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# SIMARIS Planning Tools

-- Easy, fast and safe to plan electrical power distribution

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[siemens.com/simaris](https://www.siemens.com/simaris)

## Table of content

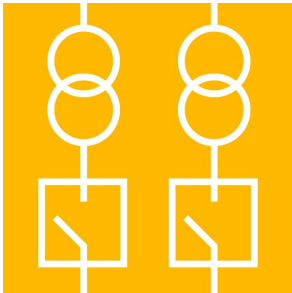


- **Overview**
- SIMARIS design 9.2
  - Single line diagram
  - Network calculation
  - Cables/wires dimensioning
  - Product configuration and selection
  - Selectivity
  - Project output
  - Special features in professional version
- SIMARIS project 5.2
- SIMARIS curves 5.2
- Marketing Support

## Outline of the SIMARIS planning tools



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



▶ **SIMARIS design**  
for network calculation  
and dimensioning



▶ **SIMARIS project**  
for determining the space  
requirements of distributing  
systems and the budget as  
well as creating technical  
specifications



▶ **SIMARIS curves**  
for visualizing  
characteristic tripping  
curves, cut-off current  
and let-through energy  
curves



## Outline of the SIMARIS planning tools

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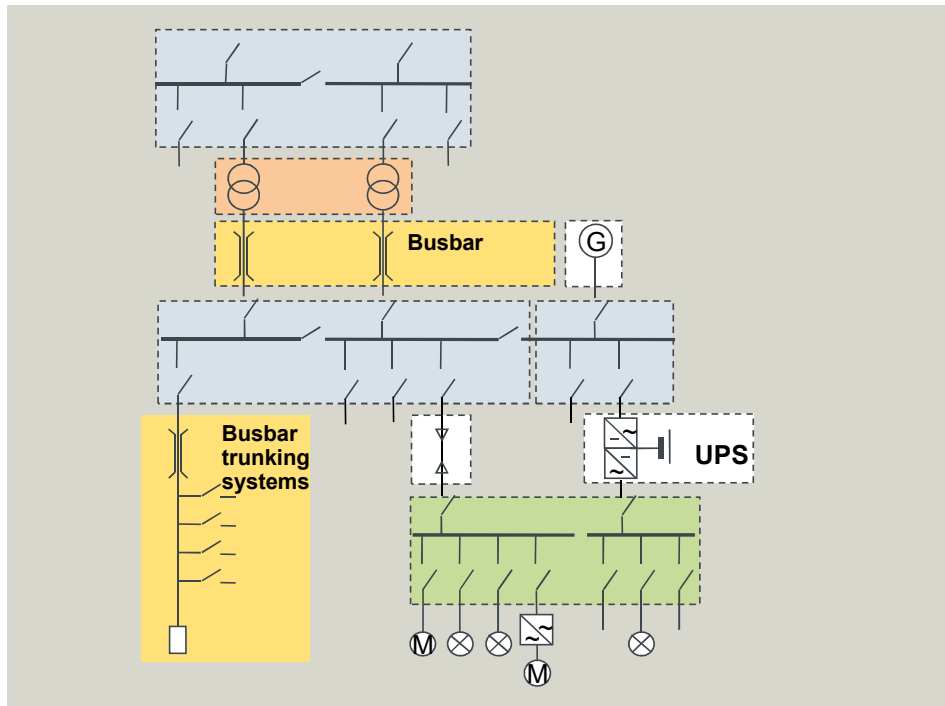
### Highlights

