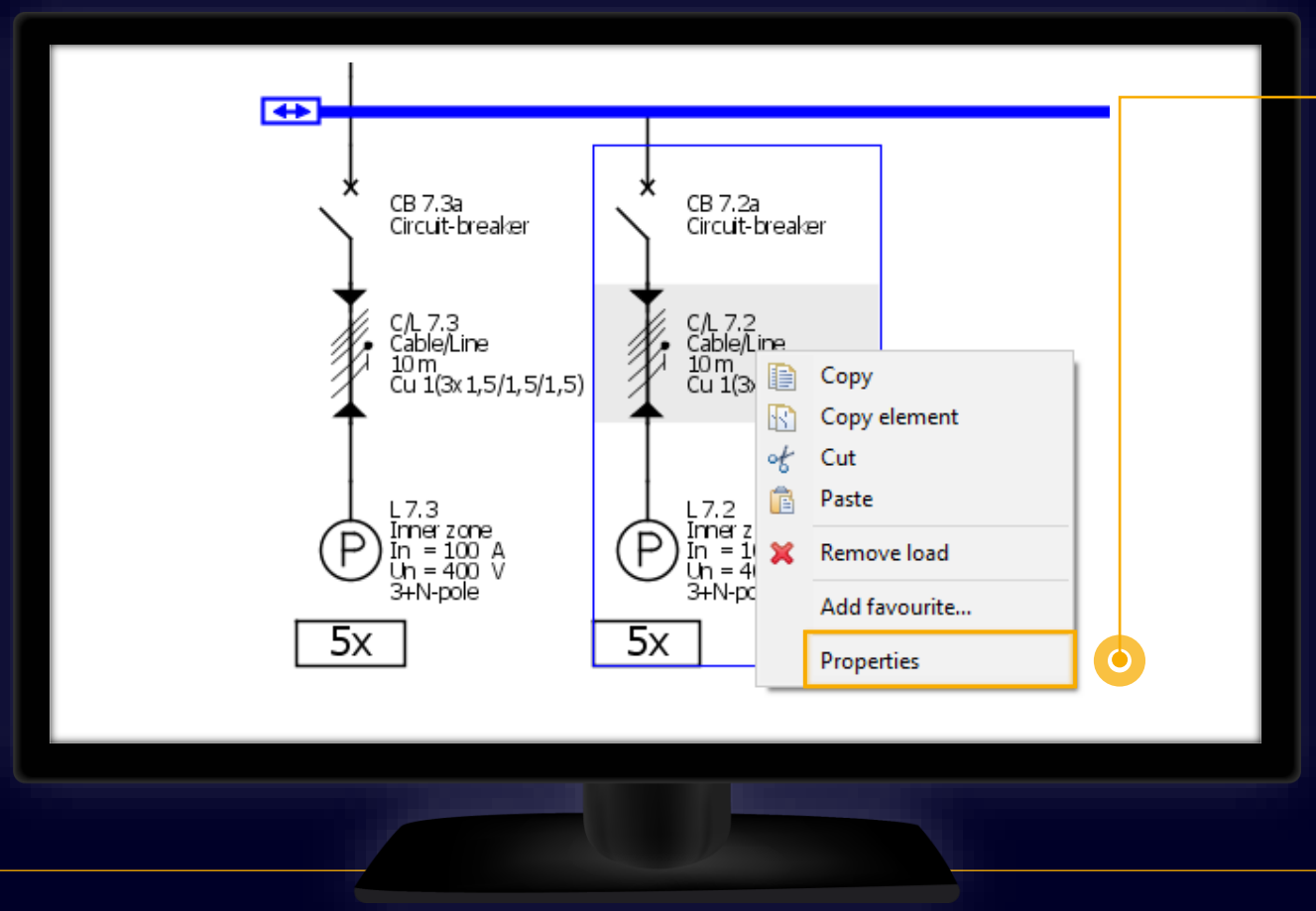
SIEMENS

Network Design
Working in the network diagram – properties



The **properties** of each element on the network diagram can be modified by marking the element and adjusting its characteristics in the Properties section (bottom left screen area) by appropriate selections or value input.

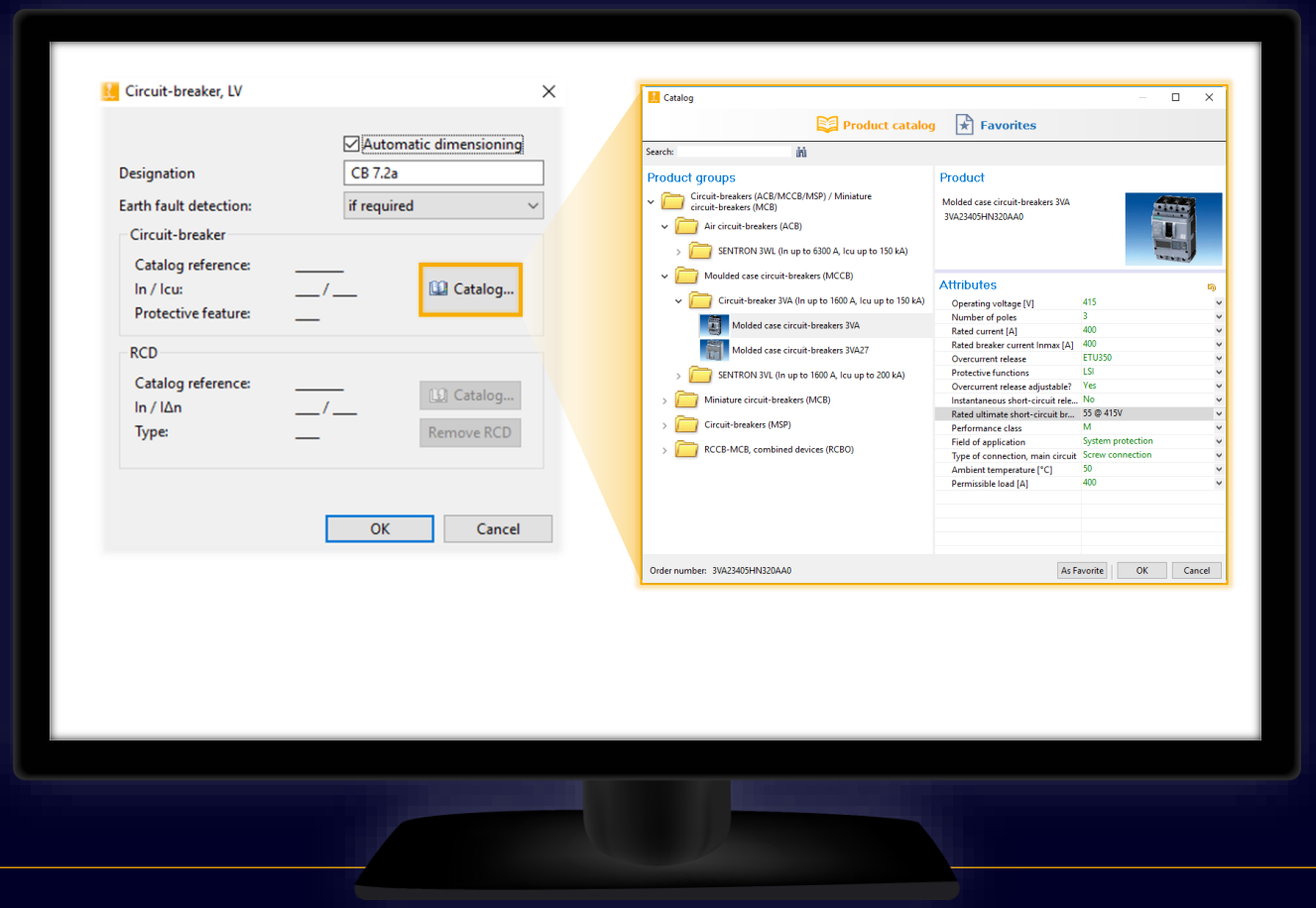
Network Design
Working in the network diagram – properties



Another possibility is opening the "**Properties**" window by marking the element on the network diagram and selecting "Properties" from the context menu (right mouse button).

- This option is available both for switching devices and fuses, that also applies to busbars and cables/wires, for examples.
- This allows to choose a different specification for devices and items of equipment that have already been specified in the automatic dimensioning process.

Network Design
Working in the network diagram – properties

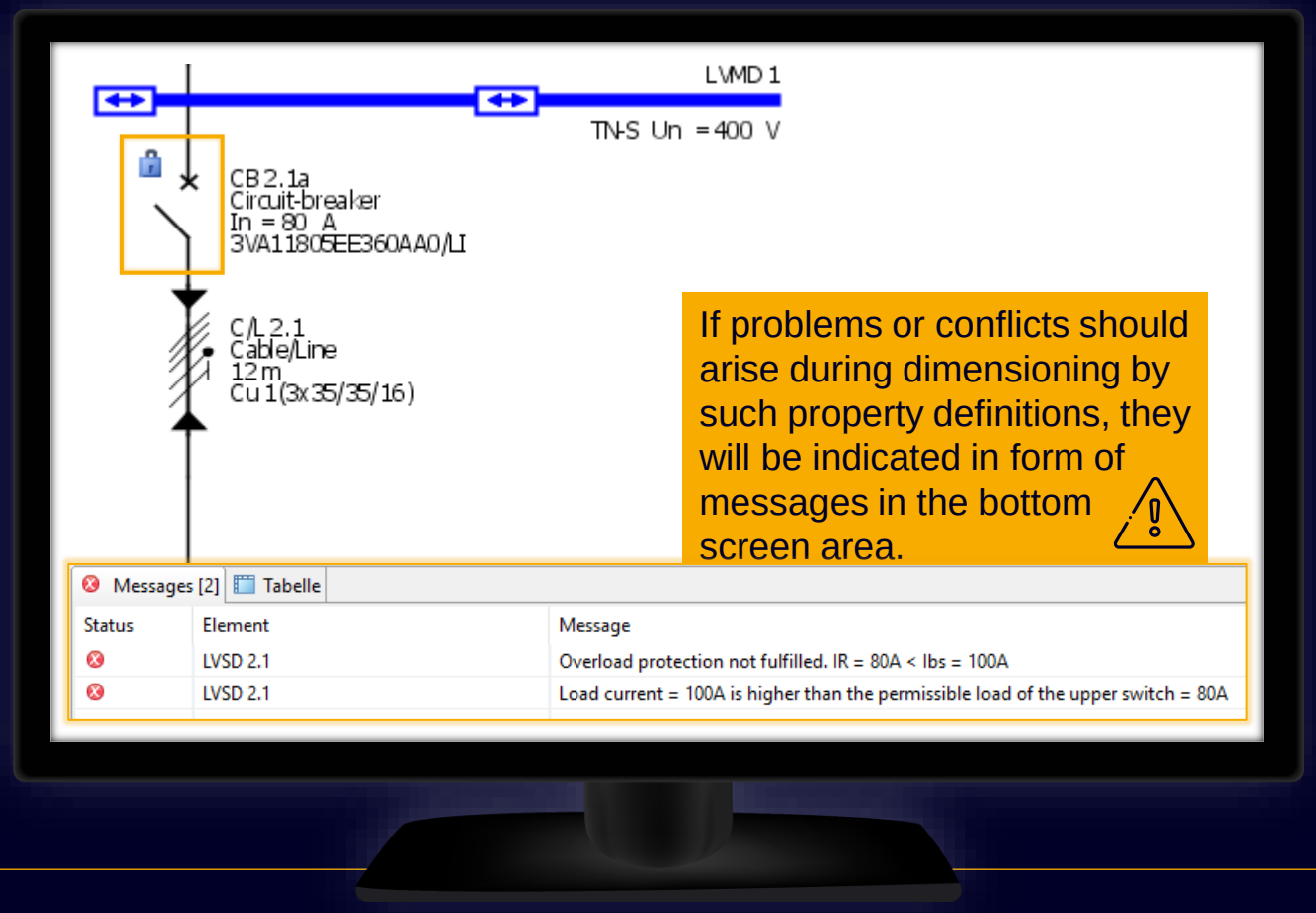


Devices can be manually specified again, e.g. after their "**Properties**" were called up from the product catalogue integrated into the software.

In the **product catalogue**, a specification is made based on the technical data that can be selected on the right.

If the order number of the desired device is known, the Product tree can also be searched directly using the Search function at the top left of the display.

Network Design
Working in the network diagram – properties

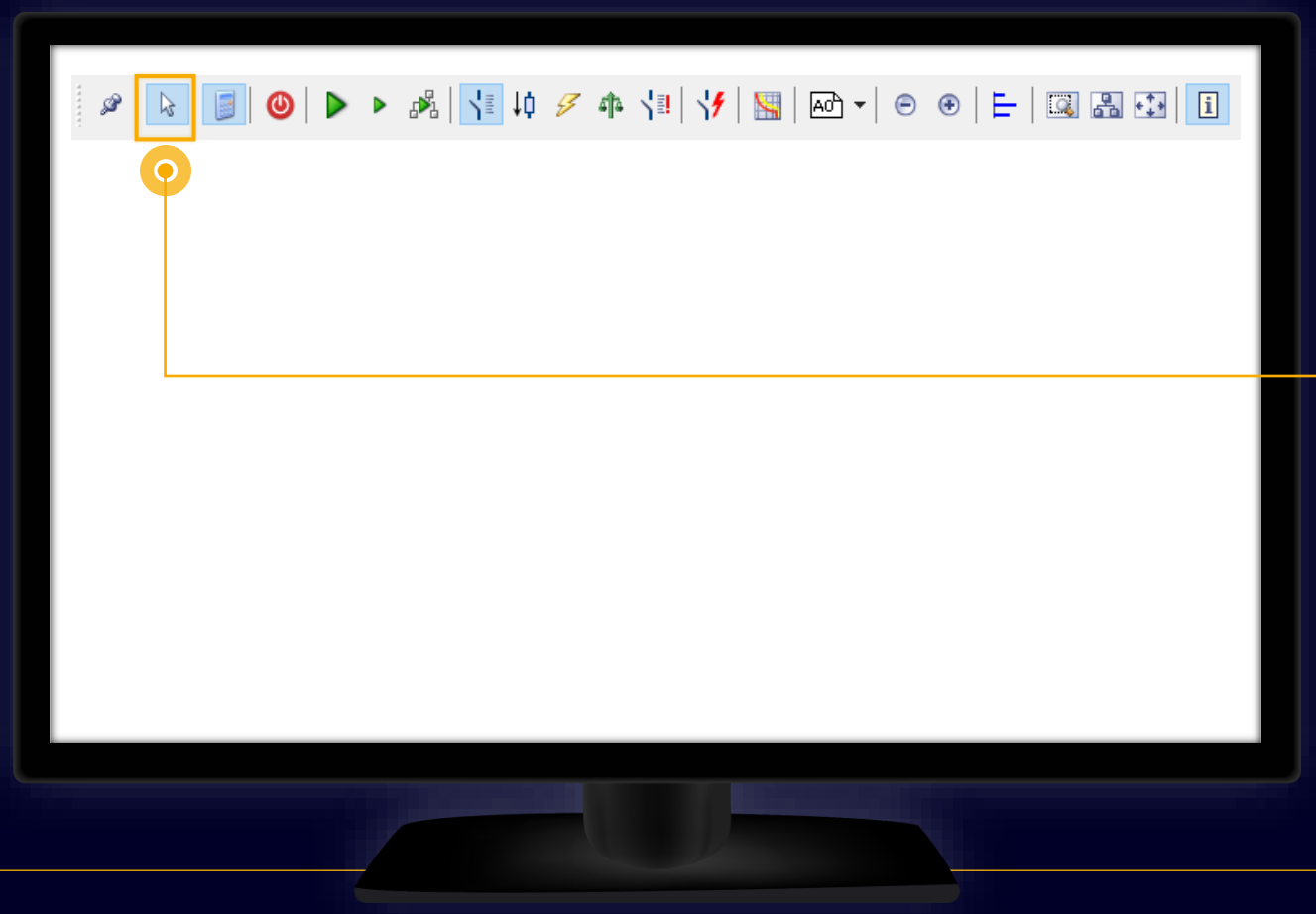


A specific selection in the product catalogue dismisses the automatic device selection, and the manually specified switching device will not be modified by the next dimensioning of the network.

This is indicated in the network diagram by a padlock symbol next to the device.

Network Design

Working in the network diagram – moving and aligning network elements



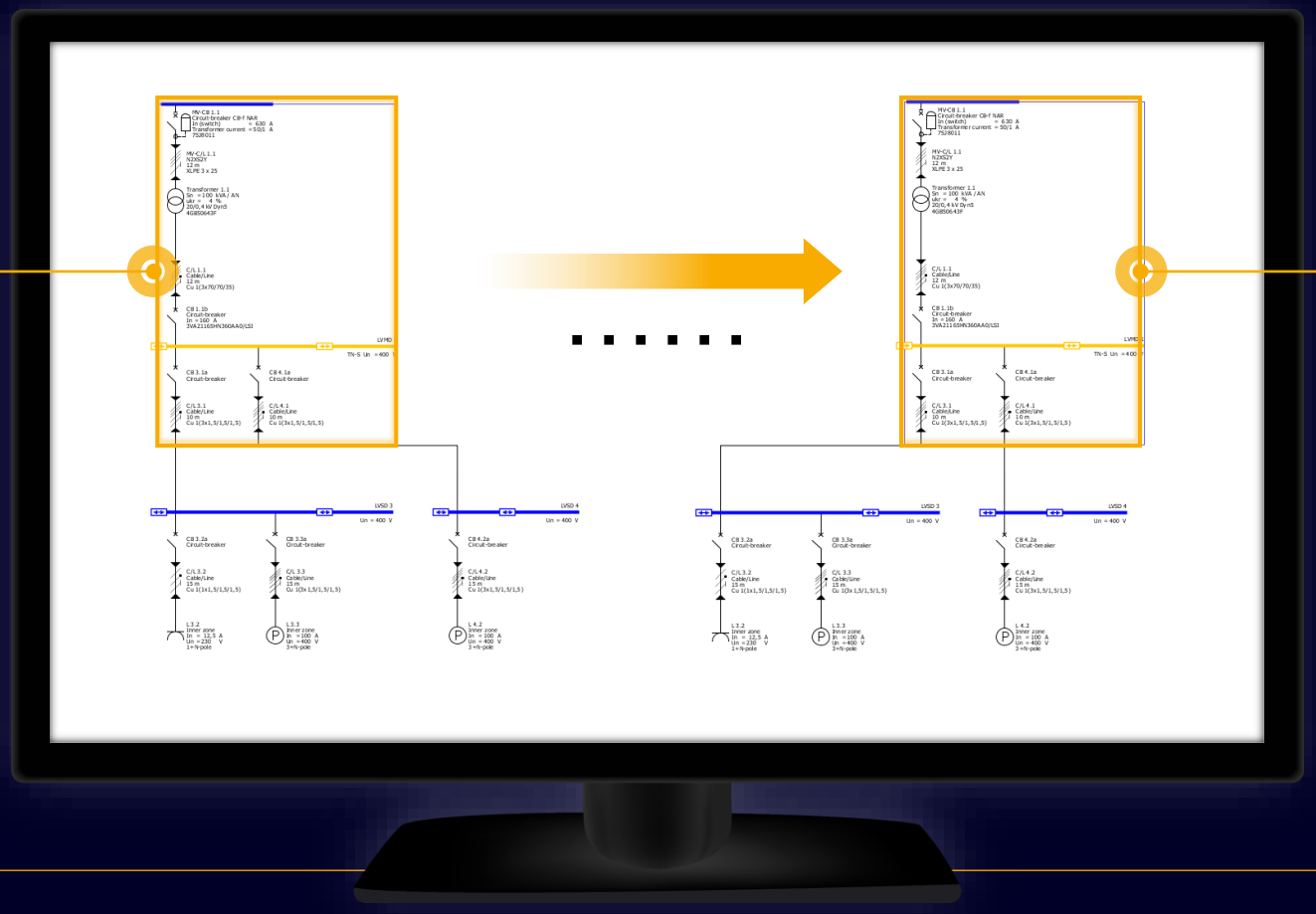
The circuits created on the network diagram can be arranged and moved around as desired.

To do so, first enable the "**selection mode**" by clicking the arrow icon on the tool bar.

Network Design

Working in the network diagram – moving and aligning network elements

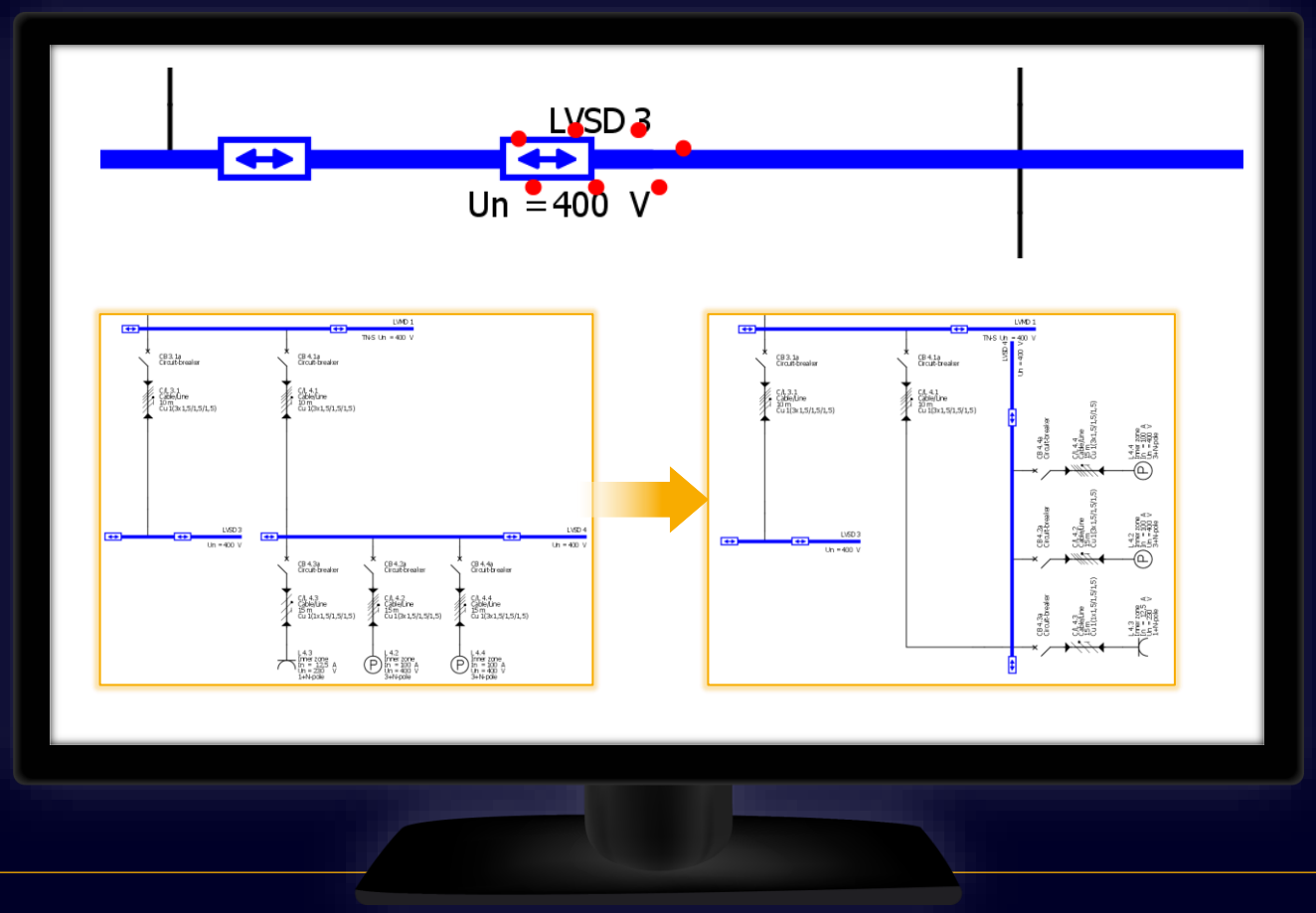
Now mark a circuit or a busbar trunking system by left-clicking the circuit (= blue/green line → turns yellow, mouse pointer changes into crosshairs inside the marking).



Another click into the marking (blue frame) while keeping the mouse button pressed moves around the entire circuit in the graphics.
The connection lines to the other parts of the network will be automatically redrawn after the move operation.

Network Design

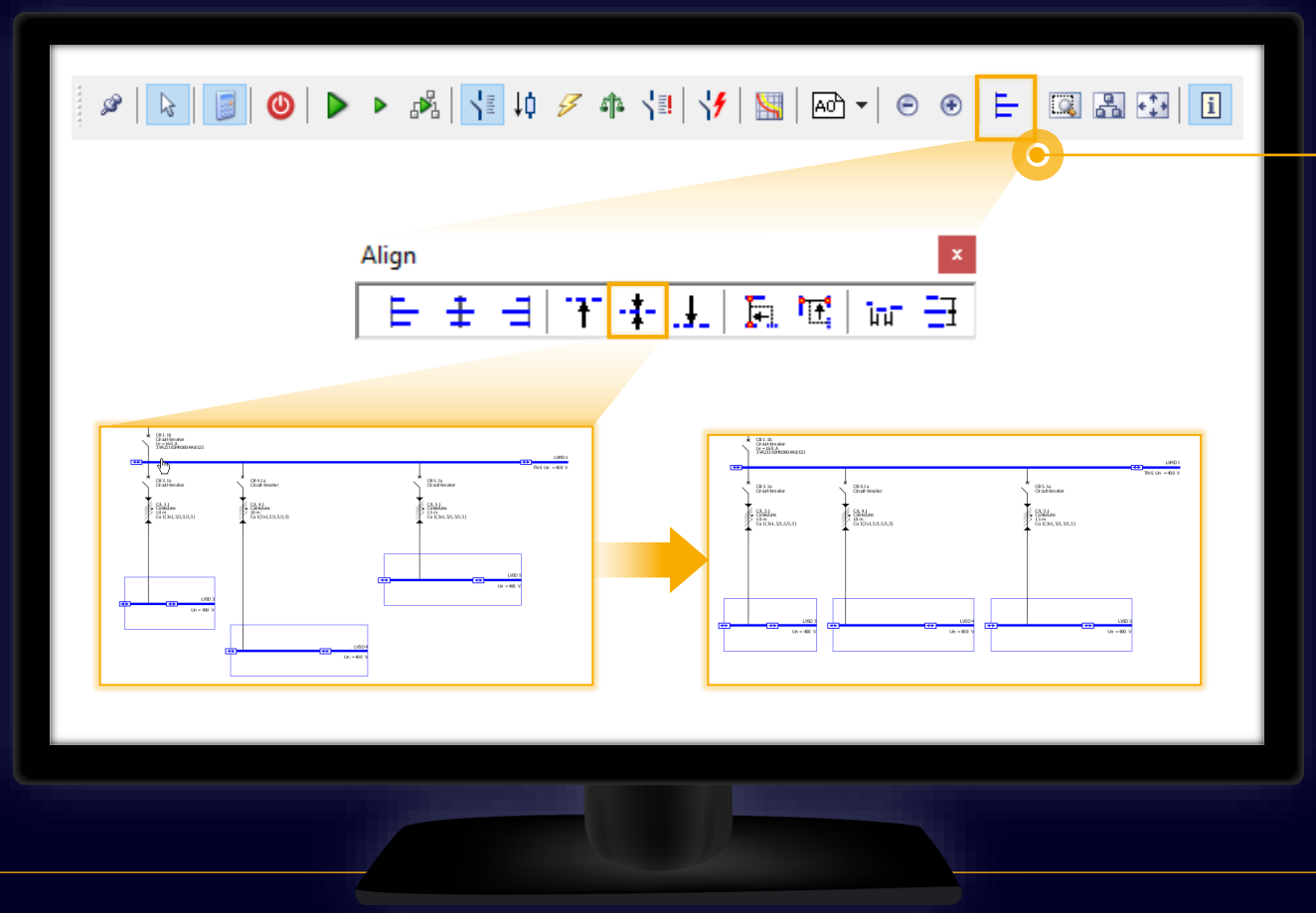
Working in the network diagram – moving and aligning network elements



- When two elements overlap in the drawing, this is shown by a red dashed line in the graphics in order to indicate that there is no electrical connection in this area.
- Use the context menu (right mouse button) to rotate marked elements on the network diagram.
  For busbar trunking systems, this is also explained in the "**Busbar systems and loads**" section.

Network Design

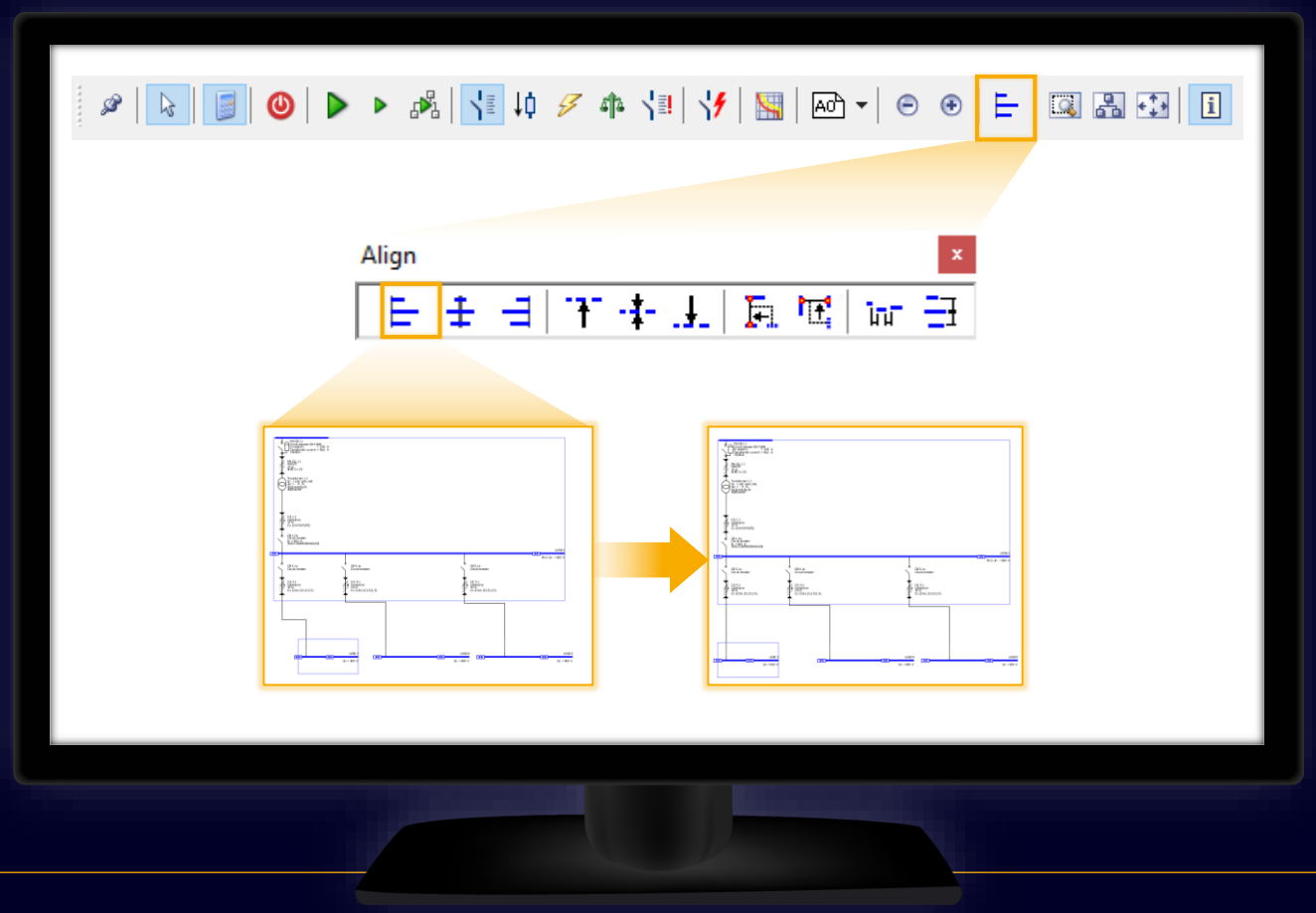
Working in the network diagram – moving and aligning network elements



There are more automatic functions for **aligning elements** on the network diagram which can also be called up from the tool bar.

Network Design

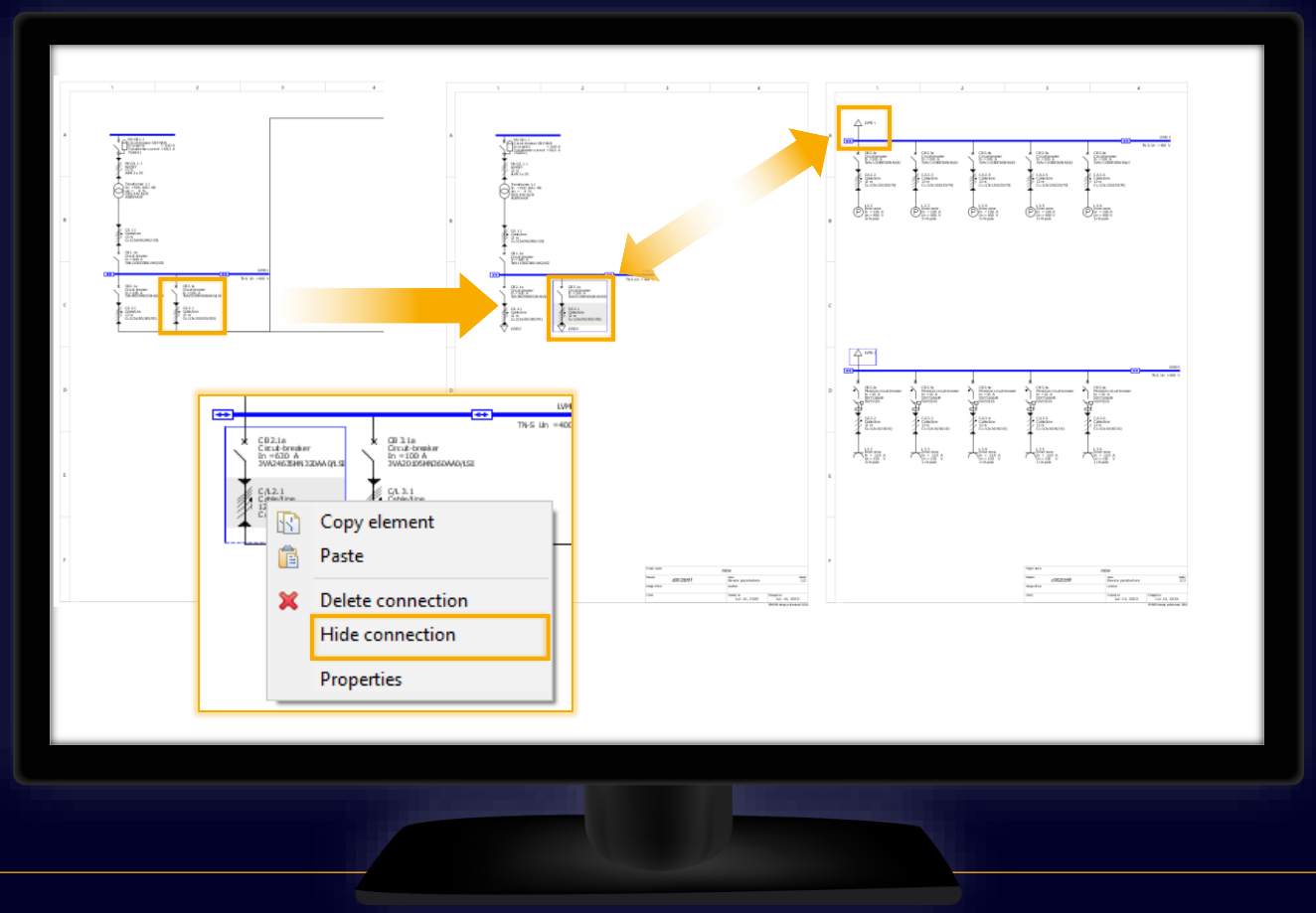
Working in the network diagram – moving and aligning network elements



Or you can align elements to the left, by marking the respective elements and performing the align action.

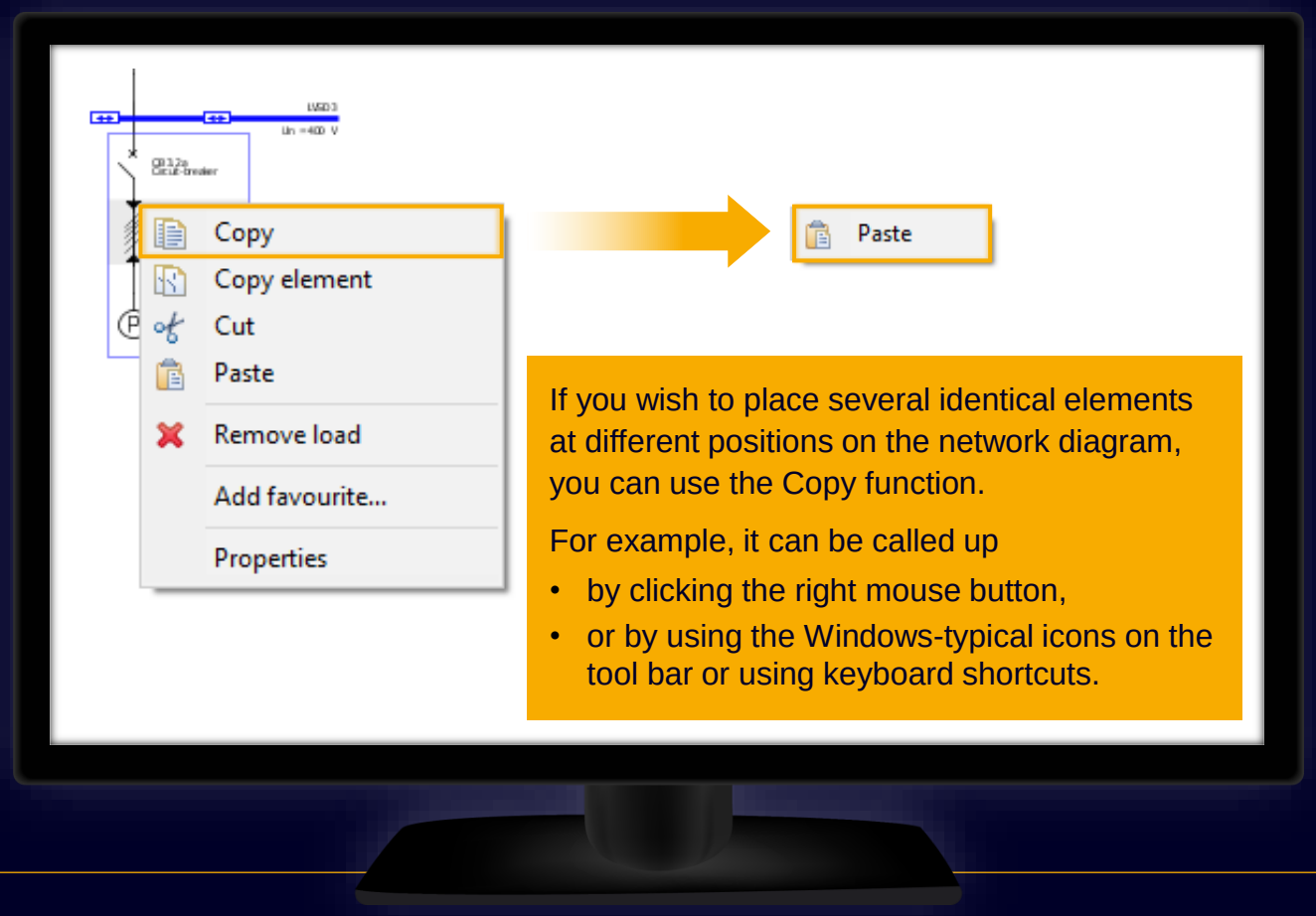
Network Design

Working in the network diagram – cross reference



Another option is to hide the connections from distributors by marking the connection in the network plan and selecting Hide the connection in the context menu. A cross reference is being created and by clicking on the **symbol** △ you can jump to the connected part. This is another way to design a well-organized network plan. The connection can be re-established immediately by right-mouse-click.

Network Design
Working in the network diagram – copying and pasting



If you wish to place several identical elements at different positions on the network diagram, you can use the Copy function.

For example, it can be called up

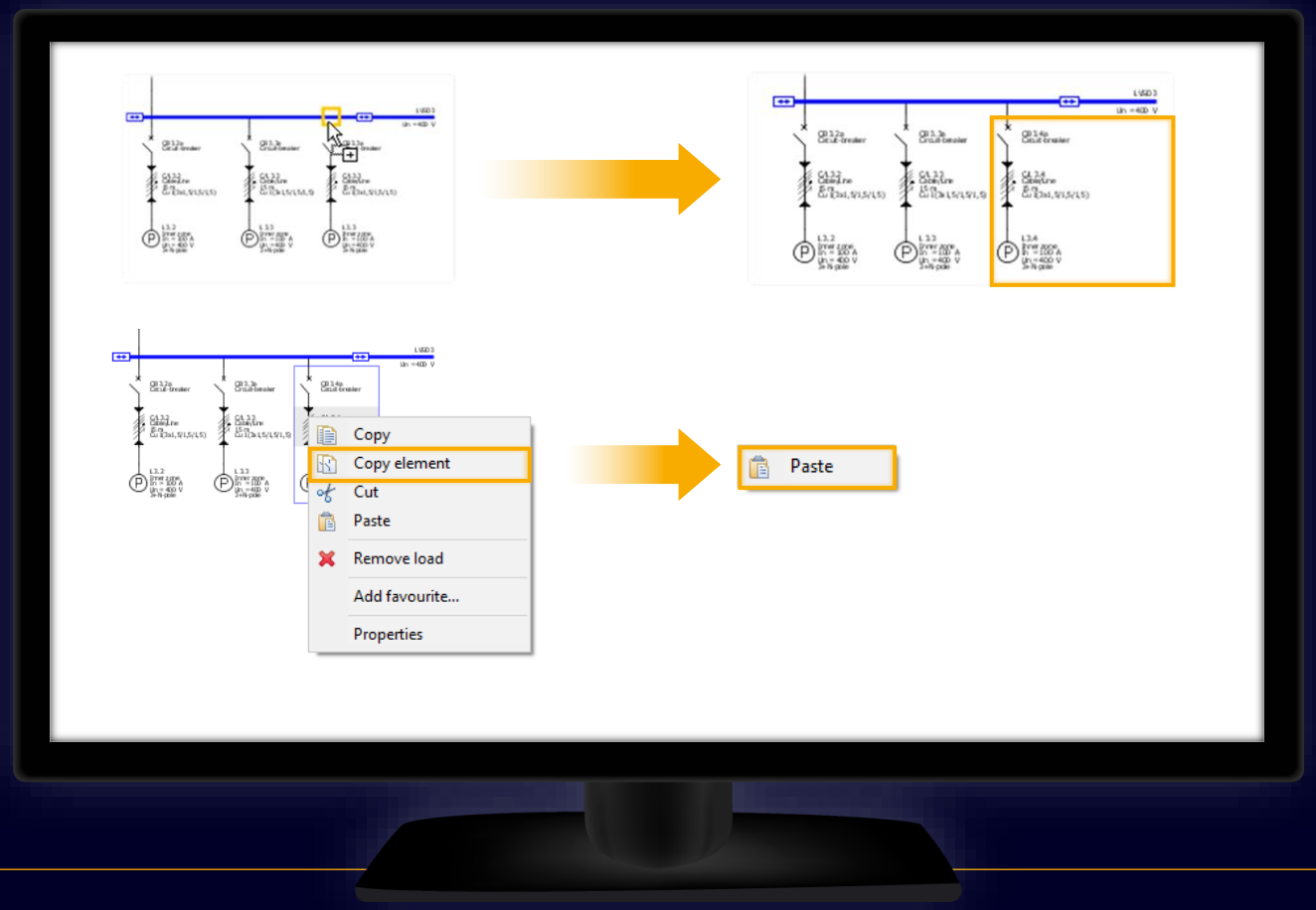
- by clicking the right mouse button,
- or by using the Windows-typical icons on the tool bar or using keyboard shortcuts.

Please note that you have the option **to copy entire circuits** (e.g. load circuits or sub-distribution systems) and insert them at another position into the network by

- first copying the element to be duplicated onto the clipboard using the context menu (right mouse button),
- and enabling the copied element with another right click and selecting "**Paste**"...

Network Design

Working in the network diagram – copying and pasting



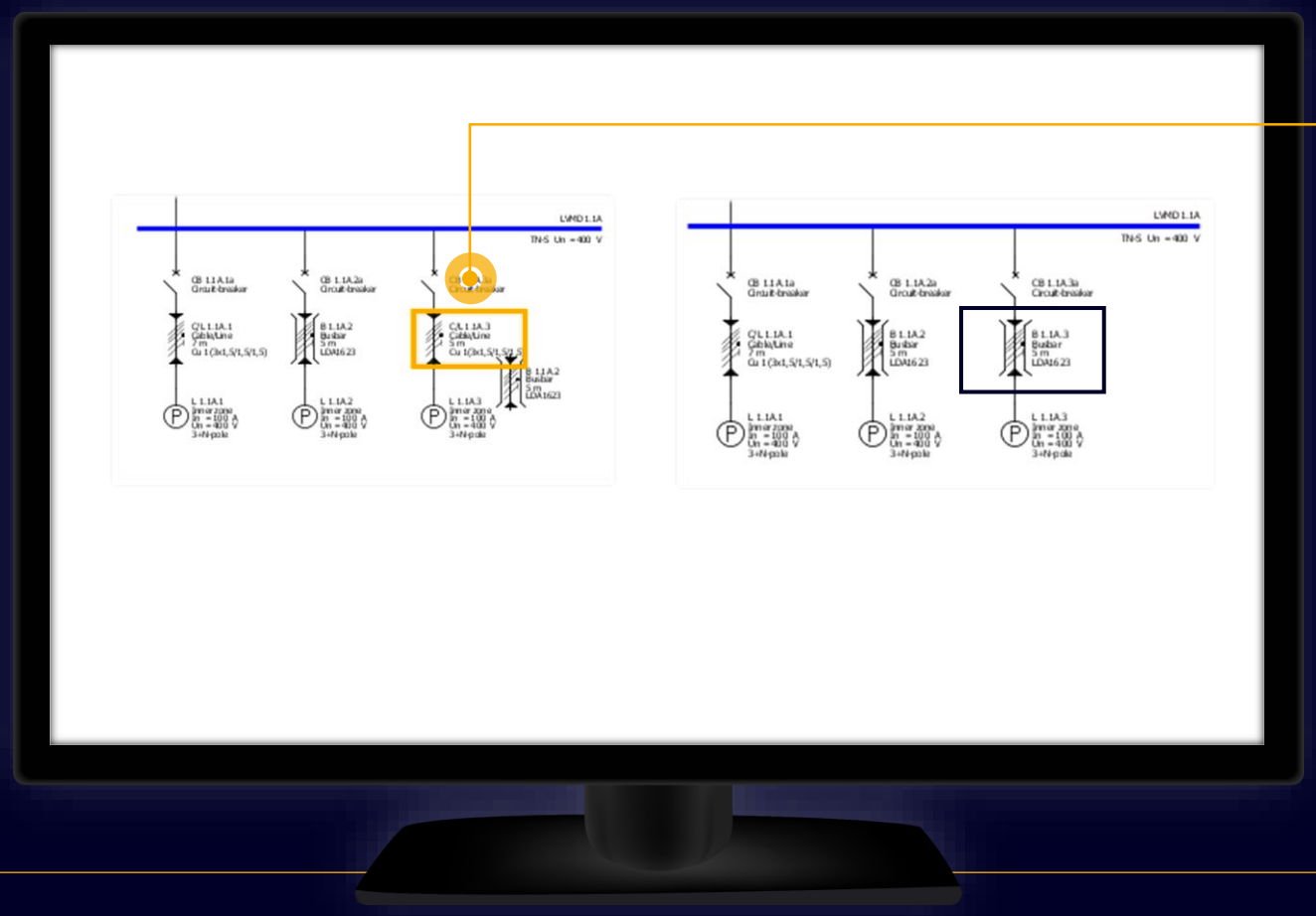
…and then dropping the element at the desired position on the network diagram by left-clicking and dragging it to an insert point with the left mouse button pressed.

But individual elements of a circuit, such as a switching device or busbar section, can be copied and pasted to another circuit:

- copy the element with the help of the context menu (right mouse button),
- and paste it via the context menu
- then left-click to place it in the desired circuit as a substitute for the previously displayed item. Suitable elements on the network diagram that can be replaced are marked by a yellow frame upon mouseover.

Network Design

Working in the network diagram – copying and pasting



…Then left-click to place it in the desired circuit as a substitute for the previously displayed item. Suitable elements on the network diagram that can be replaced are marked by a yellow frame upon mouseover.

You also have the option to copy entire networks, see "**Separate networks**".

Network Design
Working in the network diagram – favourites

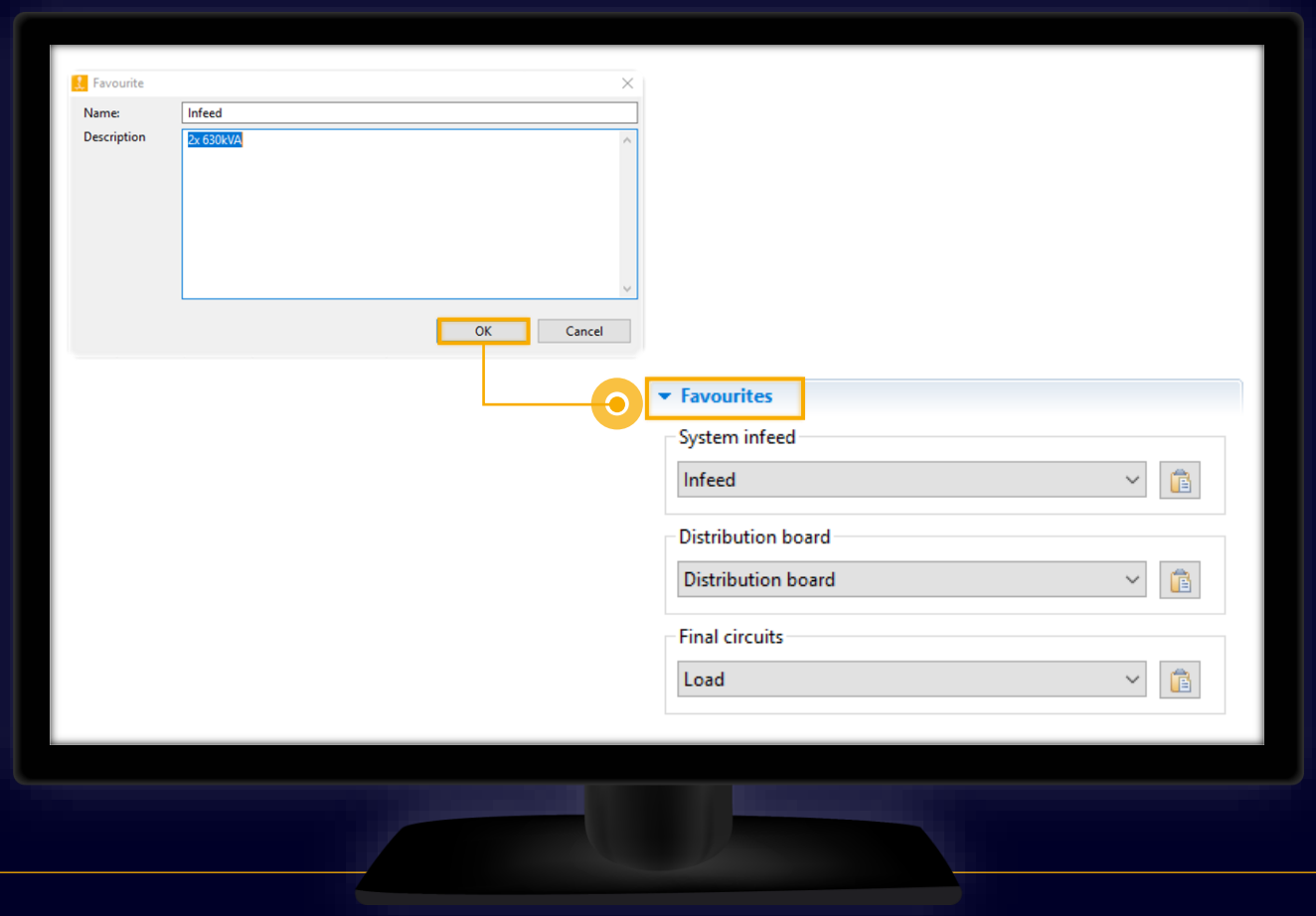
To increase your planning efficiency, you can design frequently used elements and save them as **favourites**, e.g.

- complete feed-in systems
- subdistribution systems
- or load groups.

To create a **favourite**

- mark the corresponding element, e.g. a complete feed-in system,
- and call up the function "Add favourite" from the context menu or the Tools → Favourites menu.

Network Design
Working in the network diagram – favourites



An input dialog is displayed where you can save a name and a description.

Clicking "OK" saves the **favourite** and automatically sorts it into the matching category as system infeed, distribution board or final circuit.

To reuse the **favourite**, you must select the Favourites tab instead of the Library.

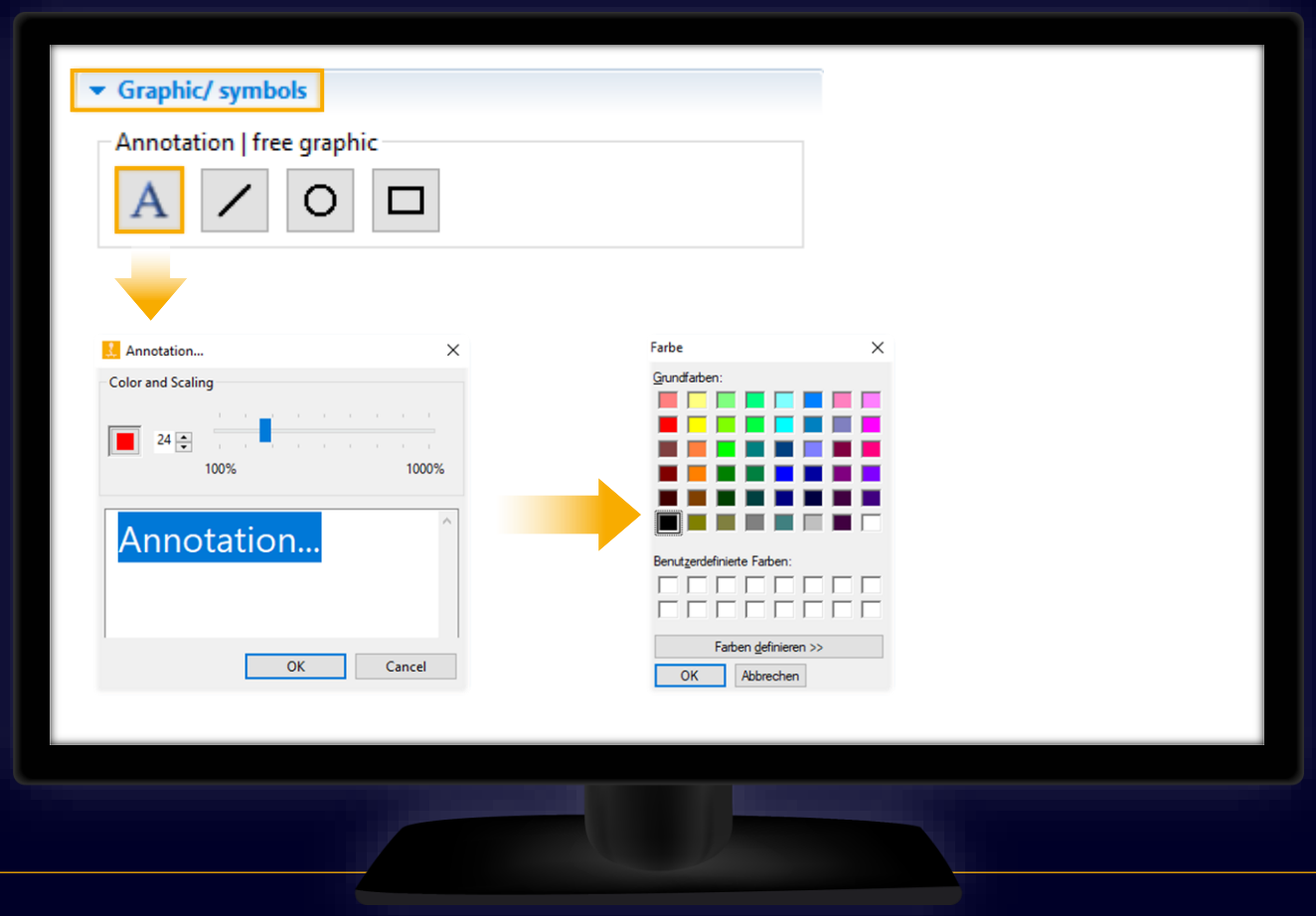
Network Design
Working in the network diagram – favourites

Via the drop-down menu, you can

- select the required element,
- than activate the insert function via the button on the right,
- and afterwards, insert the element in the usual way into the network diagram (by left mouse click on the infeed, keeping the mouse key pressed, move it and release the mouse button)

Network Design

Working in the network diagram – annotations and graphic elements



You can integrate text comments and graphic elements into your network diagram by selecting the Graphic/ symbols tab.

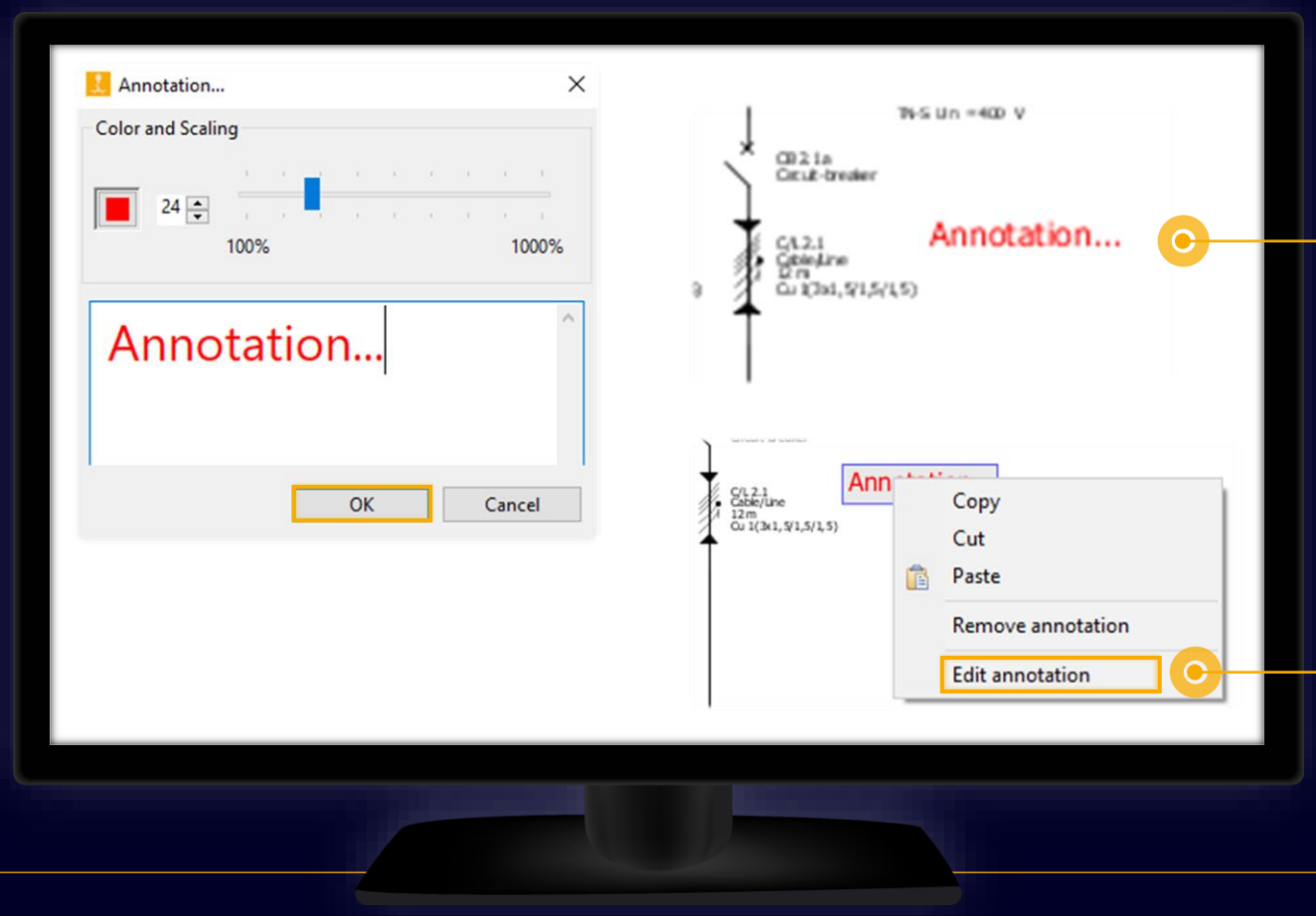
Then click one of the buttons to enable the desired element, e.g. an **Annotation**,

- and place it on the network diagram with a click of the left mouse button.
- A little window is opened, where you can set the font size with the arrow keys or the slider from 8 pt. to 48 pt. as desired.

Clicking on the colour field opens another window, where you can set the desired font colour.

Network Design

Working in the network diagram – annotations and graphic elements

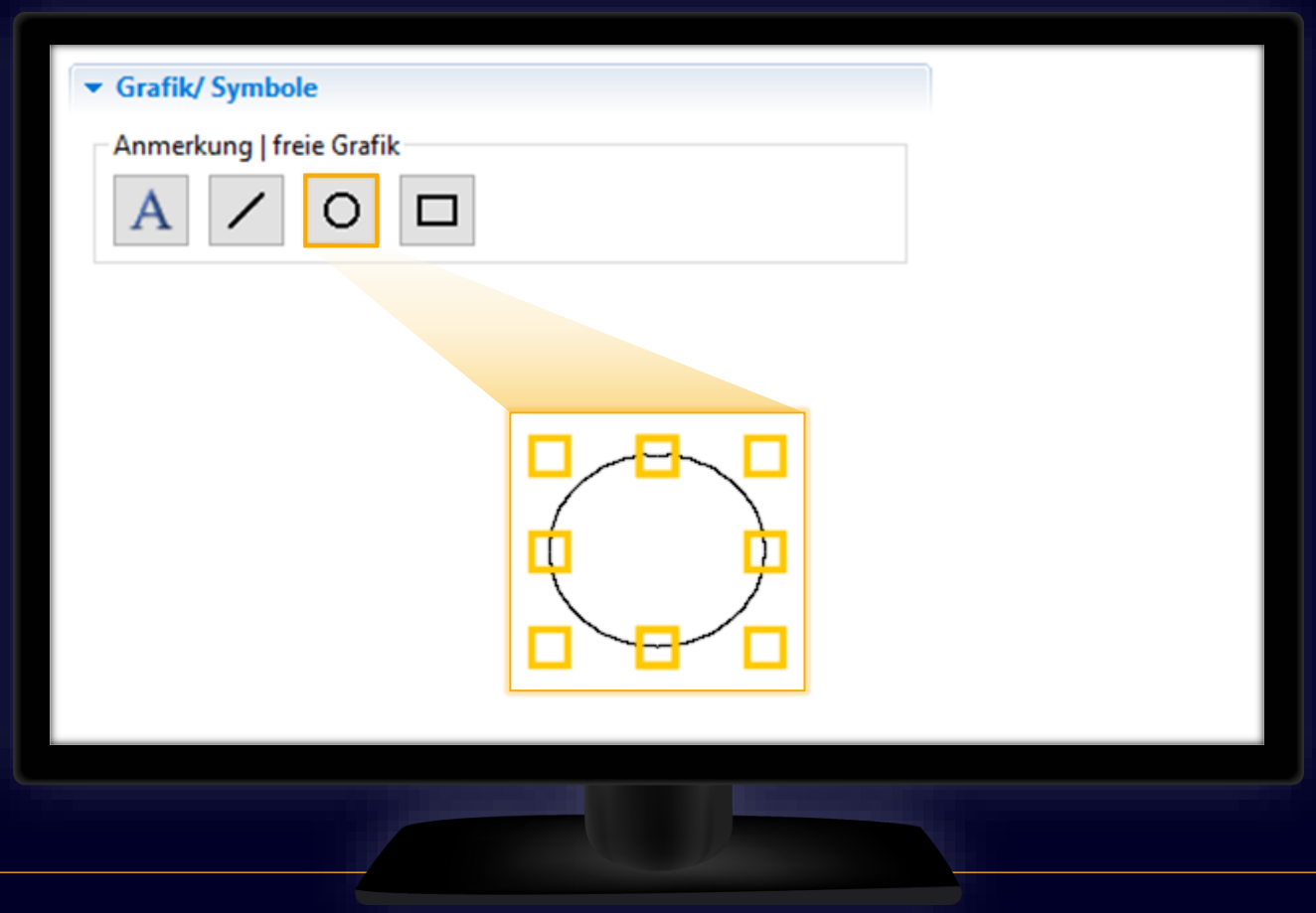


When all settings are made, the annotation is placed on the network diagram at the previously selected position, as soon as you click "**OK**".

If you would like to re-edit the annotation later, open the above dialog again from the context menu (right mouse button) and select → "**Edit annotation**".

Network Design

Working in the network diagram – annotations and graphic elements



In a similar way, you can add **lines, circles / ellipses and rectangles.**

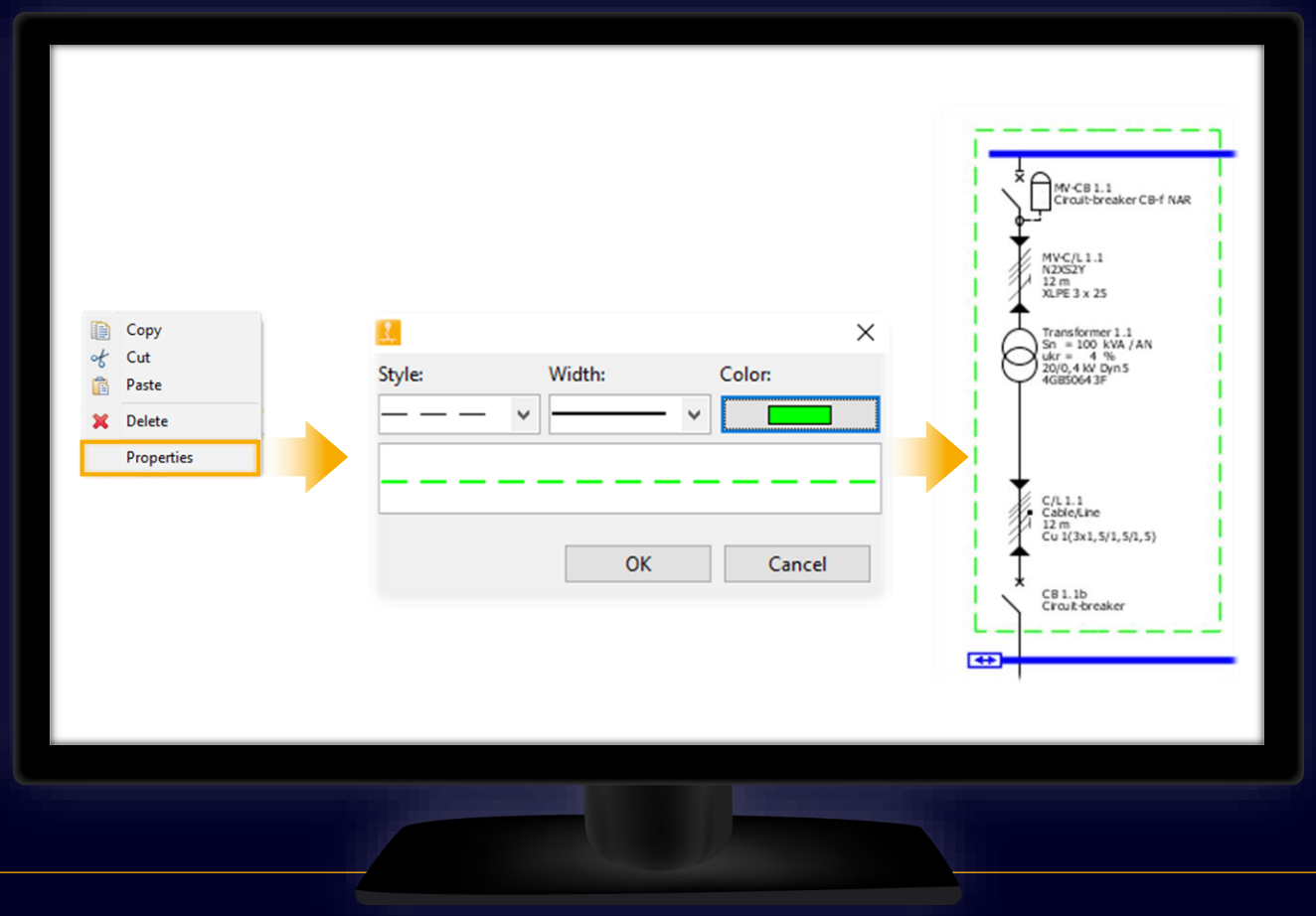
- When you select the appropriate icon, the cursor turns into crosshairs as soon as it is moved into the network diagram.
- Left-clicking places the graphic symbol in the network diagram. It can be zoomed up by dragging the mouse with the left mouse button pressed.

Once it is placed, the graphic element can still be **readjusted** by

- marking it,
- moving the mouse onto one of the little yellow boxes
- and then dragging it into one of the directions indicated by the arrow, keeping the left mouse button pressed.

Network Design

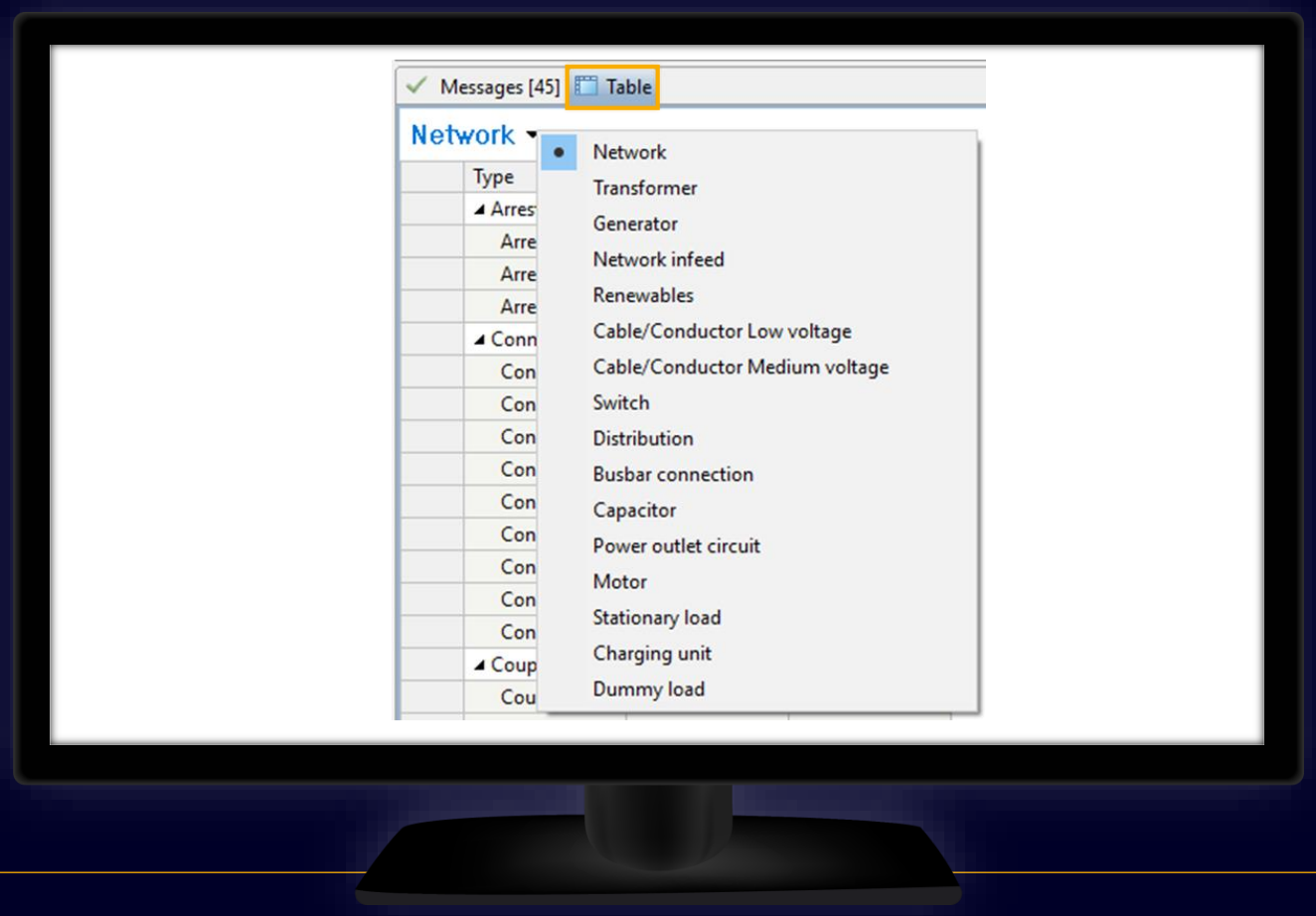
Working in the network diagram – annotations and graphic elements



Colour, style and **width of the border lines** of the graphic symbols can be changed,

- by placing the mouse on the graph,
- calling up the "Properties" dialog from the context menu (right mouse button)
- and defining the desired layout in terms of **style, line width and colour.**

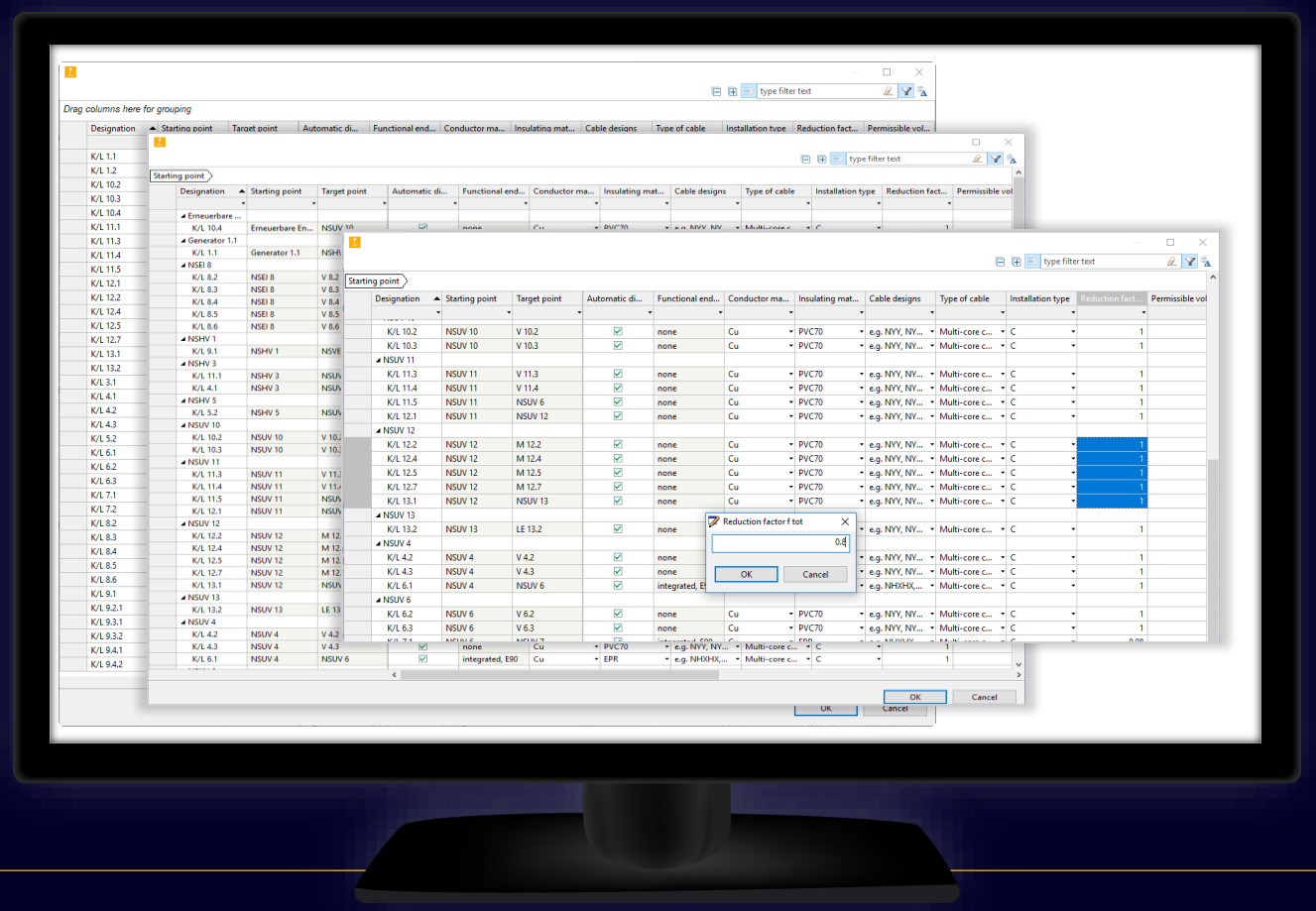
Network Design
Working in the network diagram – table



In order not to lose the overview in an extensive network map, SIMARIS design offers a comfortable **table view,** which you can call up by clicking the button below the network.

Network Design

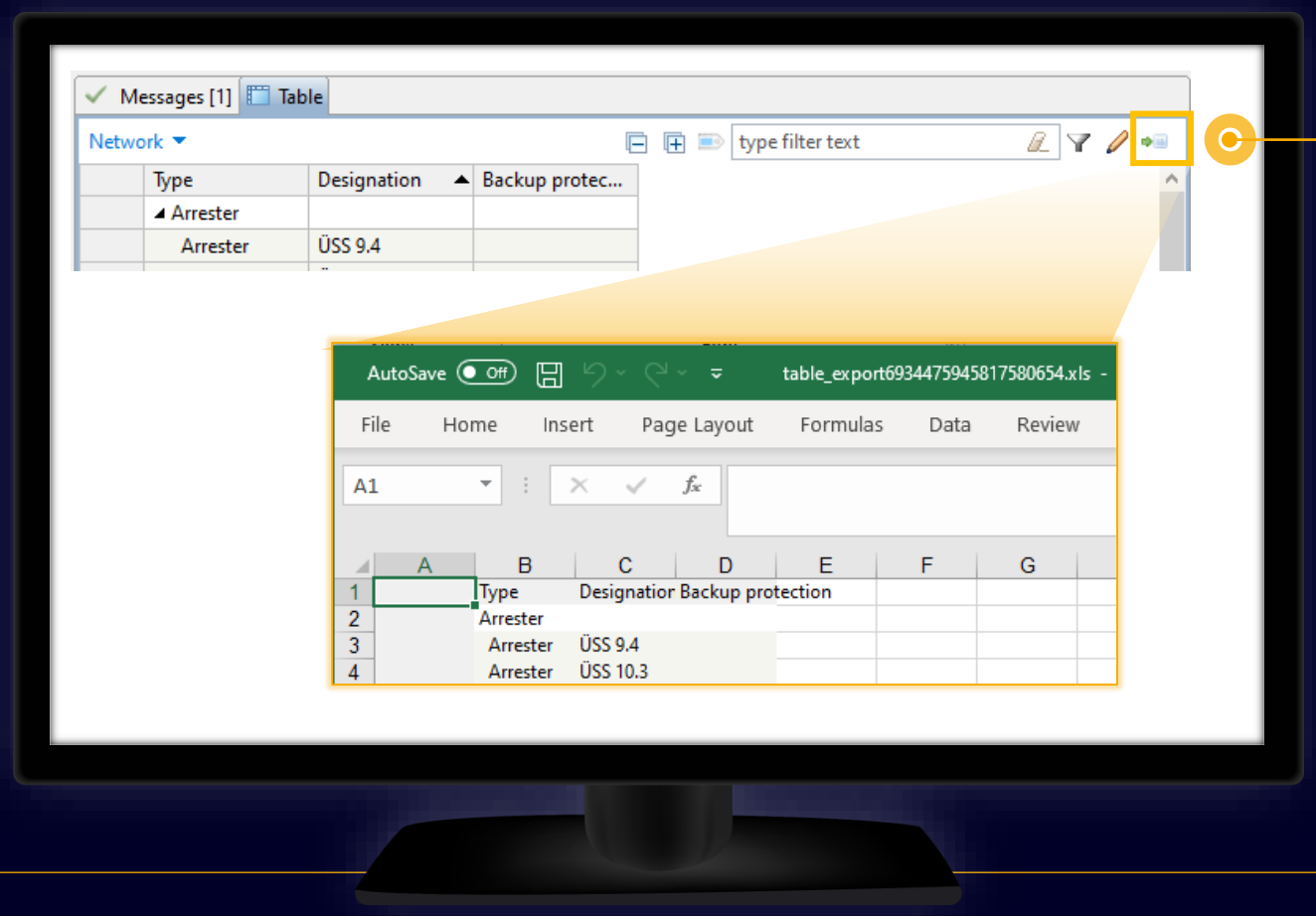
Working in the network diagram – table Cable/Conductor Low voltage



- After a table has been selected, it can be opened for editing by **double-clicking.**
- If you mark a circuit with the mouse in the respective table, it is also marked in the graphic (blue frame).
- The circuits can be grouped by dragging a column label into the header. For example, the cables can be sorted according to the starting points.
- In addition, 1 to n values of a column can be marked and changed at once.
- On the left in the example, the reduction factor for all cables of the distributor is changed at once.

Network Design

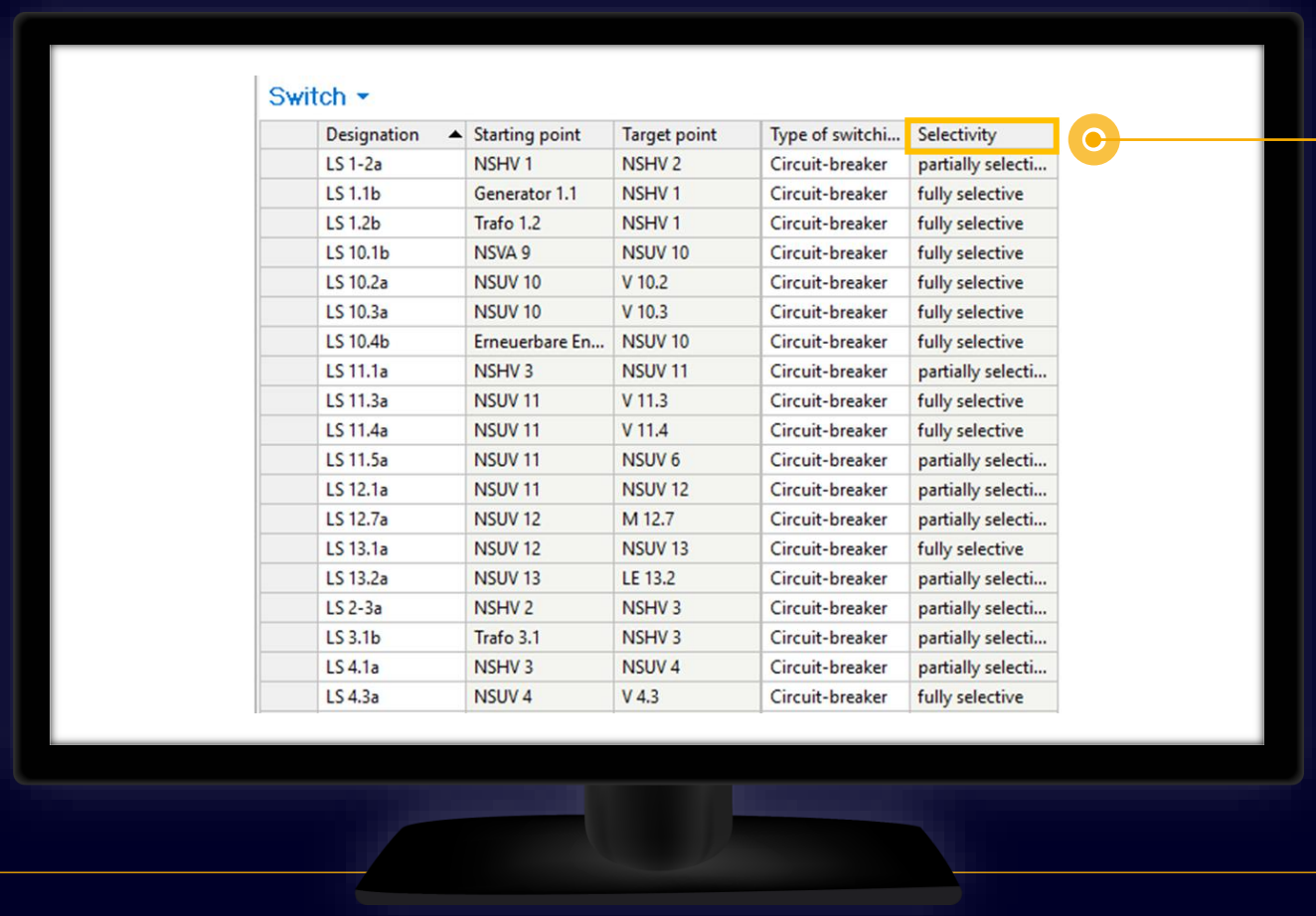
Working in the network diagram – export table



If you select the respective button on the right above, you can **export** the table as Excel file

Network Design

Working in the network diagram – table Switch

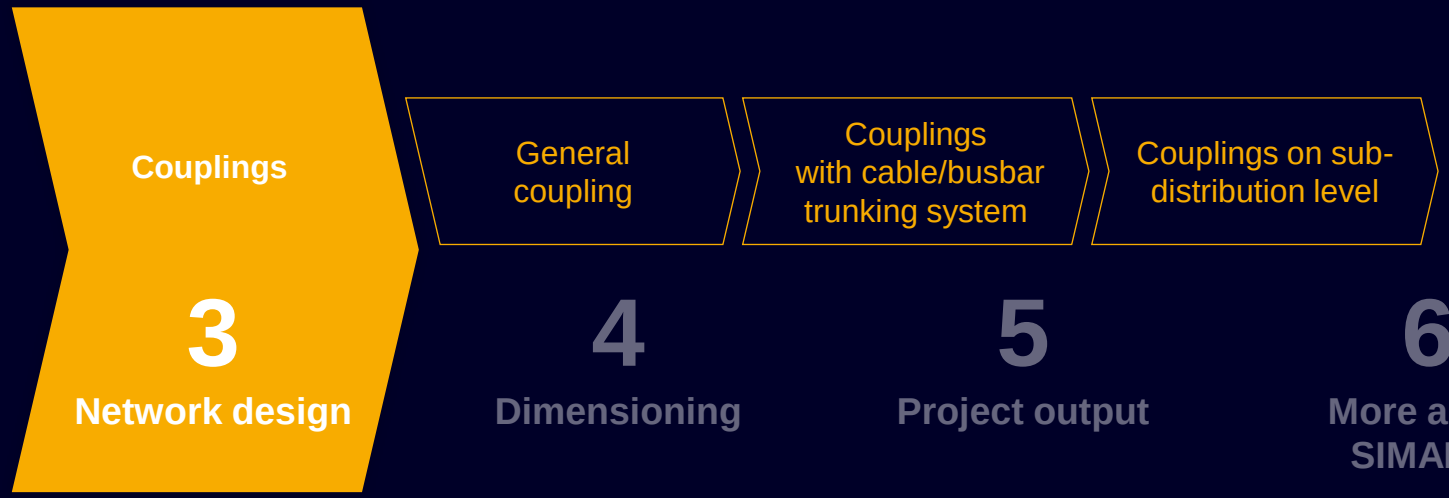


	Designation	Starting point	Target point	Type of switchi...	Selectivity
	LS 1-2a	NSHV 1	NSHV 2	Circuit-breaker	partially selecti...
	LS 1.1b	Generator 1.1	NSHV 1	Circuit-breaker	fully selective
	LS 1.2b	Trafo 1.2	NSHV 1	Circuit-breaker	fully selective
	LS 10.1b	NSVA 9	NSUV 10	Circuit-breaker	fully selective
	LS 10.2a	NSUV 10	V 10.2	Circuit-breaker	fully selective
	LS 10.3a	NSUV 10	V 10.3	Circuit-breaker	fully selective
	LS 10.4b	Erneuerbare En...	NSUV 10	Circuit-breaker	fully selective
	LS 11.1a	NSHV 3	NSUV 11	Circuit-breaker	partially selecti...
	LS 11.3a	NSUV 11	V 11.3	Circuit-breaker	fully selective
	LS 11.4a	NSUV 11	V 11.4	Circuit-breaker	fully selective
	LS 11.5a	NSUV 11	NSUV 6	Circuit-breaker	partially selecti...
	LS 12.1a	NSUV 11	NSUV 12	Circuit-breaker	partially selecti...
	LS 12.7a	NSUV 12	M 12.7	Circuit-breaker	partially selecti...
	LS 13.1a	NSUV 12	NSUV 13	Circuit-breaker	fully selective
	LS 13.2a	NSUV 13	LE 13.2	Circuit-breaker	partially selecti...
	LS 2-3a	NSHV 2	NSHV 3	Circuit-breaker	partially selecti...
	LS 3.1b	Trafo 3.1	NSHV 3	Circuit-breaker	partially selecti...
	LS 4.1a	NSHV 3	NSUV 4	Circuit-breaker	partially selecti...
	LS 4.3a	NSUV 4	V 4.3	Circuit-breaker	fully selective

As a **SIMARIS design professional** user, you also have the option of searching your network map according to the criterion of **selectivity**.

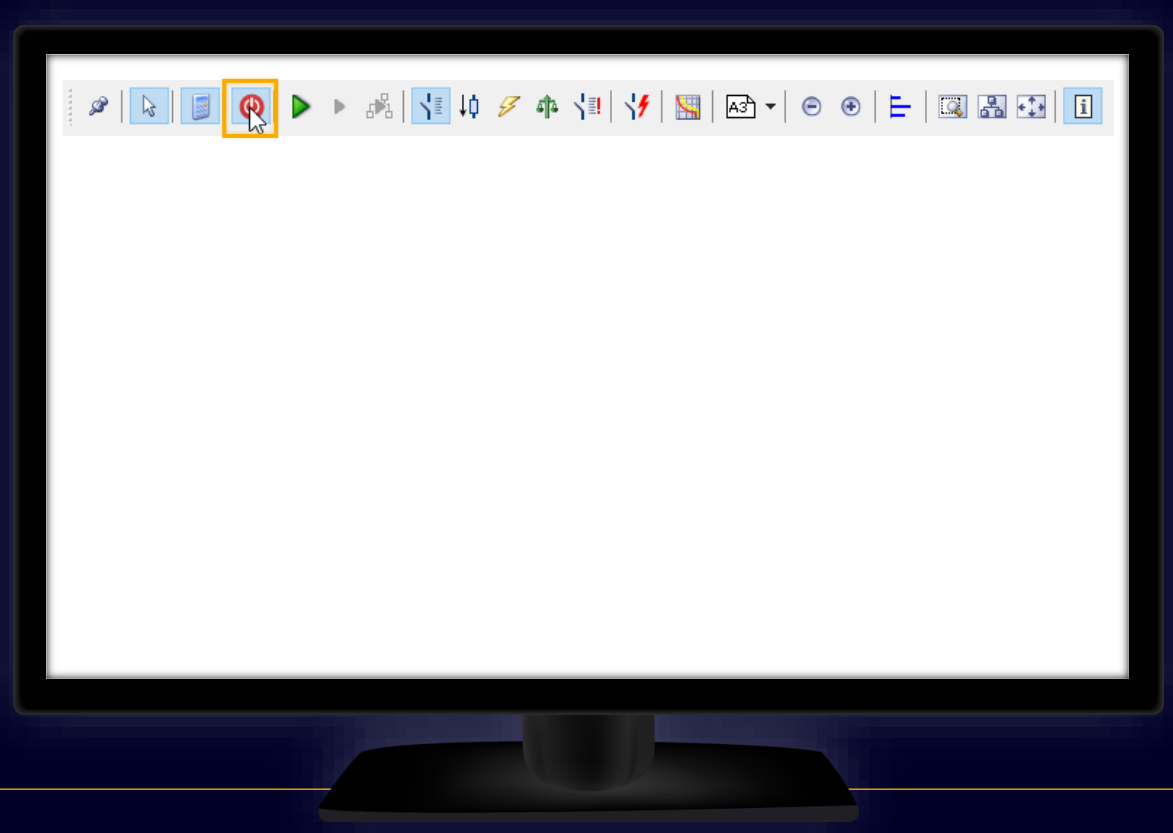
START

Couplings



SIEMENS

Network Design
Couplings



Mapping couplings in the network diagram is possible, both for

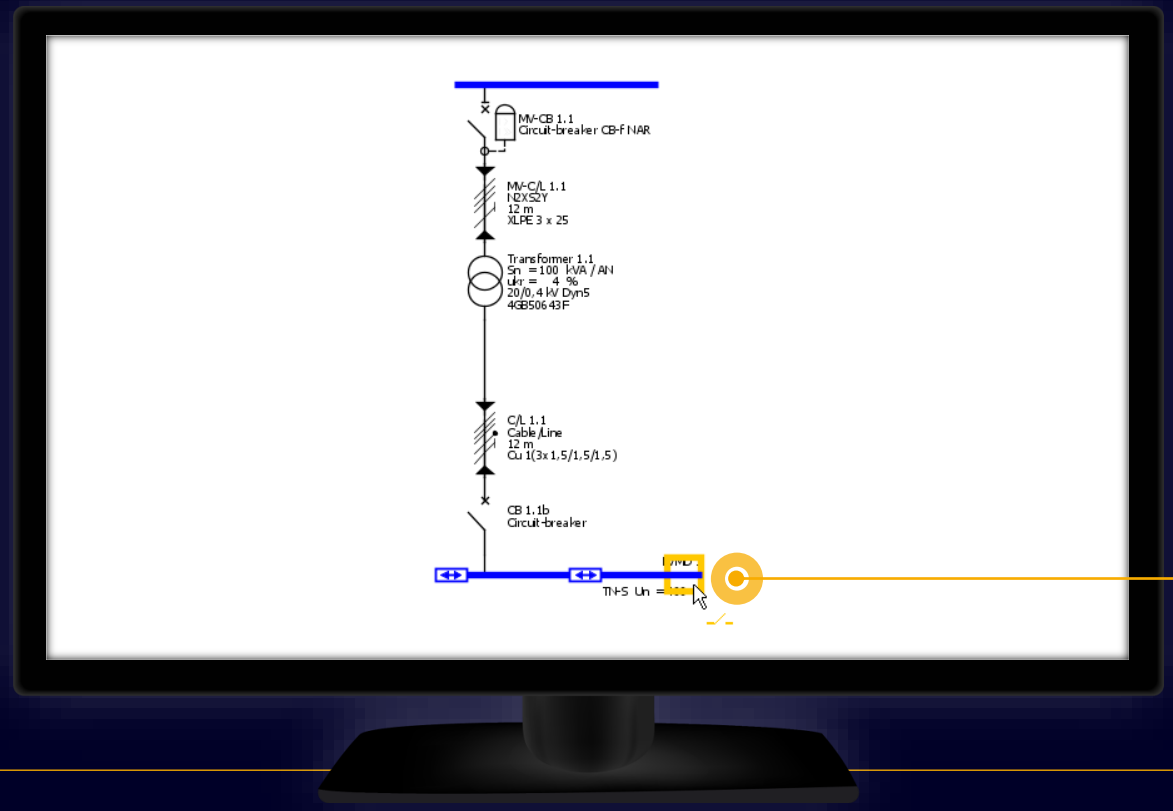
- general couplings, where bidirectional energy flow is possible,
- and for unidirectional couplings, where energy flow has been defined in one direction only.

You are able to map both normal and emergency power supply.

Note:
In order to be able to dimension such a complex feed-in system using couplings, you must define the operating modes for the feed-in system first.
This must be done after the complete feed-in system has been created. Use the "**Operating modes**" icon on the tool bar. For more detailed information, please refer to "**Dimensioning**".

Network Design
General coupling

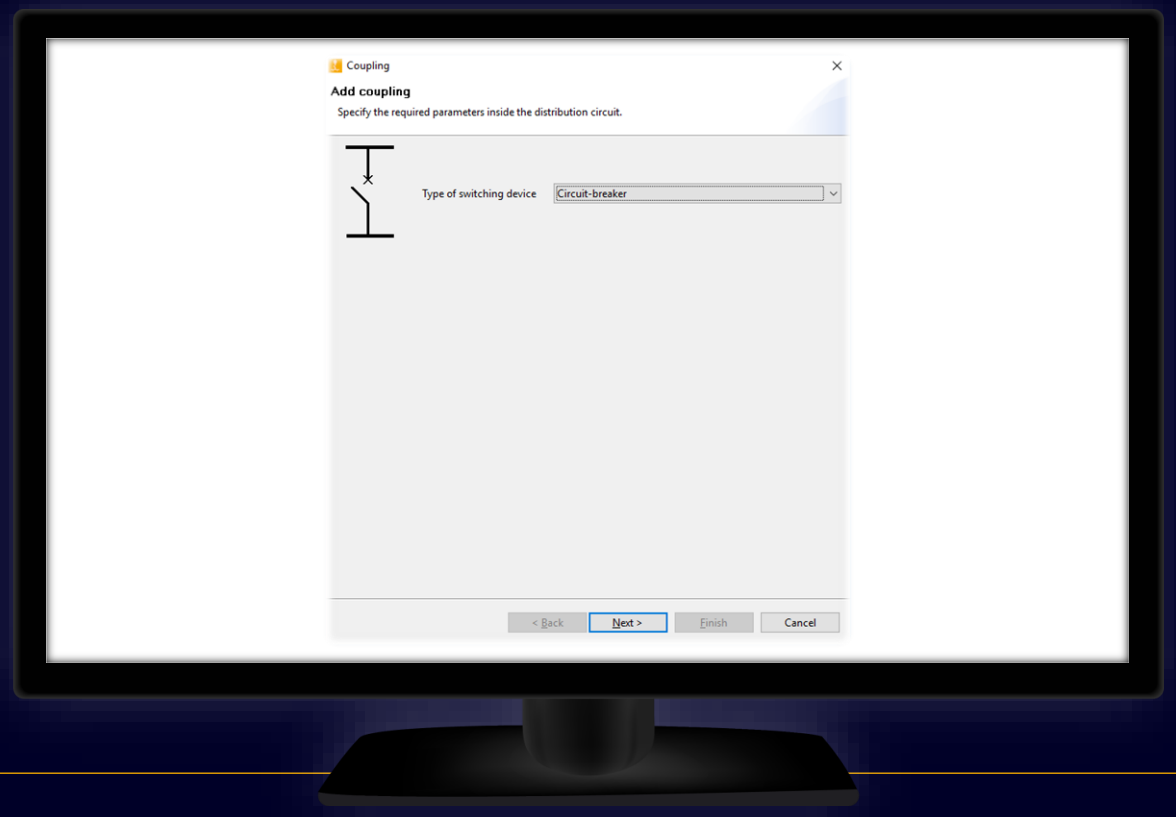
A "**Busbar coupling**" is a coupling with an undefined direction of energy flow between busbar sections.



In order to add a general coupling for normal power supply to the network diagram, please note that the cursor must placed at the **outer end** of the busbar node of the feed-in circuit.

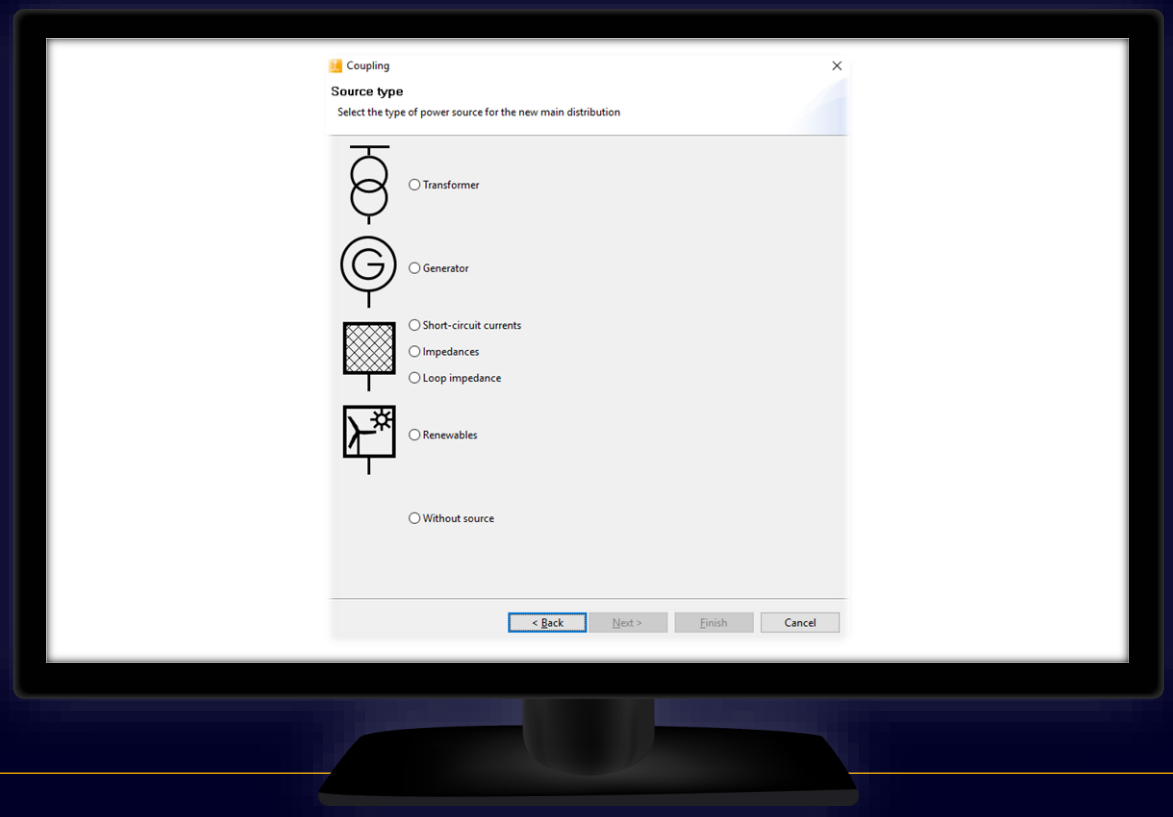
Network Design
General coupling

You are prompted to enter the coupling data.



Network Design
General coupling

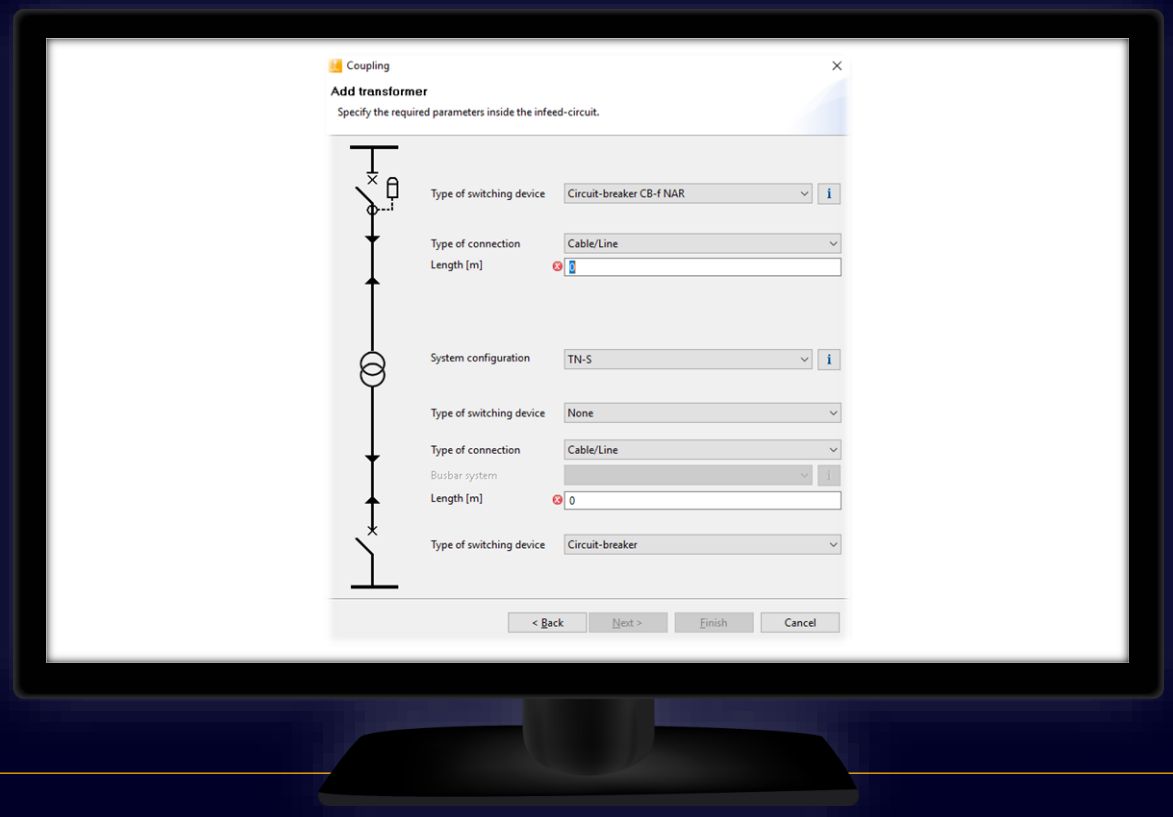
Then the new type of infeed to your network must be selected.



It may differ from the first (original) system infeed type.

If the first system infeed type is a transformer, for example, the second infeed type may be another transformer or a generator, or a method of feed-in defined through impedances, loop impedances or short-circuit currents.

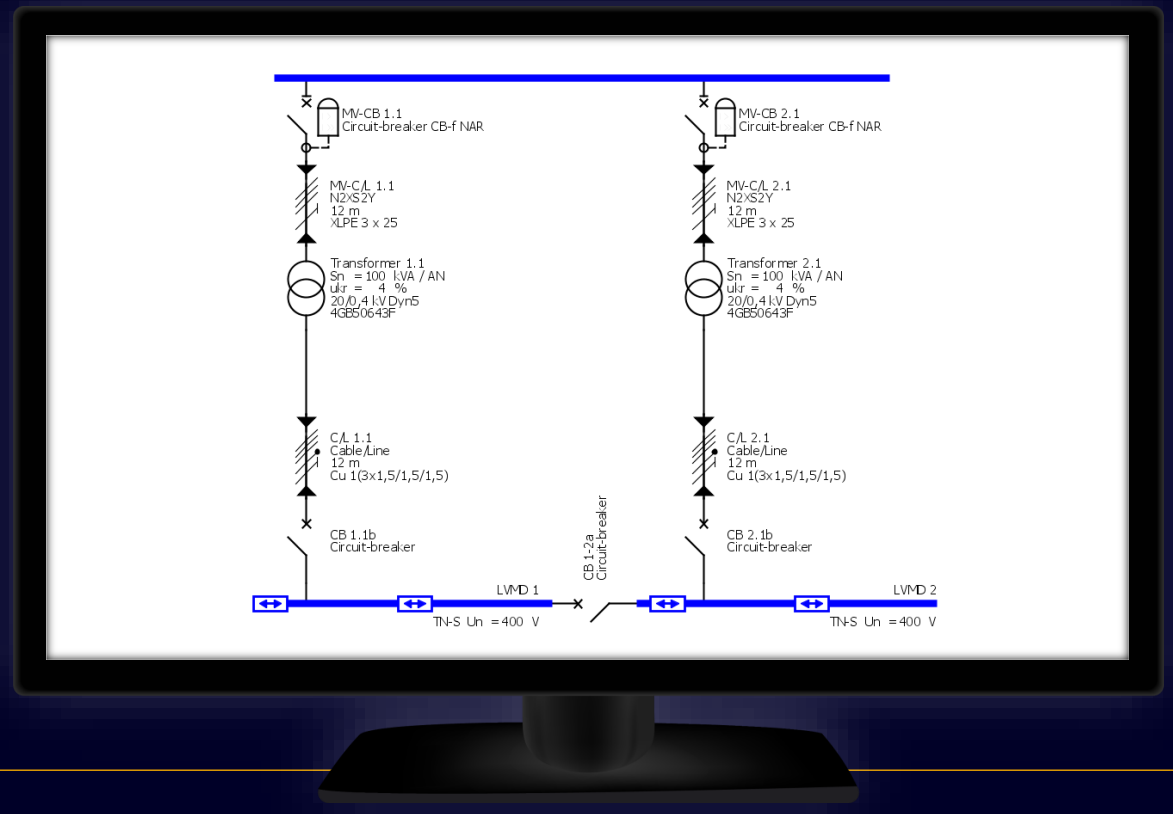
Network Design
General coupling



Now you must define the data required for the selected type of second infeed, in this case it is a transformer without medium voltage.

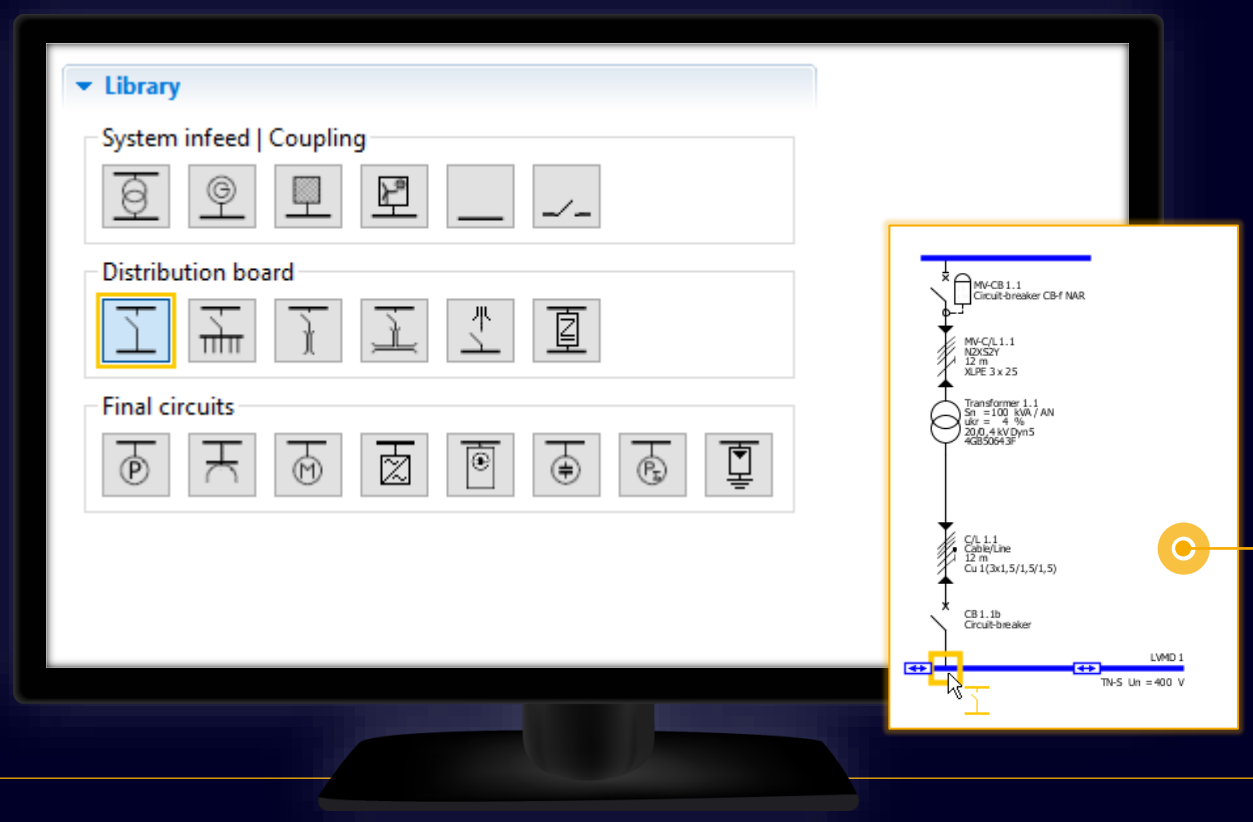
Network Design
General coupling

The coupling is represented as on the left.



Now you can add distribution boards and load circuits to the new busbar for the new feed-in system linked by the coupling in the usual way.

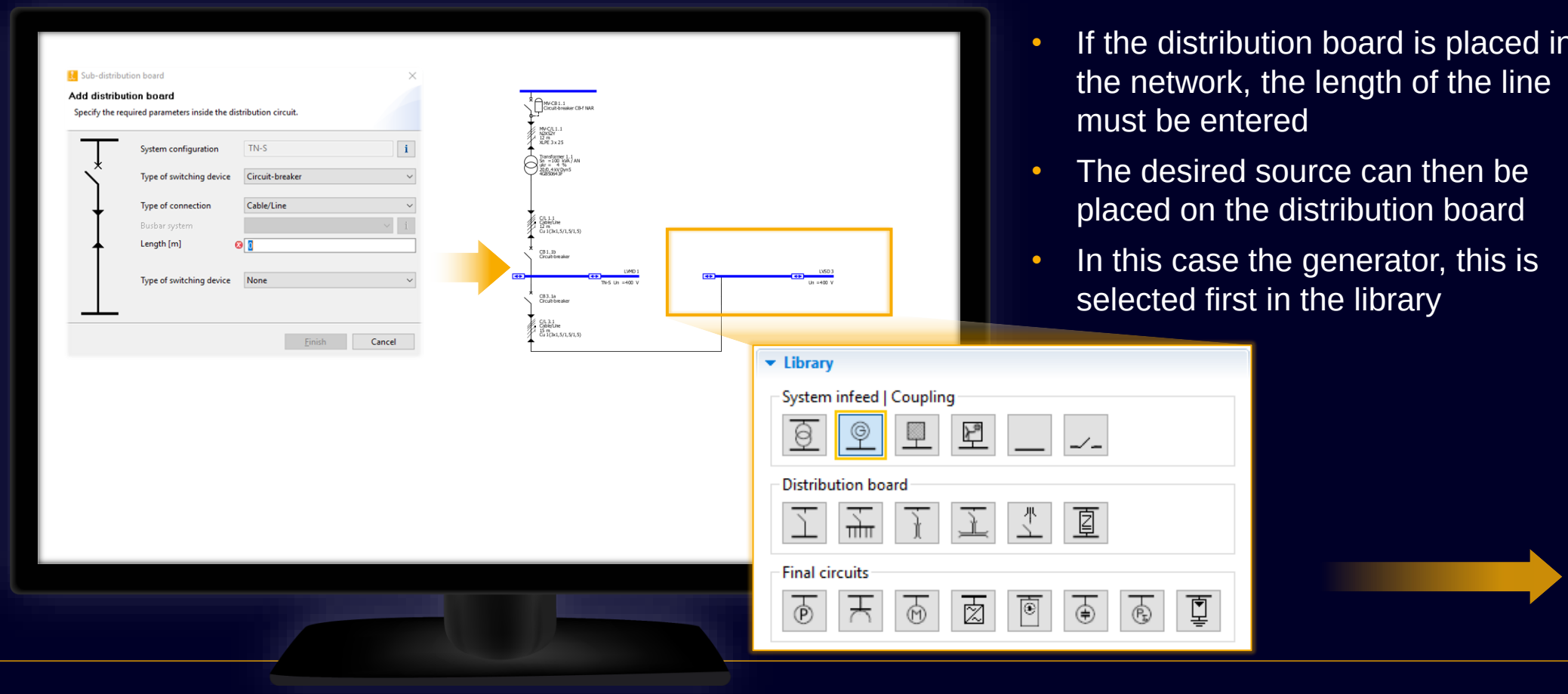
Network Design
Couplings with cable/busbar trunking system



The library element "**Distribution board**" can be used to display couplings with cables / busbar trunking systems.
This can be employed to map combinations of normal and emergency/safety power supply (e.g. between transformer- and generator-supplied networks).

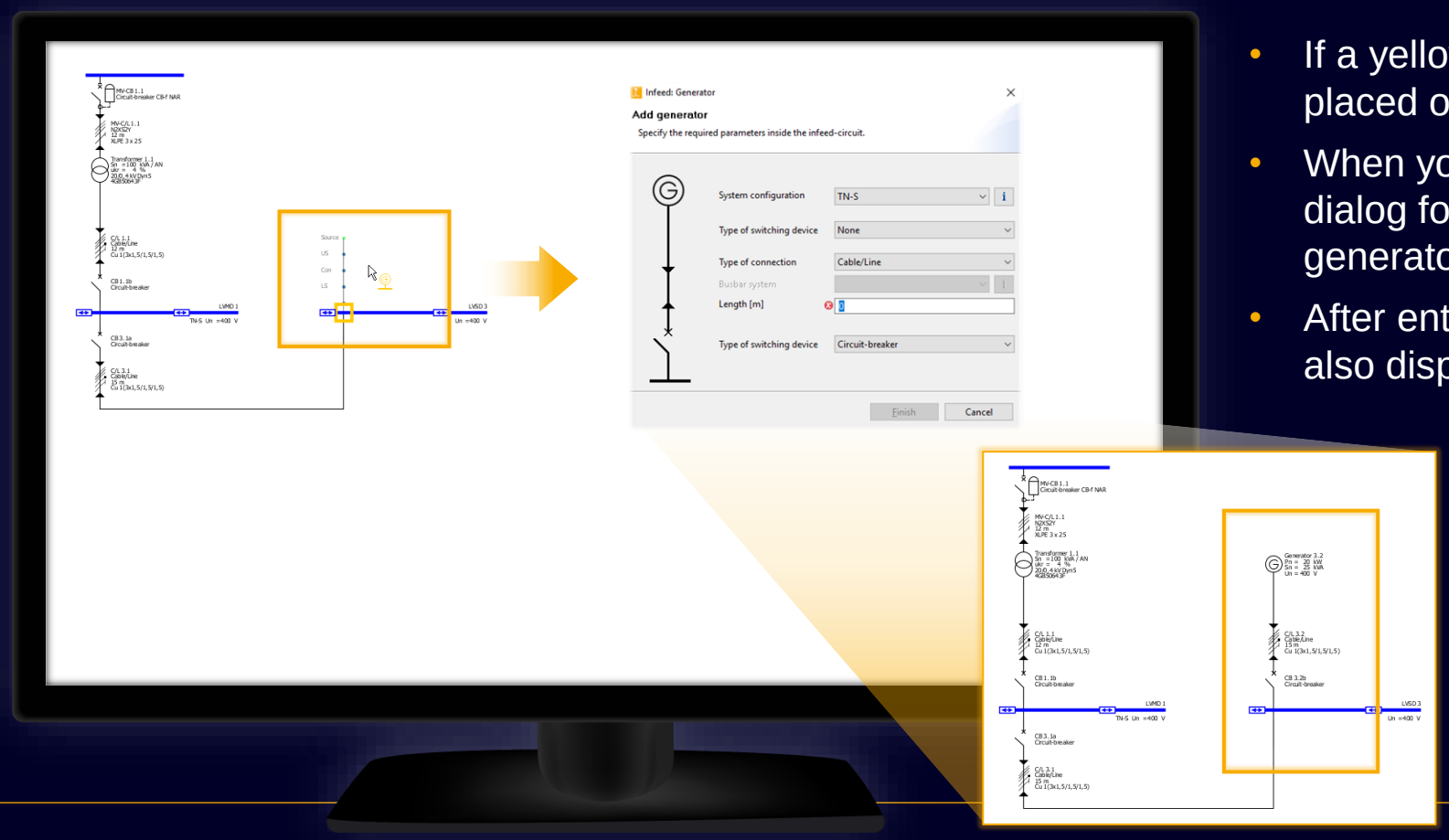
Please note that the cursor for adding a coupling to the network diagram must not be placed at the outer busbar end, but at one of the **inner** insert points of the busbar for the infeed circuit.

Network Design
Couplings with cable/busbar trunking system



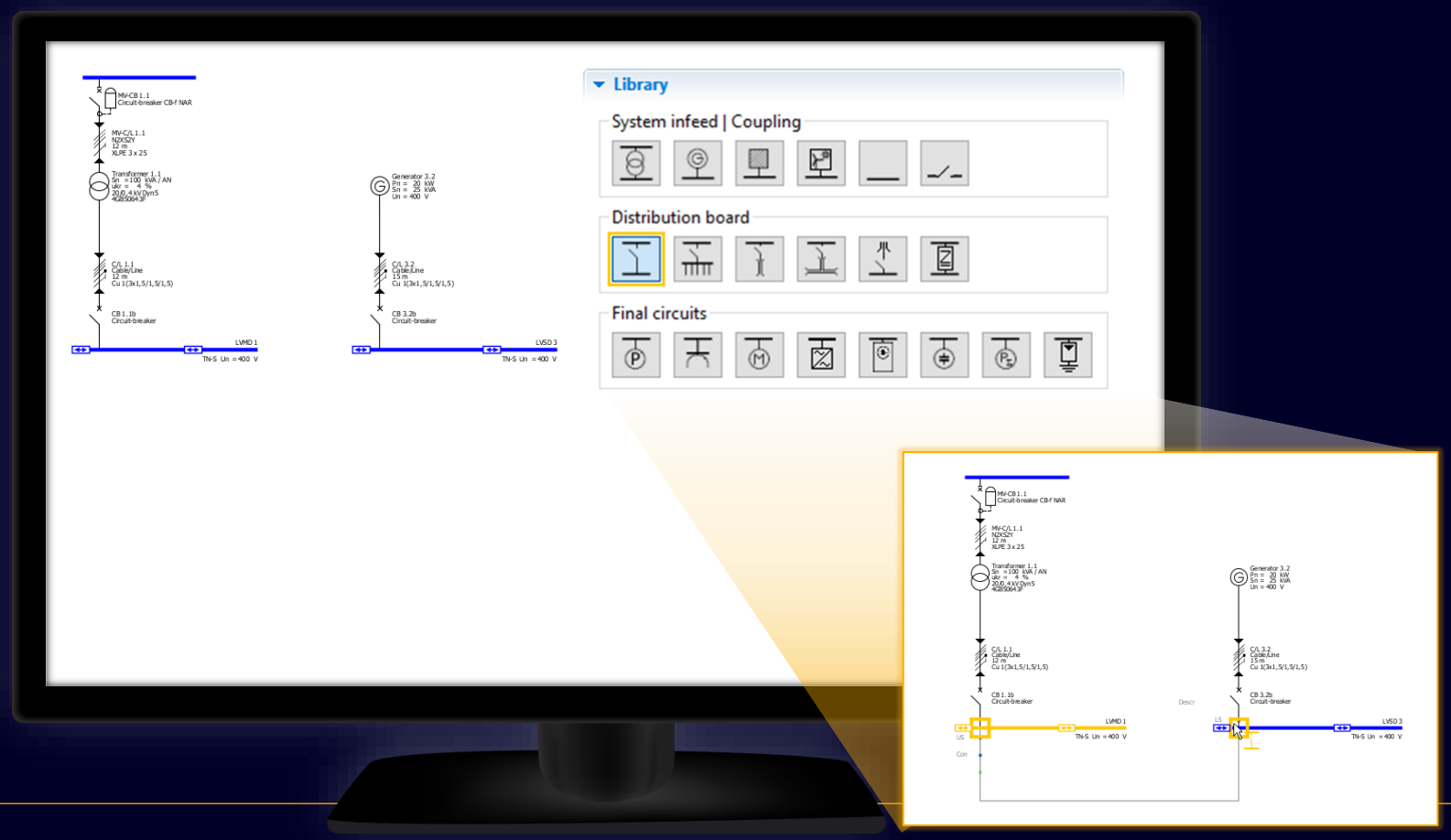
- If the distribution board is placed in the network, the length of the line must be entered
- The desired source can then be placed on the distribution board
- In this case the generator, this is selected first in the library

Network Design
Couplings with cable/busbar trunking system



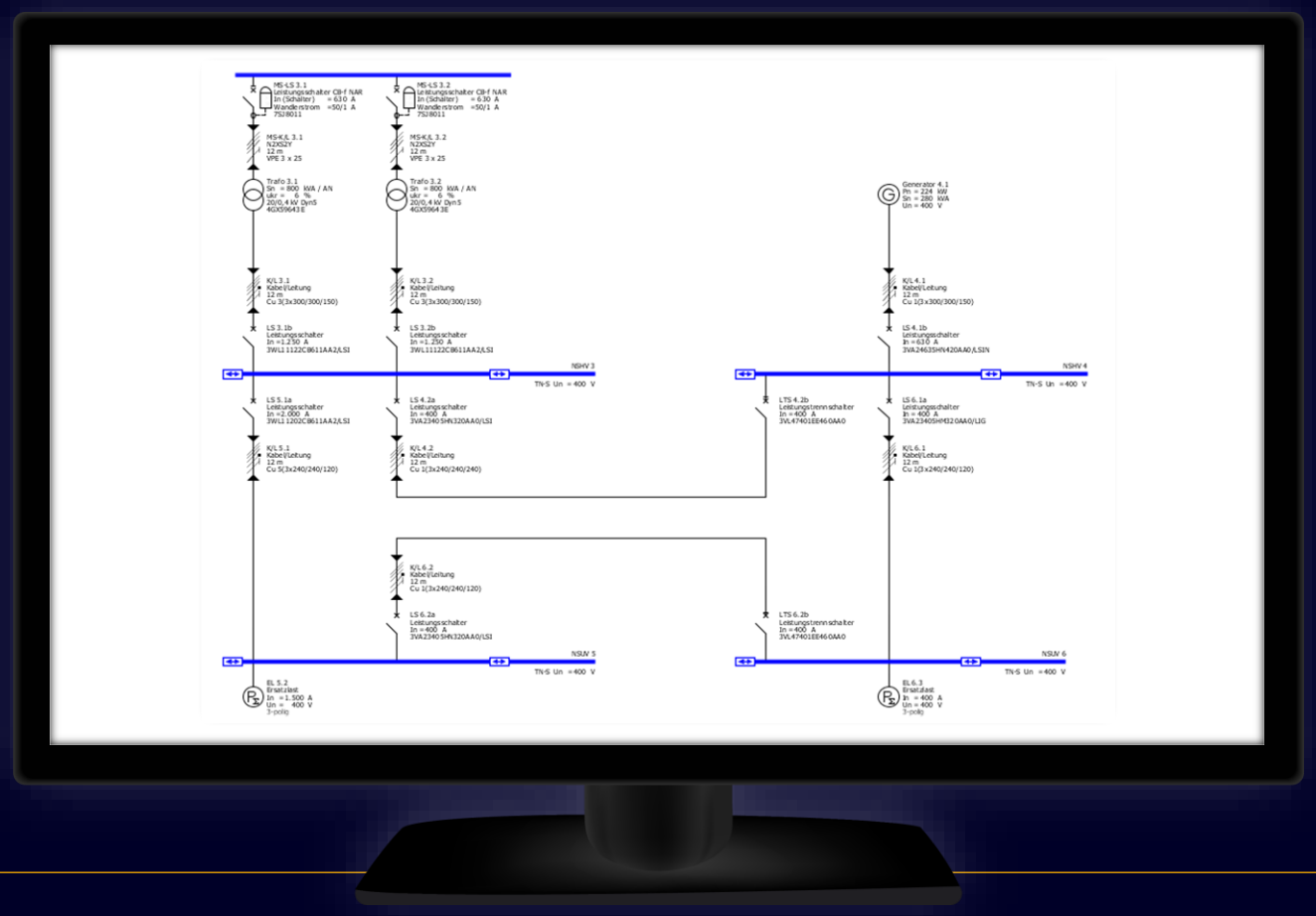
- If a yellow rectangle appears, it can be placed on the distribution board
- When you release the mouse button, the dialog for entering the data for the generator circuit appears
- After entering the data, the generator is also displayed in the network.

Network Design
Couplings with cable/busbar trunking system



- Two sources can also be connected later with a coupling
- To do this, select the "Distribution board" element in the library
- Then you pull this from the transformer to the generator
- If a yellow rectangle appears there, you can release the mouse button and complete the data for the distribution circuit

Network Design
Couplings on sub-distribution level



- Couplings can be created in SIMARIS design between main and sub-distribution board.
- With **SIMARIS design professional** it is also possible to simultaneously close the couplings and thus dimension and calculate a mesh network.
- The diagram shows a network designed with one unidirectional coupling each at the main and sub-distribution board level. .

START

Dimensioning

- Starting calculations
- Parallel network operation (pro)
- Displaying characteristic curves
- Automatic selectivity evaluation (pro)

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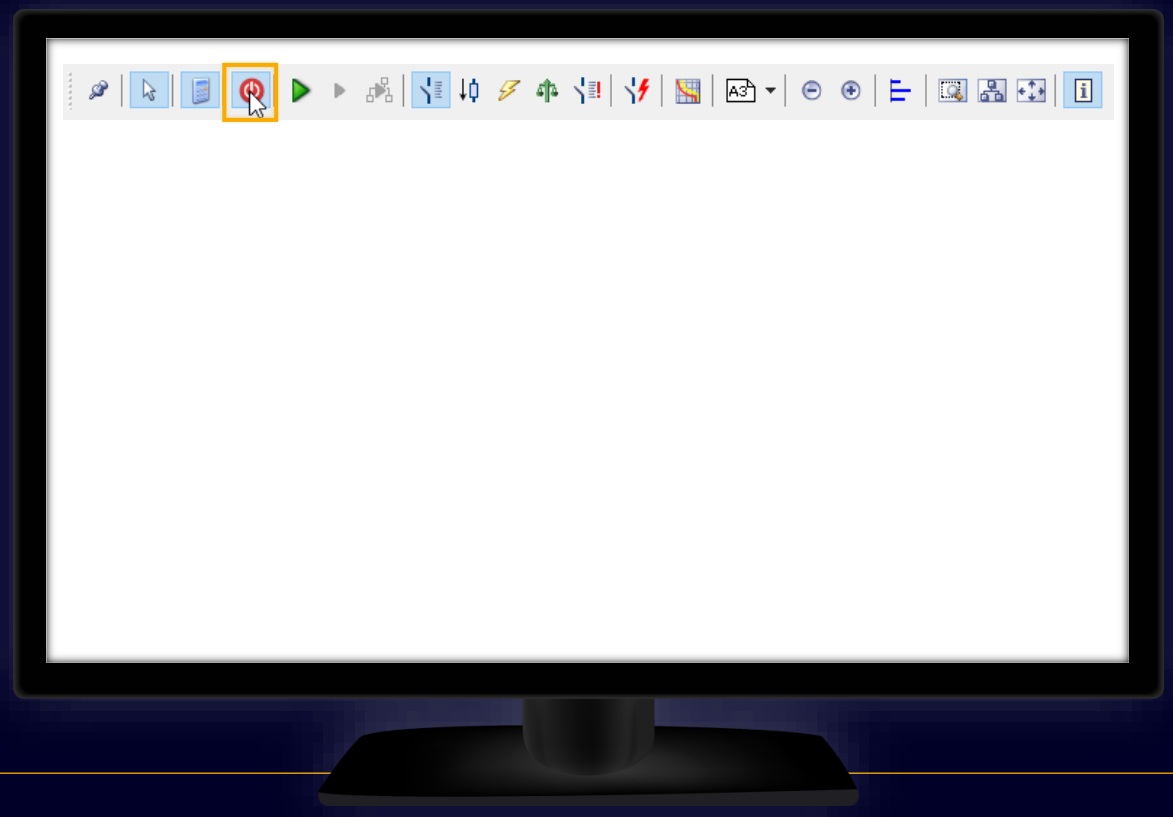
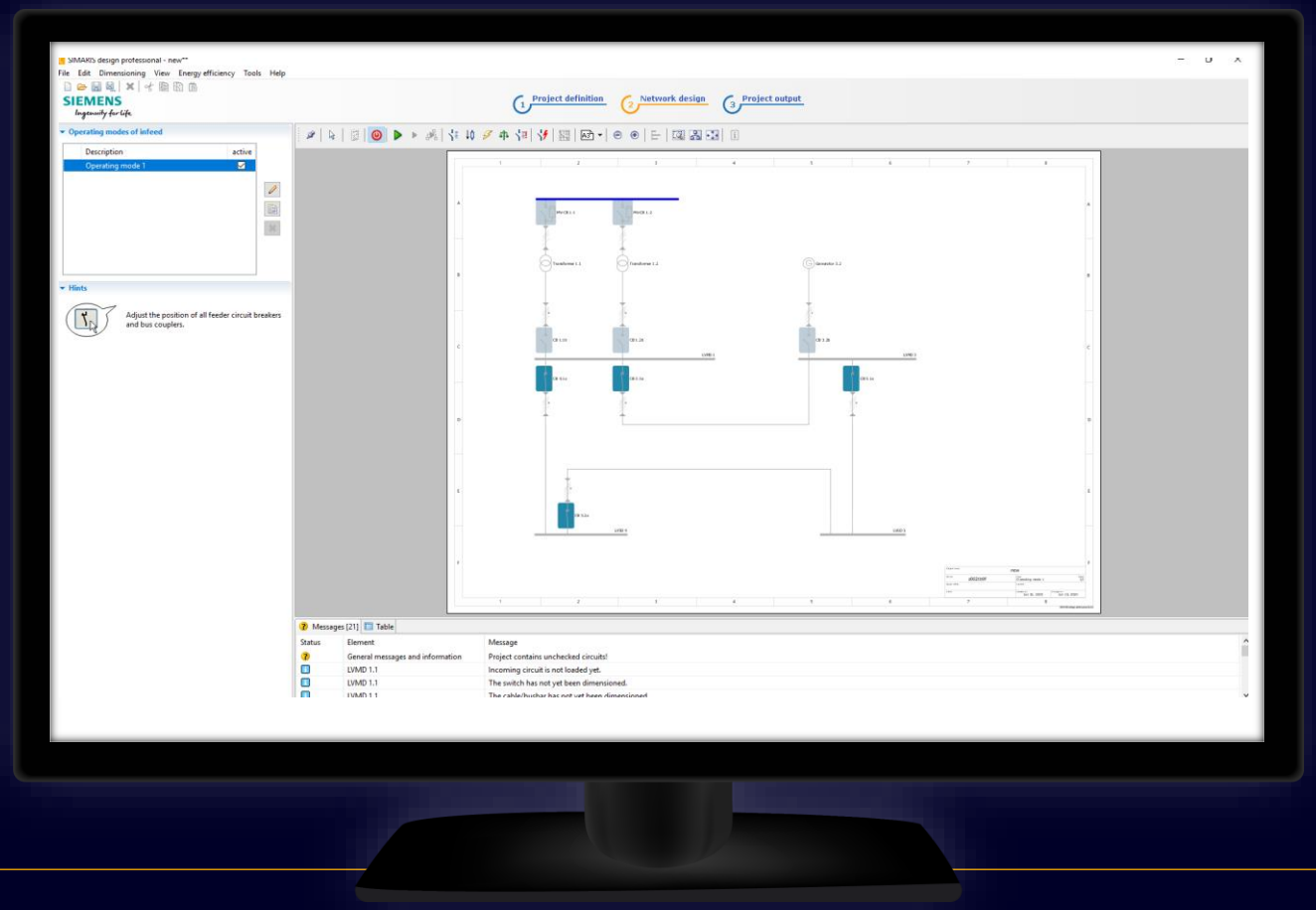
Dimensioning
Defining operating modes



SIMARIS design enables you to dimension individual circuits, a subnetwork or the whole network.
An optimal dimensioning result can be attained by considering only those operating states or switch positions in the calculation and device selection that are necessary for operating the switchgear installation safely.
This means that the prerequisite for proper network dimensioning is the definition of network operating modes and the corresponding switch positions.

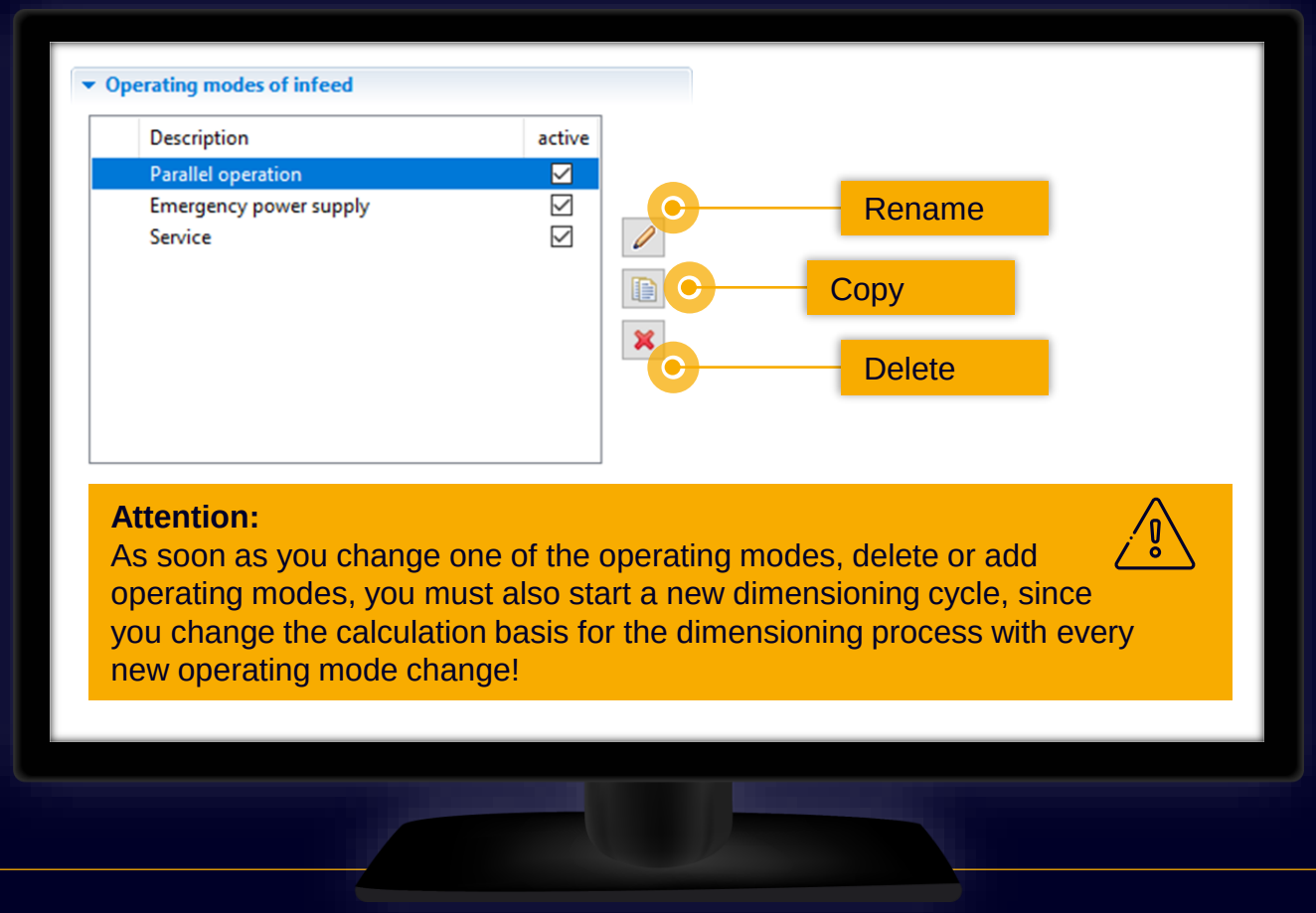
When the "**operating modes**" function is called up via the tool bar, a display of the feeder supply management is opened, where the required operating modes are graphically represented and can be further defined in terms of their switch positions.

Dimensioning
Defining operating modes



First a view opens in which all switches of sources and distributors can be switched. The switches of the sources are all open, the switches of the distributors are all closed. By clicking on the switch it can be opened or closed.

Dimensioning
Defining operating modes

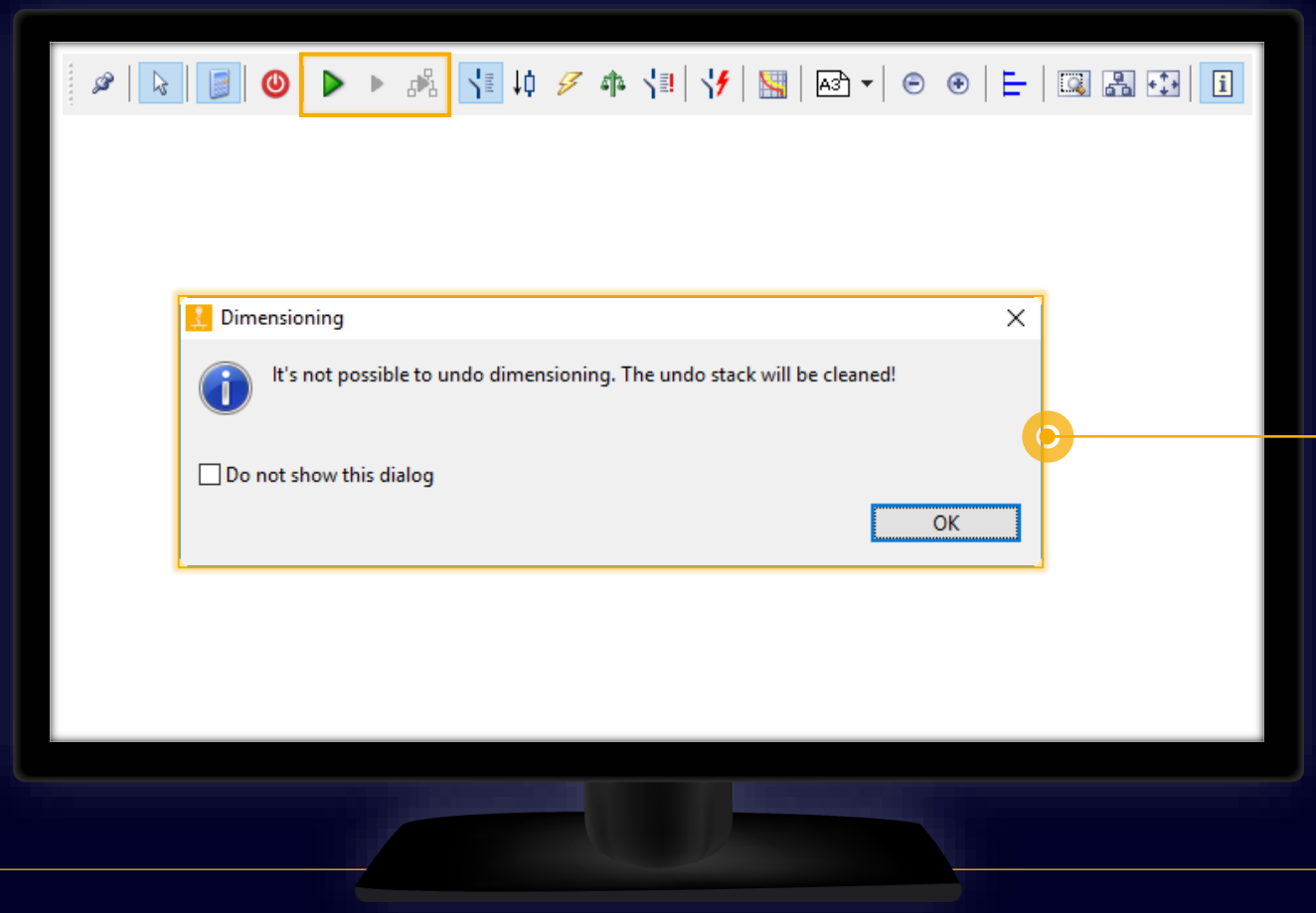


More operating modes are defined by duplicating the existing operating mode. Afterwards the switch positions are defined according to the new operating mode requirements.

Operating modes can be activated/deactivated. Dimensioning is only done for activated operating modes.

- This action returns an overview of the required operating modes as exemplified in this screenshot. These operating modes will then form the basis for the subsequent dimensioning process.
- Switching states for which a calculation is not possible, are marked accordingly. They must be properly adjusted prior to dimensioning.

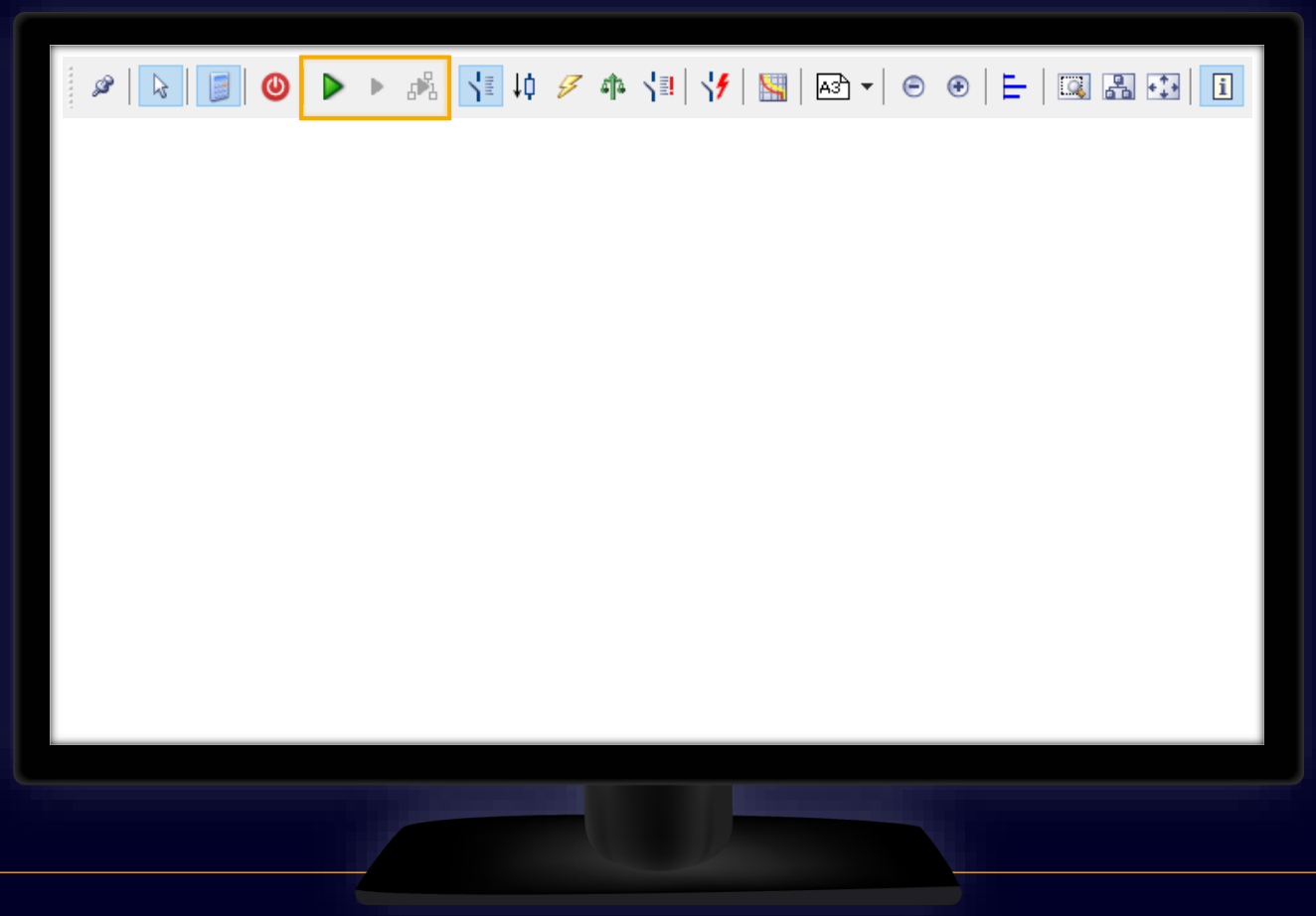
Dimensioning
Starting calculations



Dimensioning the entire network, selected circuits or subnetworks can be directly triggered using the dimensioning icons on the tool bar.

If you did not define any operating modes beforehand, the dialog for the definition of operating modes will be displayed automatically (for a description, please refer to "**Defining operating modes**")

Dimensioning
Starting calculations

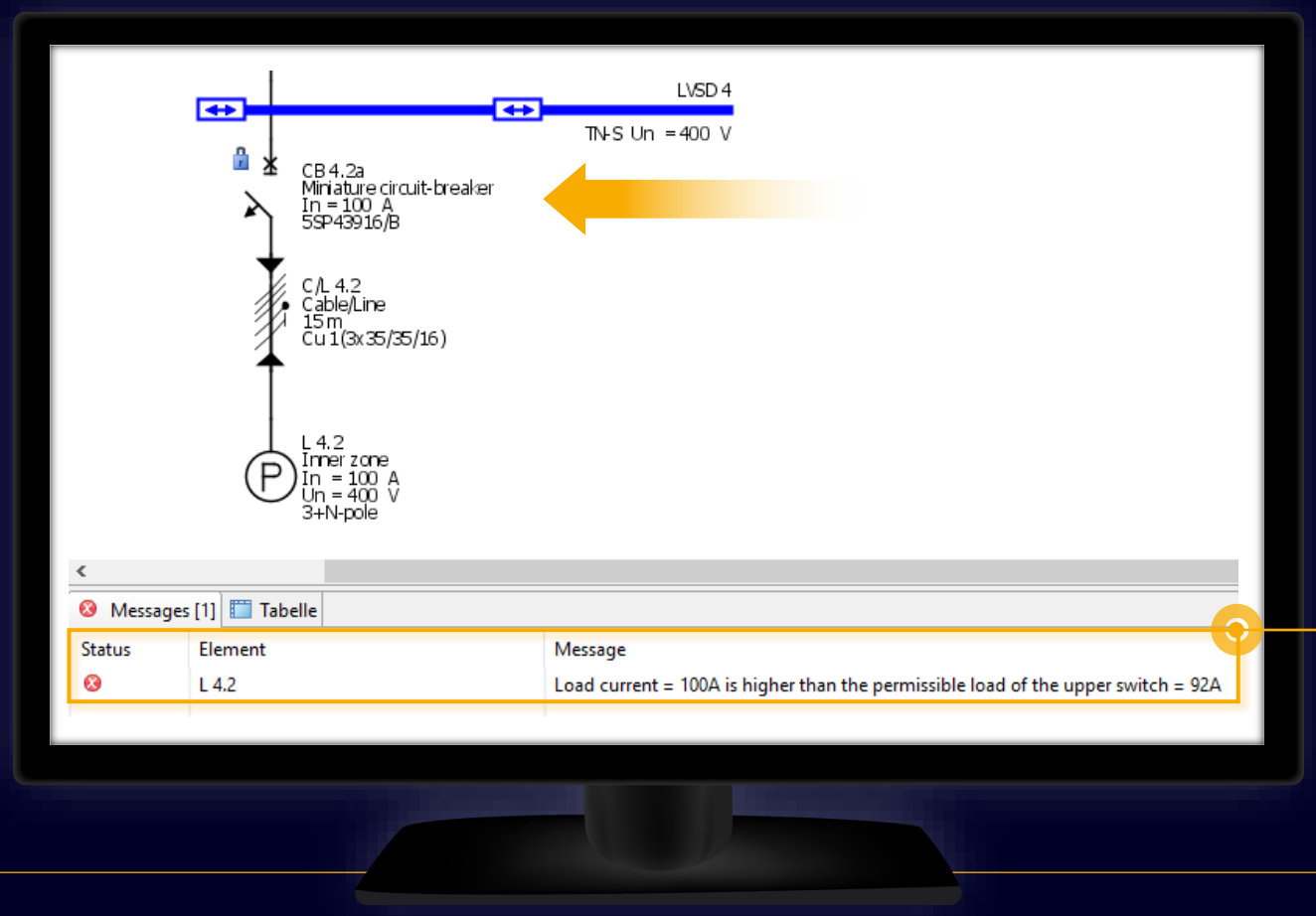


Dimensioning and the resulting device selection are performed according to defined operating constellations. Thus an optimized dimensioning result is attained.

SIMARIS design calculates the minimum and maximum short-circuit currents from all defined operating modes, this calculation forms the basis for dimensioning the entire network.

Complex network configurations can be easily implemented with the aid of tie breakers or bus couplers, also see "**Couplings**".

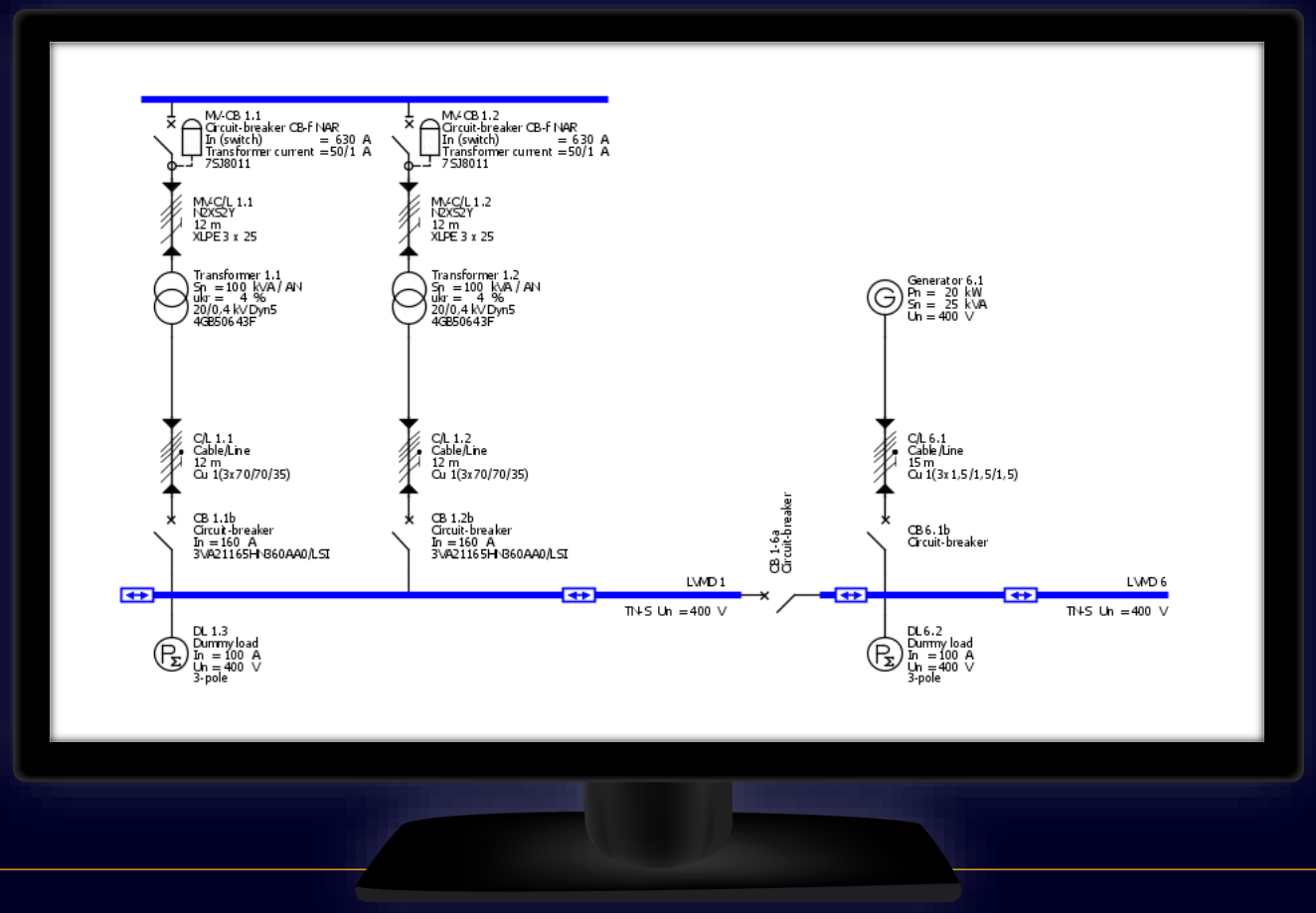
Dimensioning
Starting calculations



If errors should occur during the dimensioning process, e.g. owing to default devices which do not meet the requirements for the defined operating modes, info and error messages will be displayed below the network diagram.

If one of the messages is selected with the cursor (now highlighted in grey), the corresponding device is marked in yellow on the network diagram so that a correlation can always be created between messages and items of equipment in the network diagram.

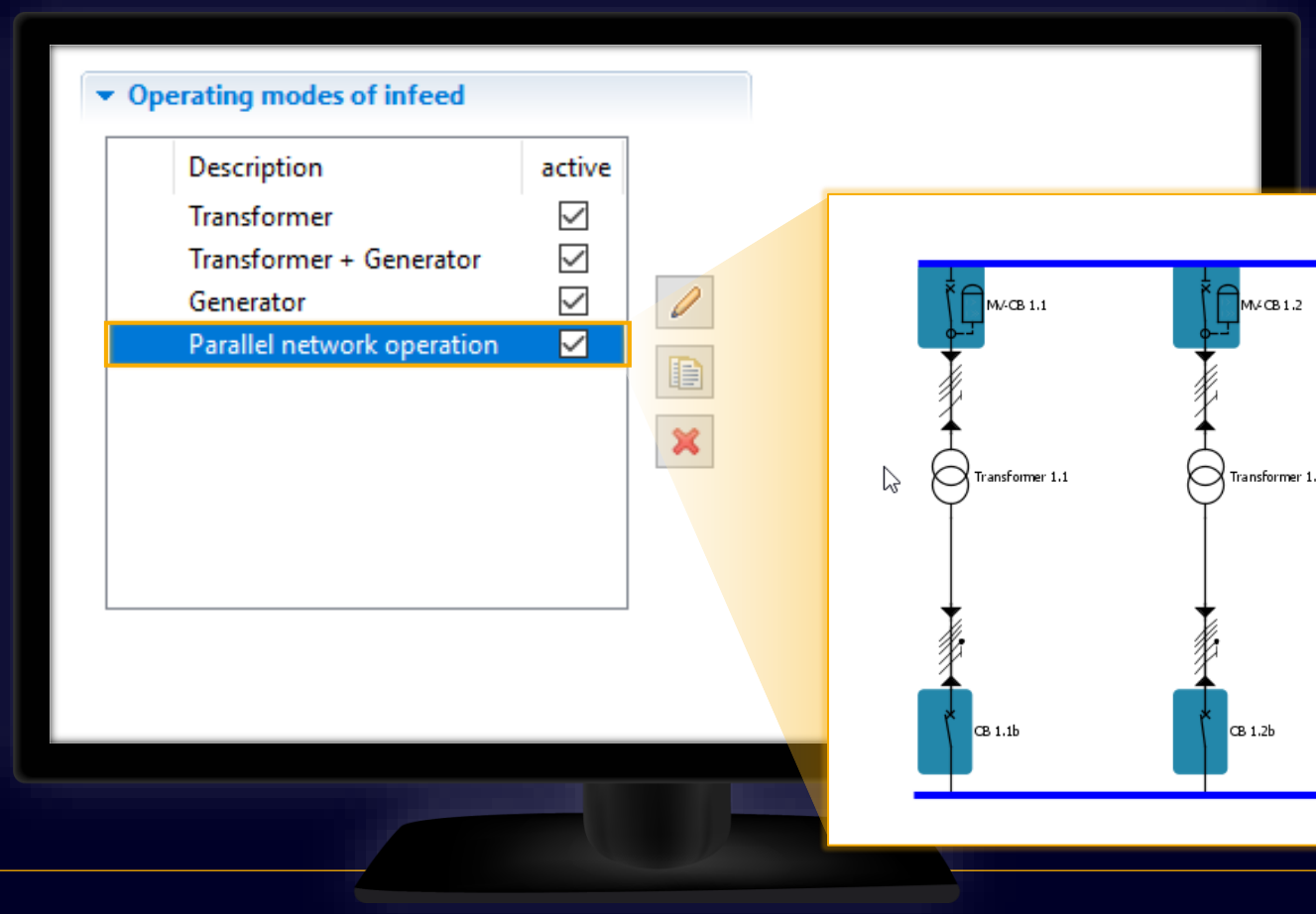
Dimensioning
Parallel network operation (pro)

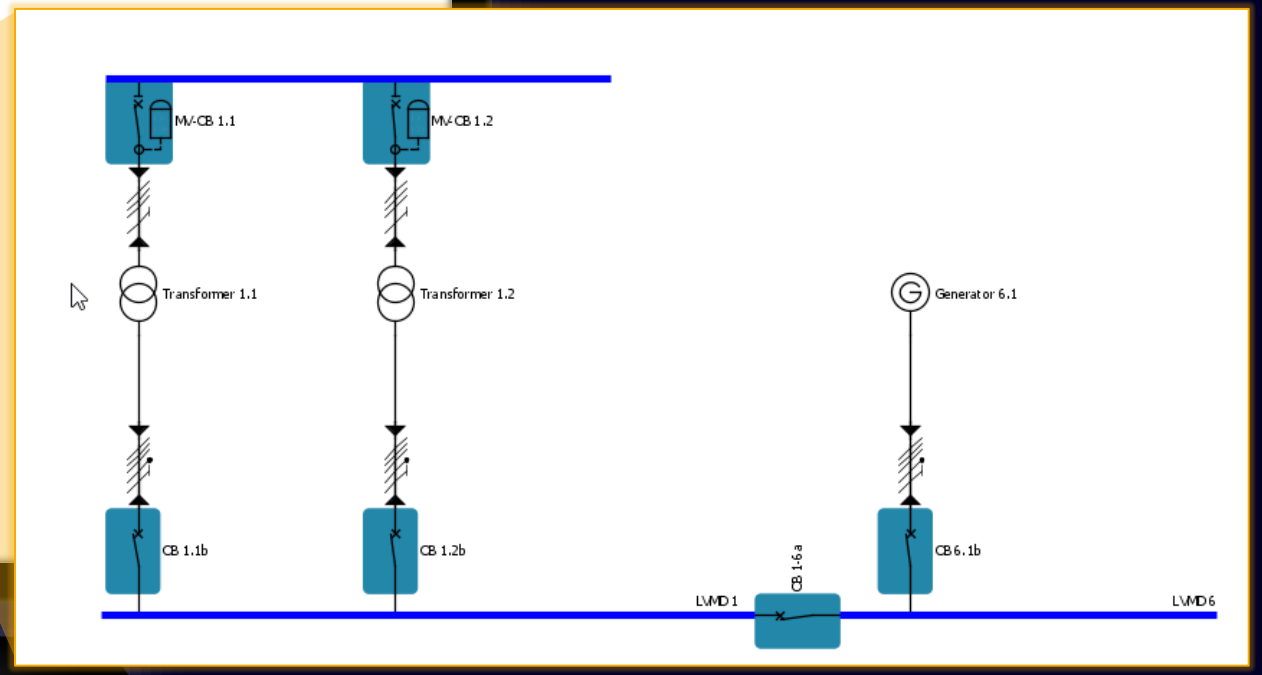


The possibility to dimension identical power sources connected in parallel and calculating the impact of this configuration on the short-circuit currents or load currents in the network, is extended by another option in **SIMARIS design professional:**

- different power sources (e.g. transformers and generators) can be operated in parallel in the same network.
- **Parallel network** operation can be configured in SIMARIS design by adding bidirectional ties (couplings) in conjunction with not identical infeed systems.

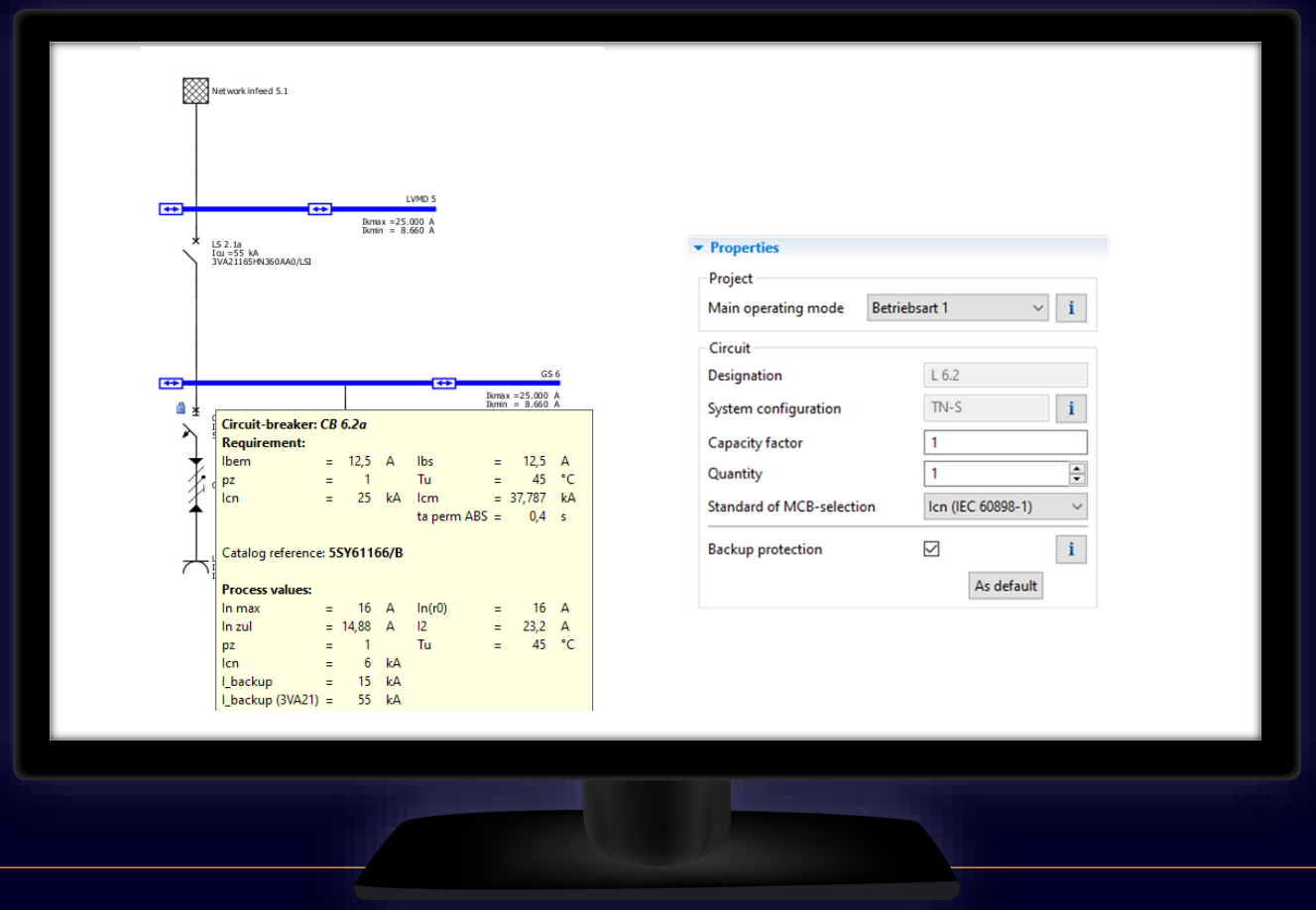
Dimensioning
Parallel network operation (pro)





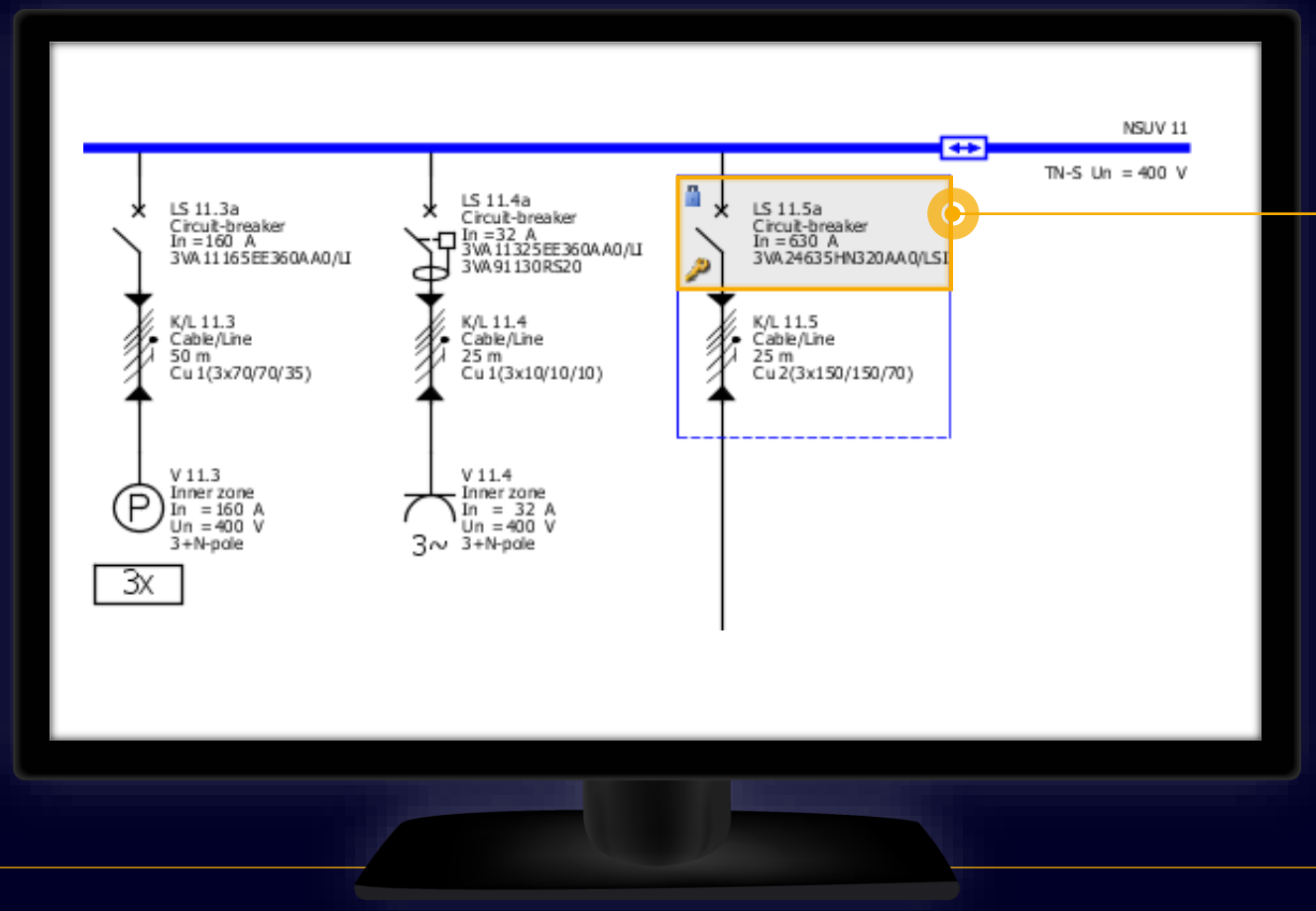
In the following example, the 4th defined operating mode (red frame) represents such parallel network operation.

Dimensioning
Back-up protection



If the checkmark for the back-up protection is set in the properties, the miniature circuit breakers in the final circuits are checked according to the **back-up protection tables**

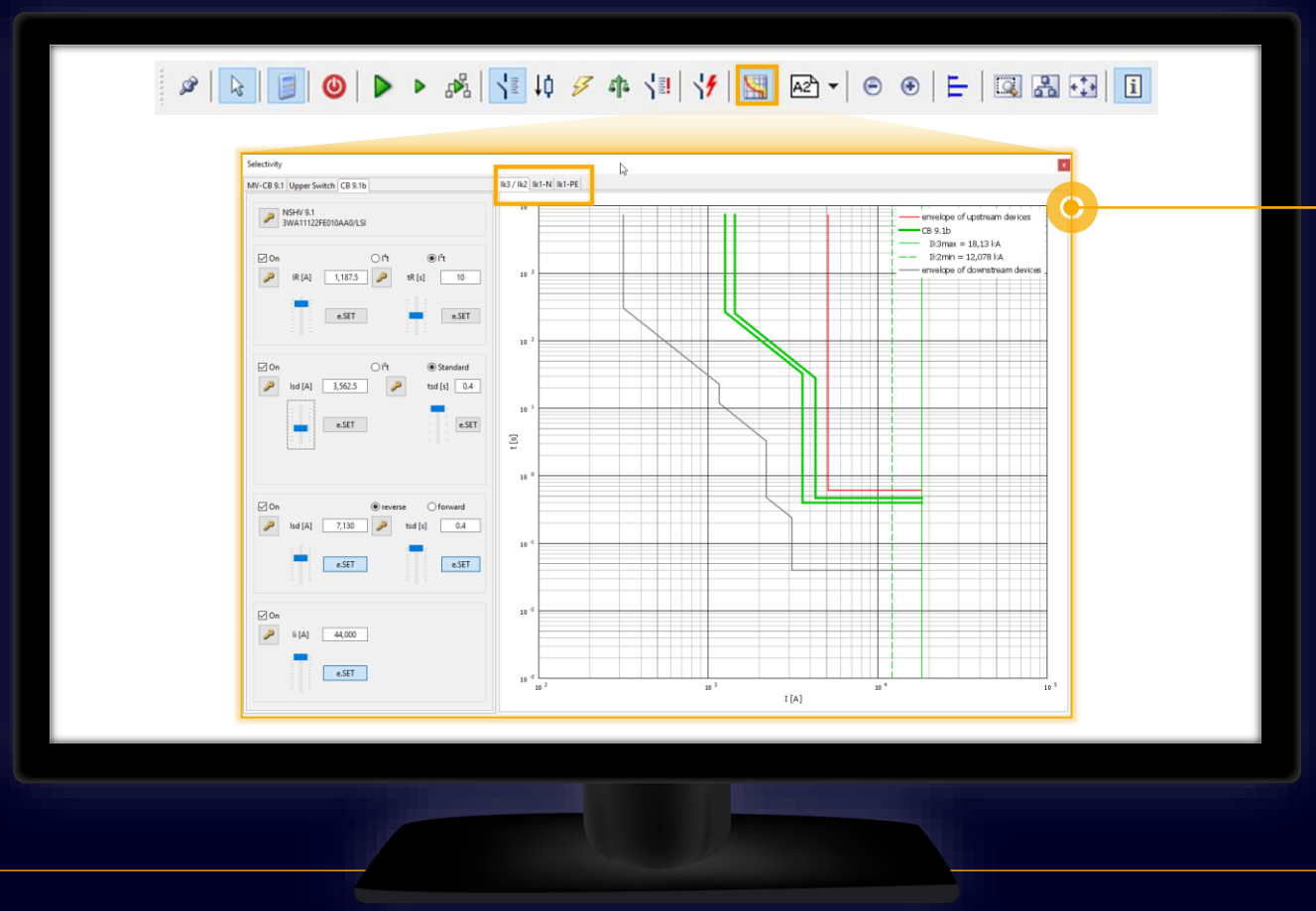
Dimensioning
Displaying characteristic curves



After you have dimensioned the network you created, you can display the characteristic device curves.

To do so, **at least one element on the network diagram** must always be selected (highlighted in grey).

Dimensioning
Displaying characteristic curves

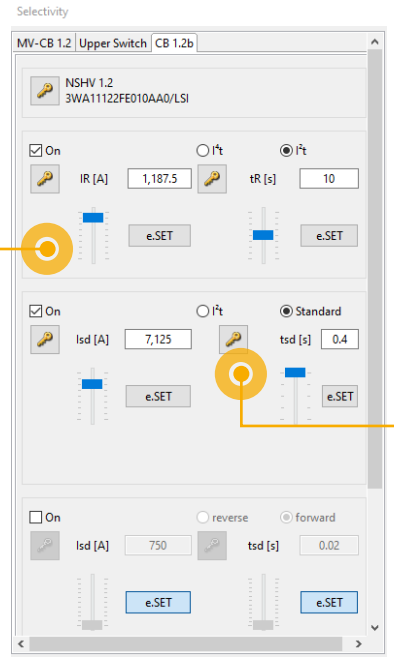


Click the icon **for displaying characteristic curves** on the tool bar.

A window opens, where the current-time characteristic of the selected element as well as the envelope curves of the upstream and downstream device are displayed in a diagram.

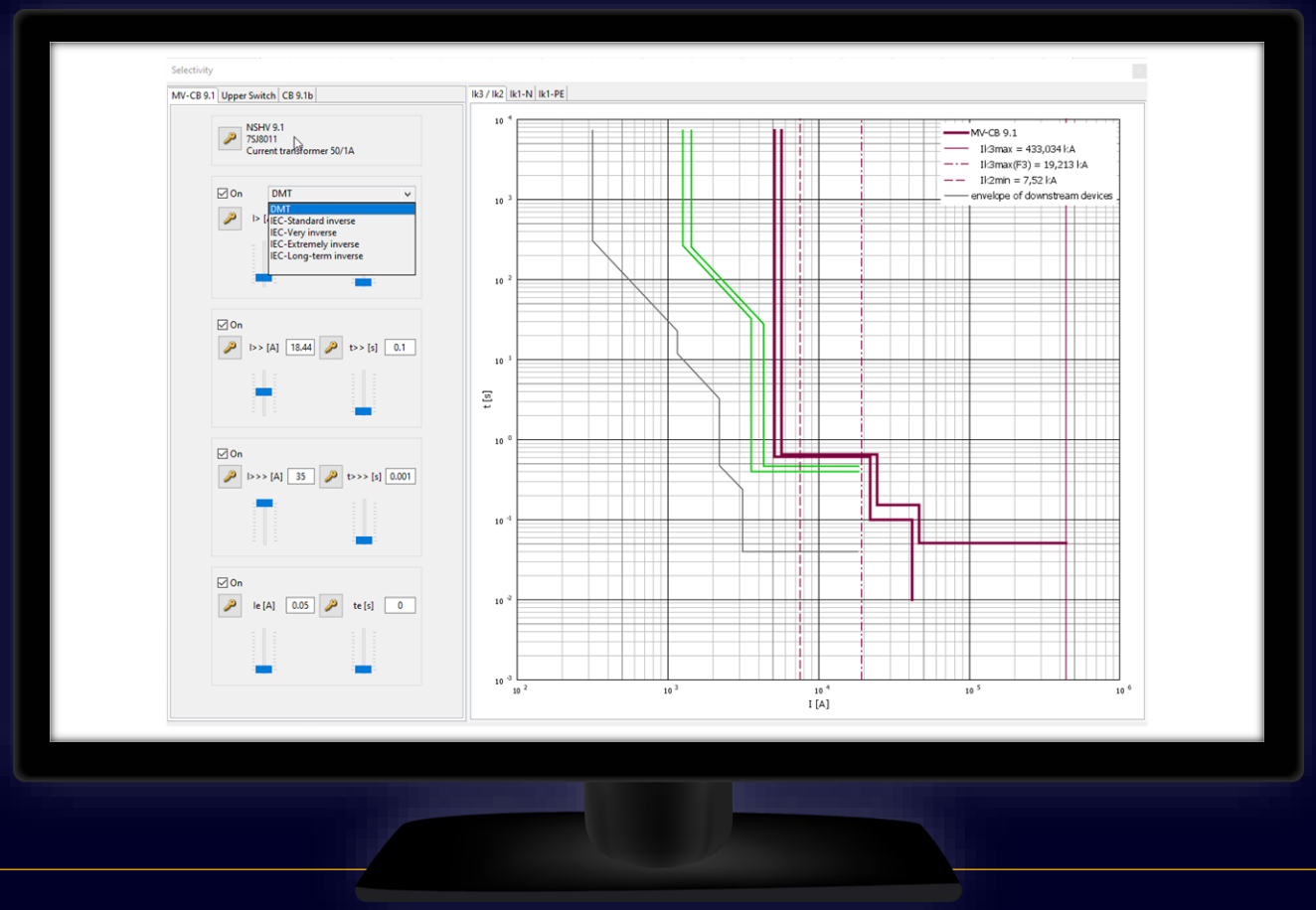
Dimensioning
Displaying characteristic curves

If there is the option for entering parameters of the selected device, they can now be **set with sliders.**



- The effects of these new settings on the current-time characteristic are simultaneously shown in the diagram on the right, where the device curve is adjusted accordingly.
- A click on the key icon of one or all switches locks your settings.
- They won't be changed any more in any subsequent redimensioning process.
- Such devices are identified **by a key on the network diagram** as well.
- Any conflicts resulting from the defined setting are indicated in form of messages below the network diagram.

Dimensioning
Displaying characteristic curves

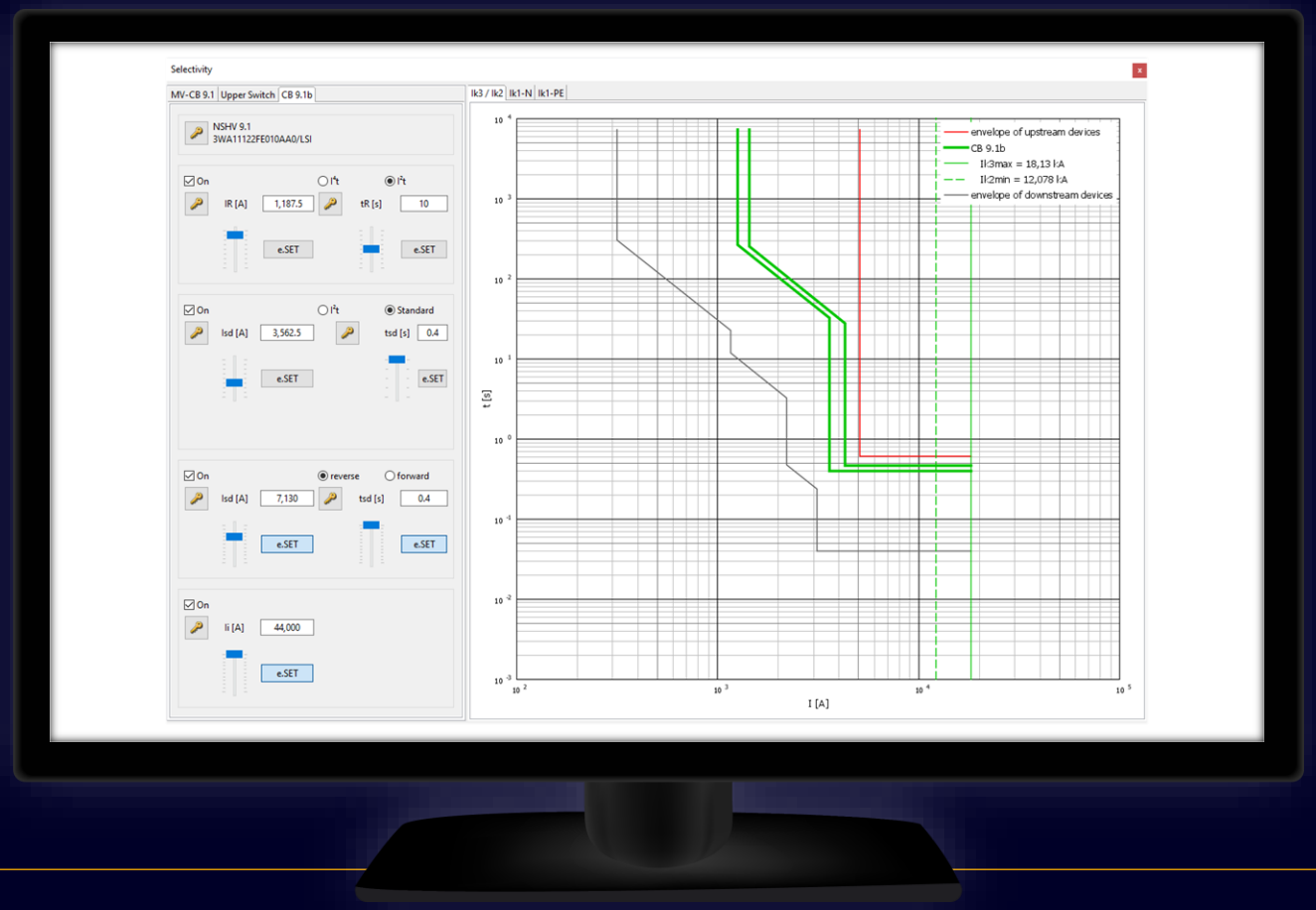


For medium-voltage circuit breakers you can select either DMT (Definite Minimum Time) or IDMT (Inverse Definite Minimum Time) in the selectivity window

For IDMT you can select the following curves:

- **IEC-Standard invers**
- **IEC-Very invers**
- **IEC-Extremely invers**
- **IEC-Long-term invers**

Dimensioning
Displaying characteristic curves – Directional Short Circuit Protection



For **type 3WA open circuit breakers**, in addition to the known settings for LSIG, a directional short circuit protection (dst) can also be set in the "**Selectivity**" window.

The following settings can be selected for dst:

Forward:

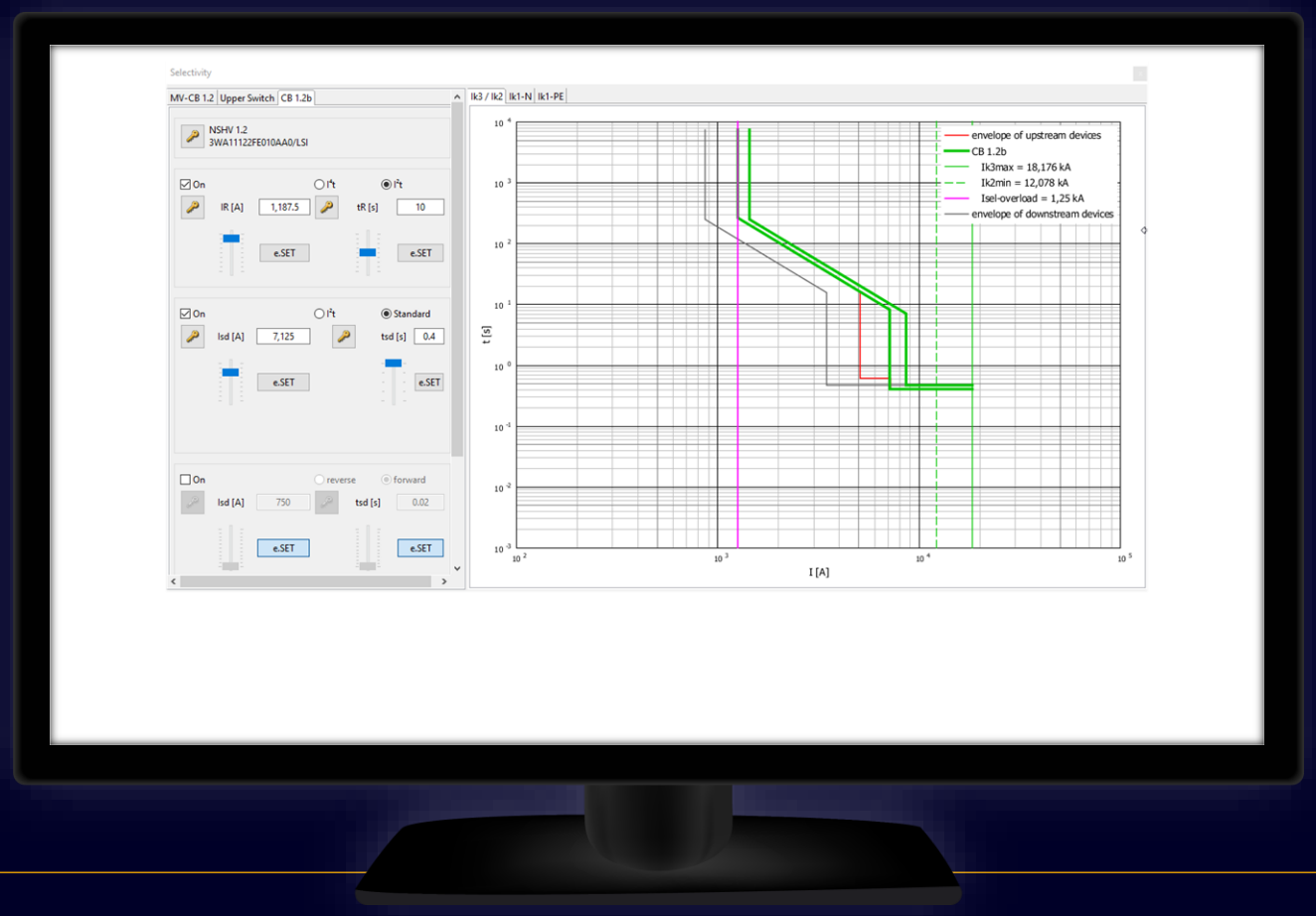
- Isd
- tsd

Backward:

- Isd
- tsd

The selected characteristic is always displayed

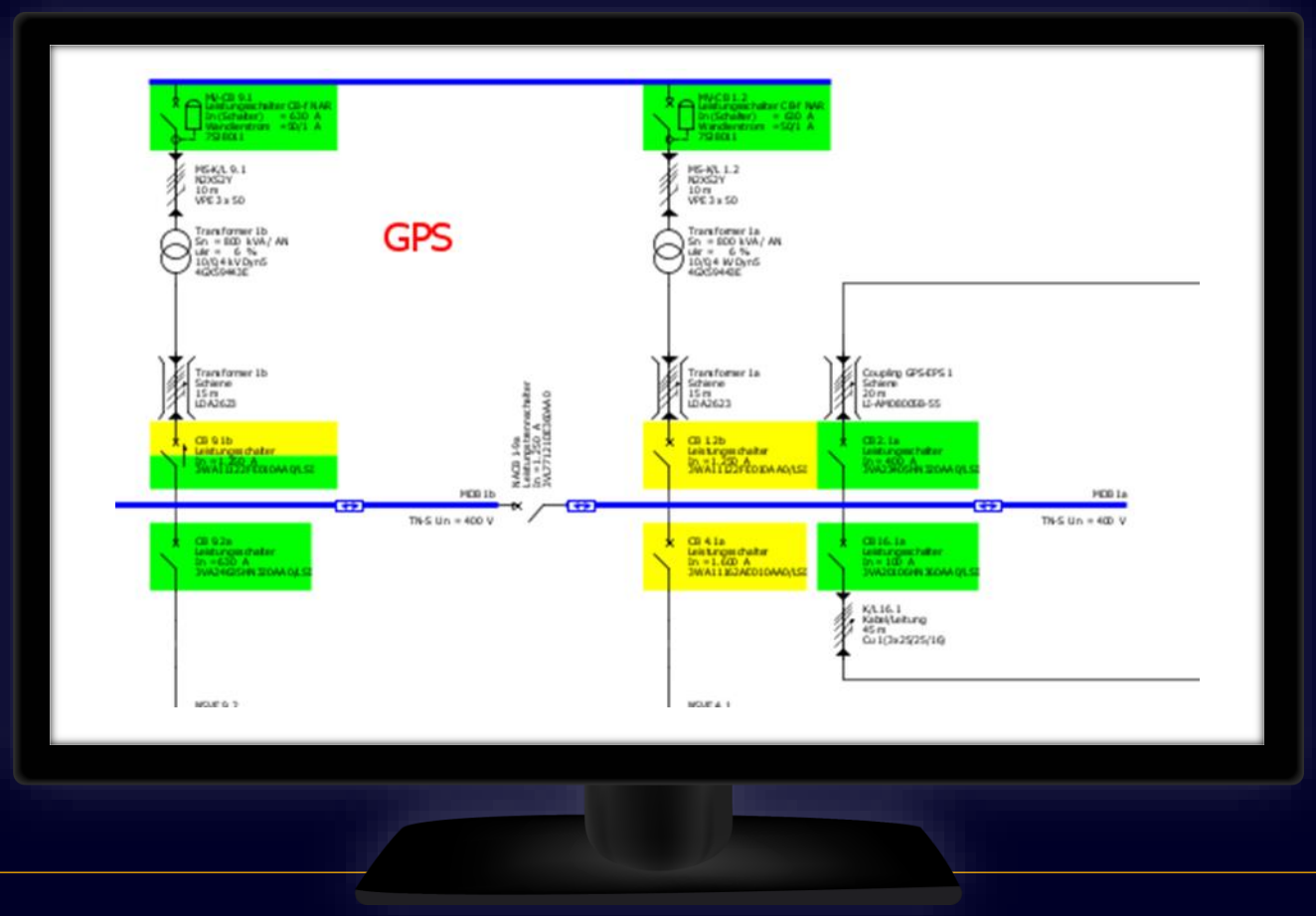
Dimensioning
Automatic selectivity evaluation (pro)



With **SIMARIS design professional** you can benefit from automatic selectivity evaluations by the software.

In addition to the current-time characteristic of the selected item of equipment and the envelope curves of its upstream and downstream device, its selectivity limits are also displayed automatically.

Dimensioning
Automatic selectivity evaluation (pro)



In addition, each switching device is colour-marked in the entire network diagram as follows, when selectivity evaluation was enabled:

Green: item is fully selective

Yellow: item is partially selective

Grey: item cannot be evaluated

The evaluation is made for the operating mode defined as the main operating mode

If switches are evaluated in two colors, different results are available for the directions

START

Project output

- Overview
- Project documentation
- Operating modes
- Selectivity documentation
- Transfer file

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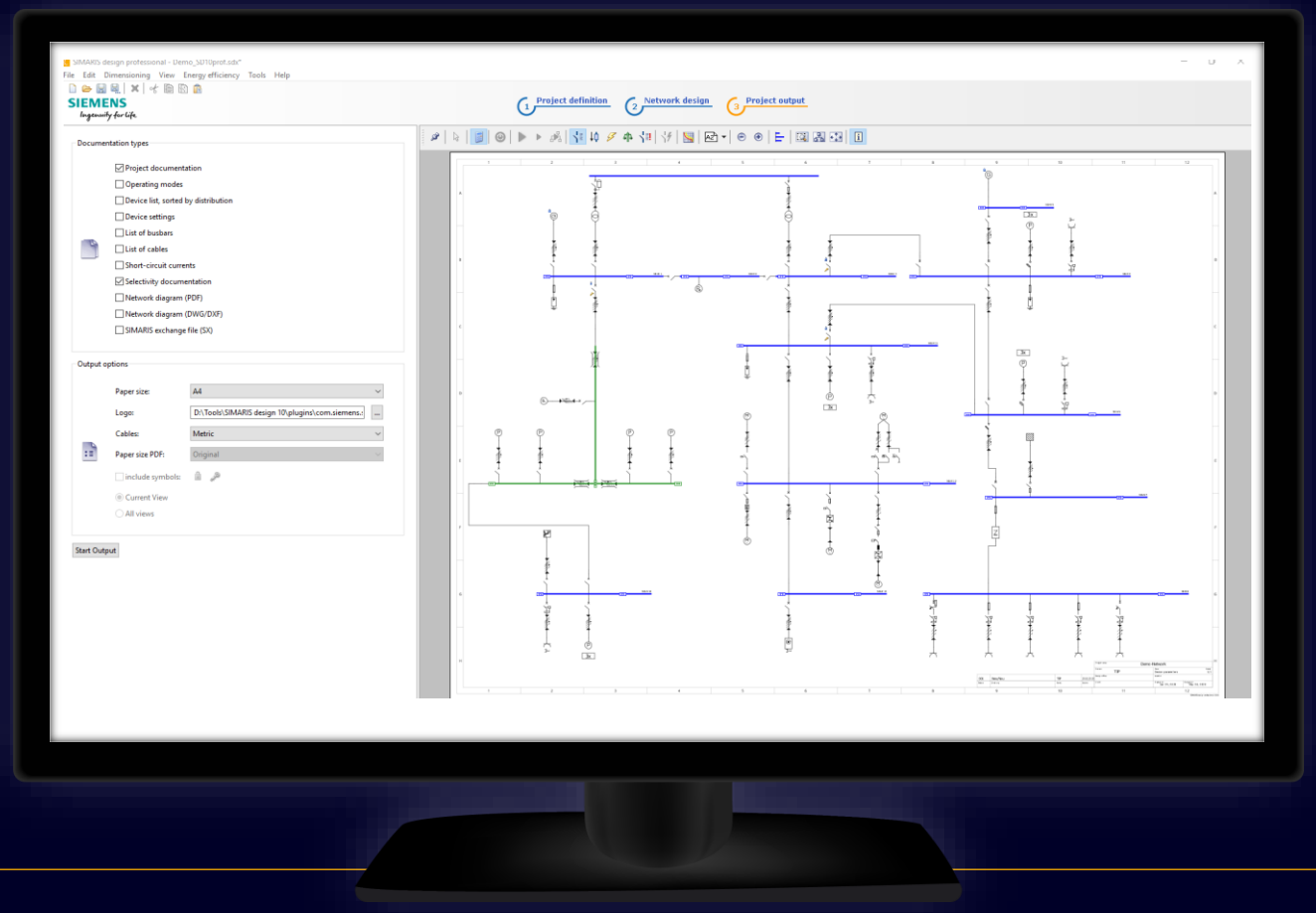
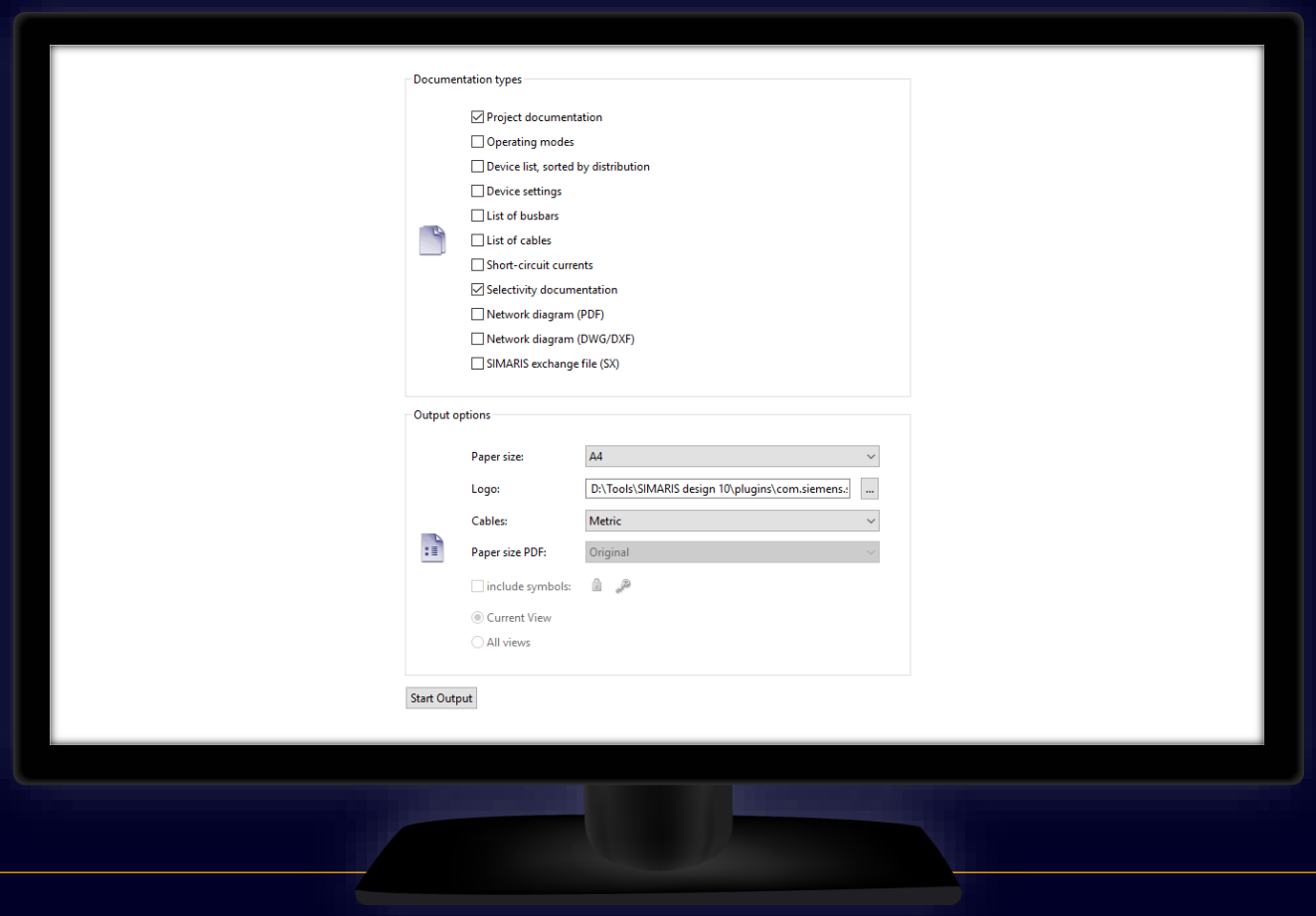
Project Output
Overview



In the step "**Project output**", you can see the network diagram you designed on the right. It cannot be modified any more in this program step.

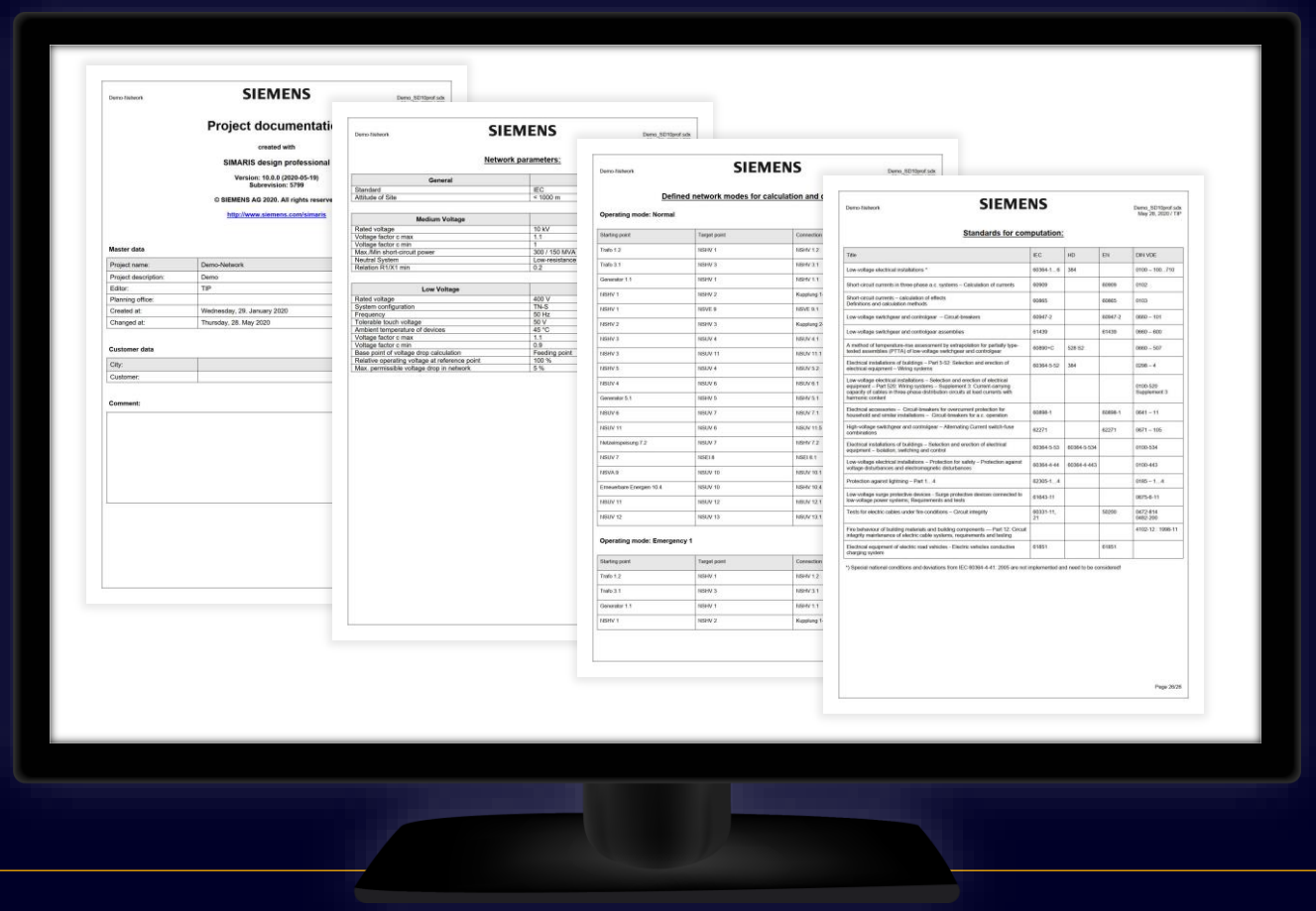
Project Output
Overview



In the screen area on the left, **you can define the output type of your project by clicking the appropriate check box.**

Below you can select the options linked to that **output type.**

Project Output
Project documentation

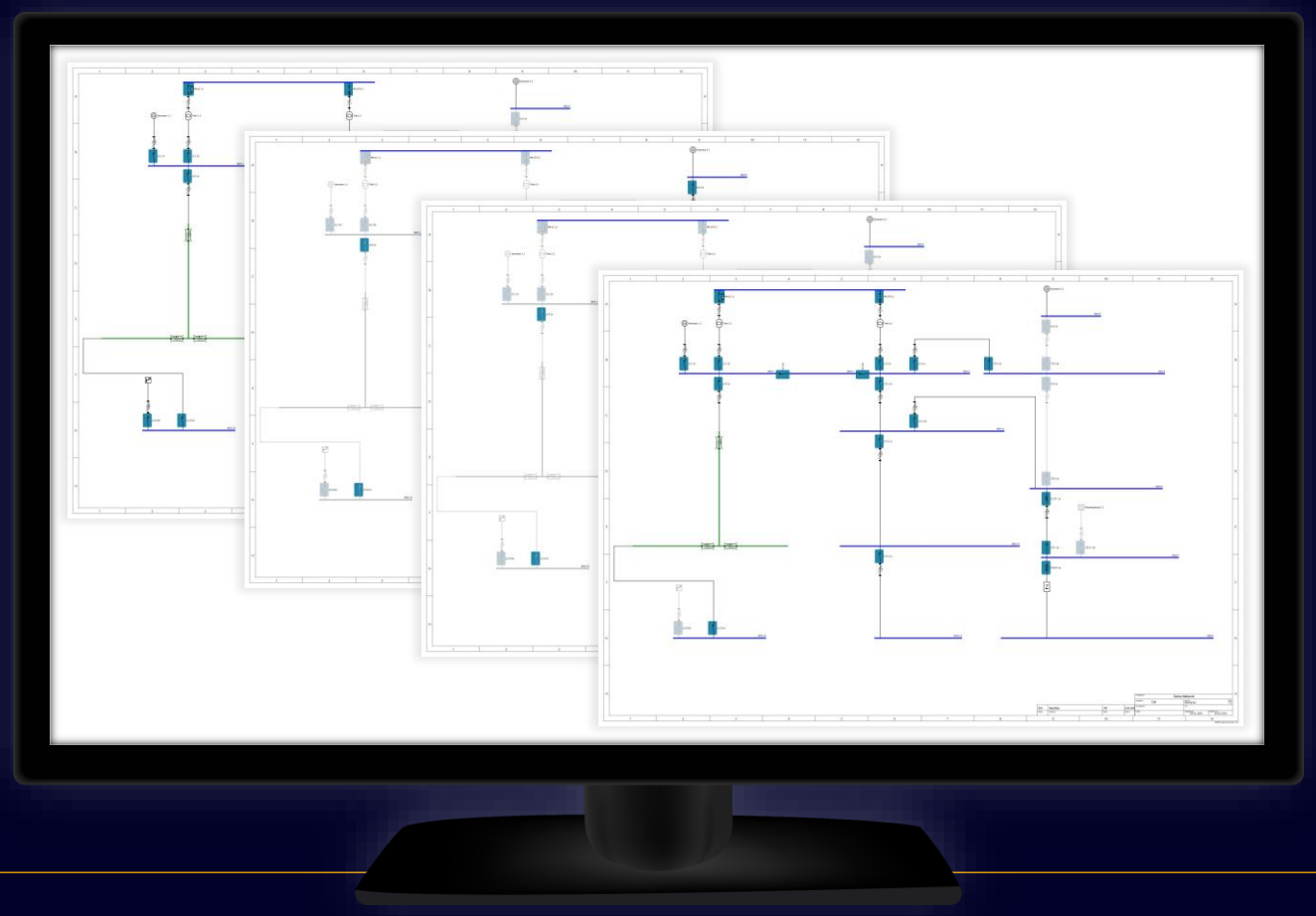


Some of the output variants available in SIMARIS design are described below:

"**Project documentation**" for example comprises

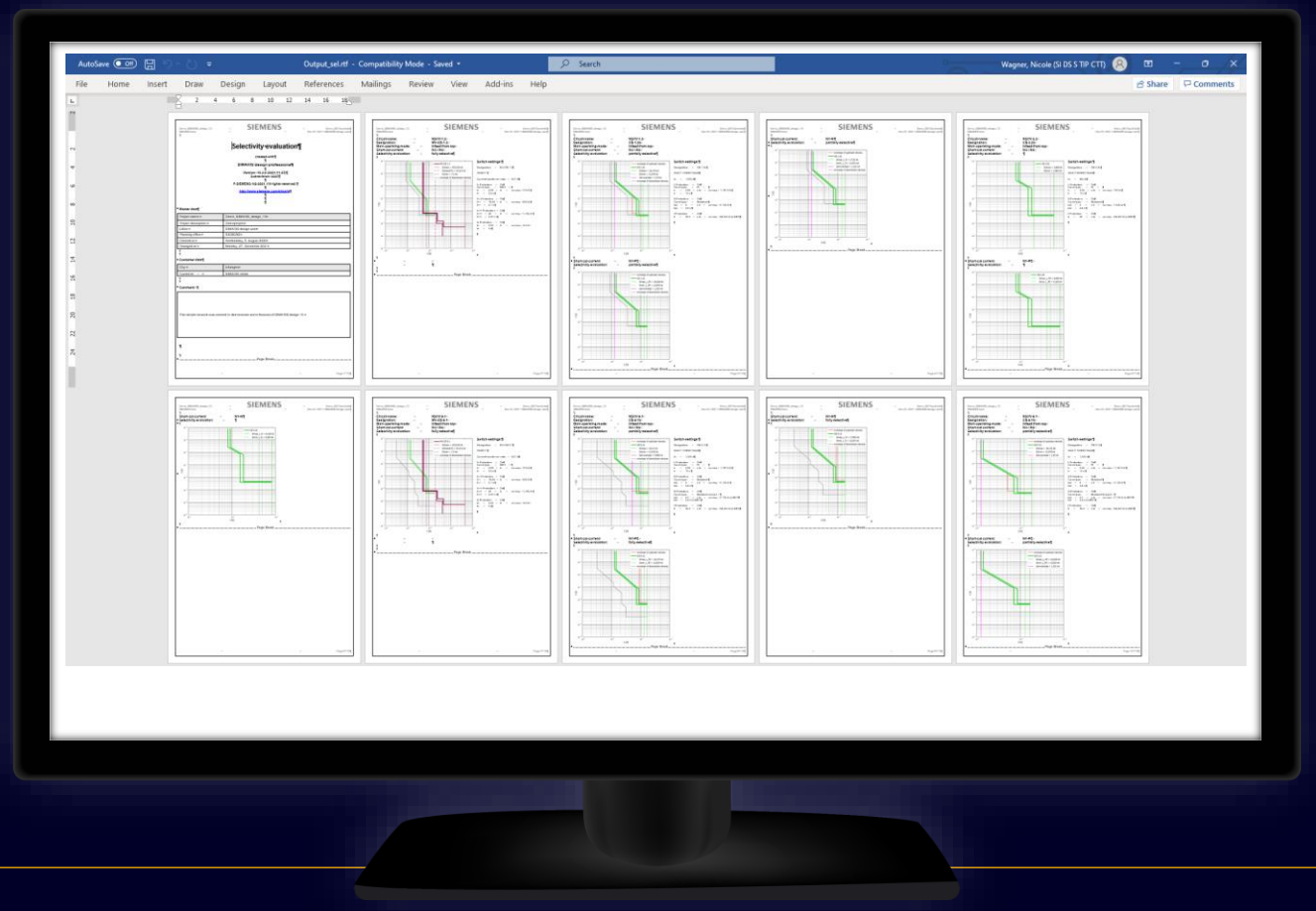
- a cover sheet
- an overview of the default settings made
- a graphical representation of the defined network operating modes
- device lists
- a list of the standards used for the calculation.

Project Output
Operating modes



The "**Operating modes**" output contains a sheet for each defined operating mode, which shows the specified switch positions.

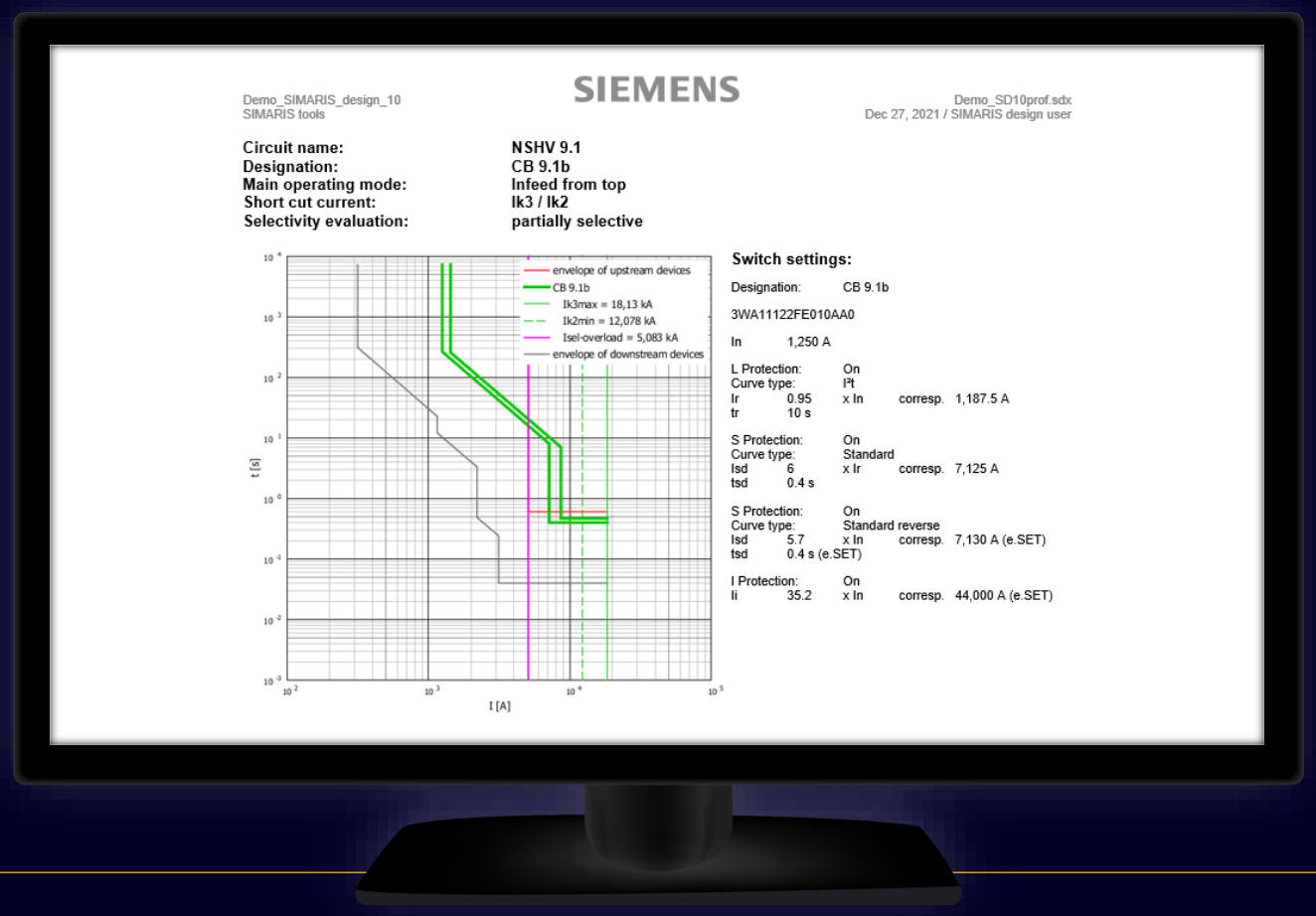
Project Output
Selectivity documentation



"**Selectivity documentation**" comprises a data sheet for each configured device

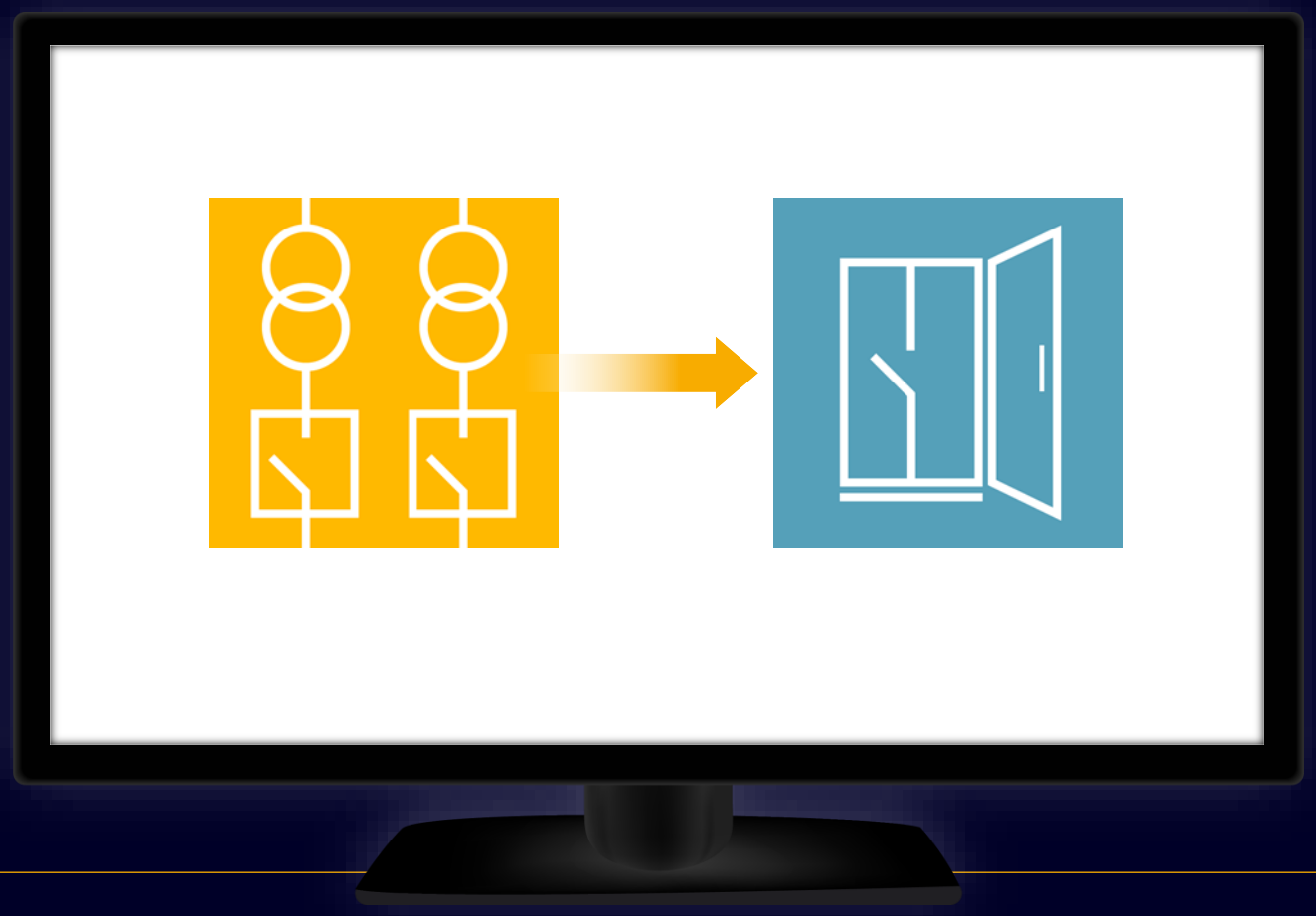
- which allows an unambiguous identification of the device on the network diagram,
- documents all of the required parameter settings,
- and includes a drawing showing the corresponding tripping characteristic incl. tolerance bands and the envelope curves of the upstream and downstream devices.

Project Output
Selectivity documentation (professional)



In addition, users of the **professional** version are provided with a selectivity evaluation of every device and the selectivity limits for the device are shown on the graphics.

Project Output
Transfer file for SIMARIS project



In **SIMARIS design** users are able to create a transfer file (.sx) to hand over project data to SIMARIS project.

SIMARIS project is a software tool for determining the space requirements of electric power distribution systems and budgeting them. In addition, it can automatically create tender specification texts for the configured switchgear and BIM data.
SIMARIS project is currently available for the following countries: Austria, Brazil, Canada, China, Germany, Italy, Netherlands, Poland, Portugal, Russia, Spain, Switzerland, Turkey.

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- SIMARIS planning tools
- Totally Integrated Power
- Disclaimer
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More about SIMARIS
SIMARIS planning tools

START

In the SIMARIS design software, you will find more useful information about how to familiarize with the program and how to handle it efficiently. Click the menu item "**Help**" to access the Technical Manual for SIMARIS design and SIMARIS project.

SIMARIS design
for network calculation and dimensioning

SIMARIS project
for determining the space requirements of distribution boards, the budget and for generating specifications (bills of quantities) and BIM data

SIMARIS curves
to display tripping characteristics, as well as cut-off current characteristics and let-through energy curves

SIMARIS Online Toolbox with practical calculation tools for the daily business

SIMARIS busbarplan
for 3D-planning of busbar trunking systems

This website offers you a lot more information and interesting news about the SIMARIS planning tools.

The contact page, where you can find all regional contact partners for the SIMARIS planning tools, is also available at www.siemens.com/simaris/contact.

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More about SIMARIS
Integrated power distribution with Totally Integrated Power

Using SIMARIS planning tools you always rely on **Totally Integrated Power** – the intelligent concept for integrated power distribution in commercial, institutional and industrial buildings, ranging from the medium voltage level to the socket outlet.

This technology platform comprises tools and support for planning and configuring power distribution systems, a well-matched, comprehensive product and systems portfolio and the communications option to link power distribution to higher-level HMI, monitoring / control and management systems. This way, you can attain noticeable saving potentials throughout the entire project cycle – from investment and planning to building installation and operation.

www.siemens.com/tip-cs

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More about SIMARIS
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