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



# Planning range from MV down to LV in the SIMARIS planning tools

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Medium-voltage switchgear



Transformer

Low-voltage main distribution board



Busbar trunking systems

Distribution boards



## Table of content

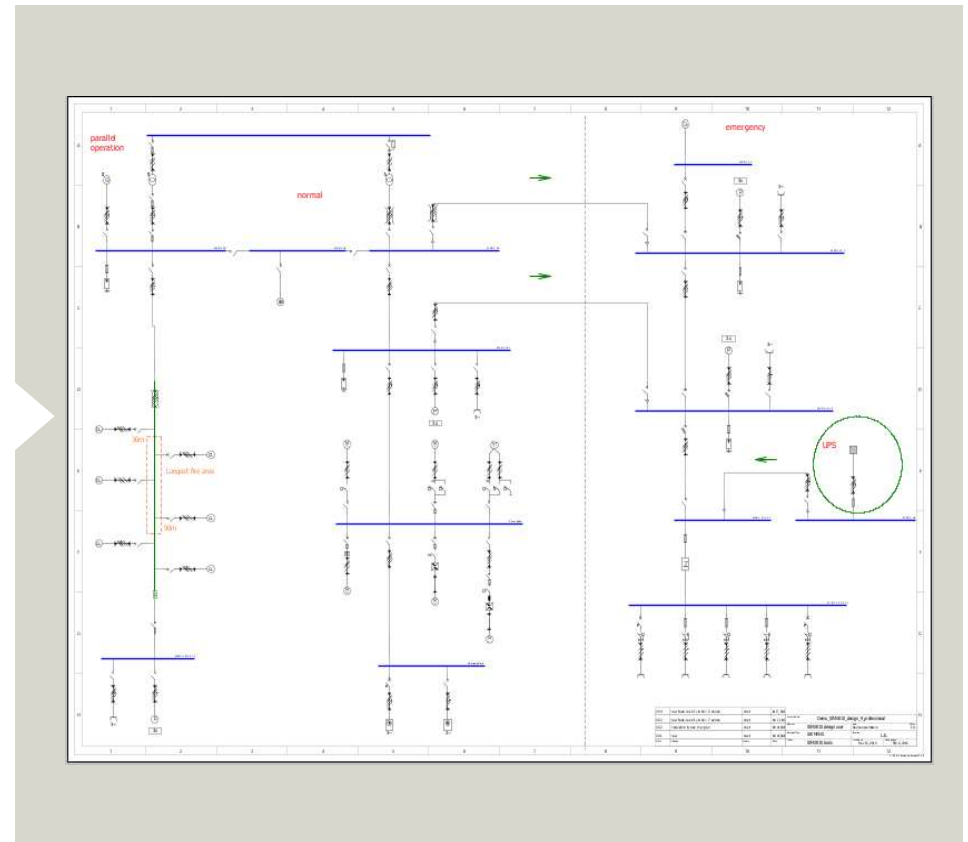


- Overview
- **SIMARIS design 9.2**
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# SIMARIS design overview

## Highlights

- Calculation of short-circuit current, load flow, voltage drop and energy balance
- Consideration of required personal, short-circuit and overload protection, selectivity
- Free definition of network operating modes and switching conditions
- Output planning results: single-line diagram with DWG/DXF/PDF format, and others
- Dimensioning performed according to the accepted rules of good installation practice and all applicable standards (VDE, IEC)



# Network Design – Overview

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Library  
Favorites  
Graphic/symbols

Hints

Properties of  
circuits

Properties of  
equipment

The screenshot displays the SIMARIS design professional software interface. The main window shows a network diagram with various components like buses, breakers, and transformers. The interface includes a top menu bar, a toolbar, and several panels on the left side. The 'Properties of circuit' panel is open, showing details for a circuit named 'LVMD 11A1'. The 'Messages' panel at the bottom right displays a warning message about supplementary protective equipotential-bonding for transformer LVMD1.

Status	Element	Message
Warning	LVMD 11A1	Supplementary protective equipotential-bonding required for transformer LVMD1
Information	Network 11	The dimensioned medium-voltage devices have to be checked for permitted use in the appropriate switchboard.

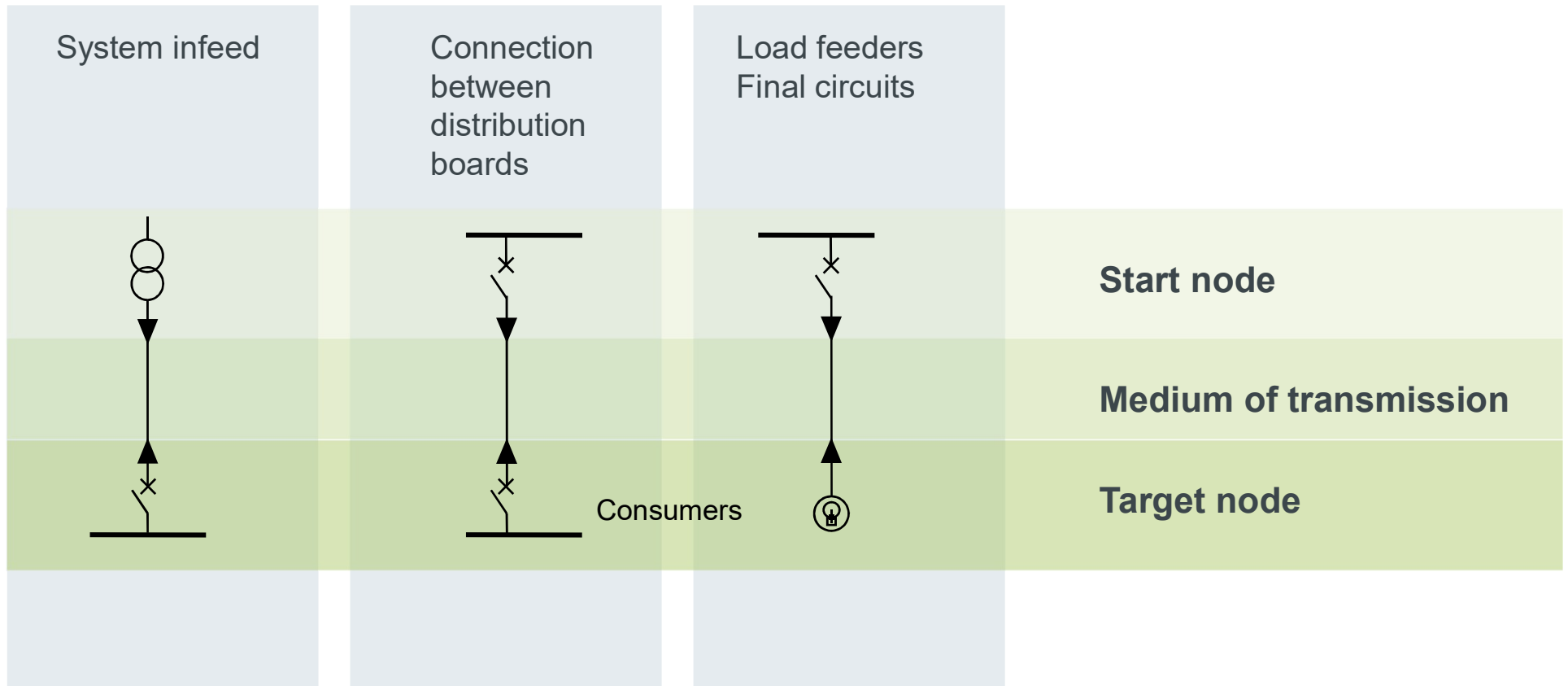
Tool bar

Graphics window

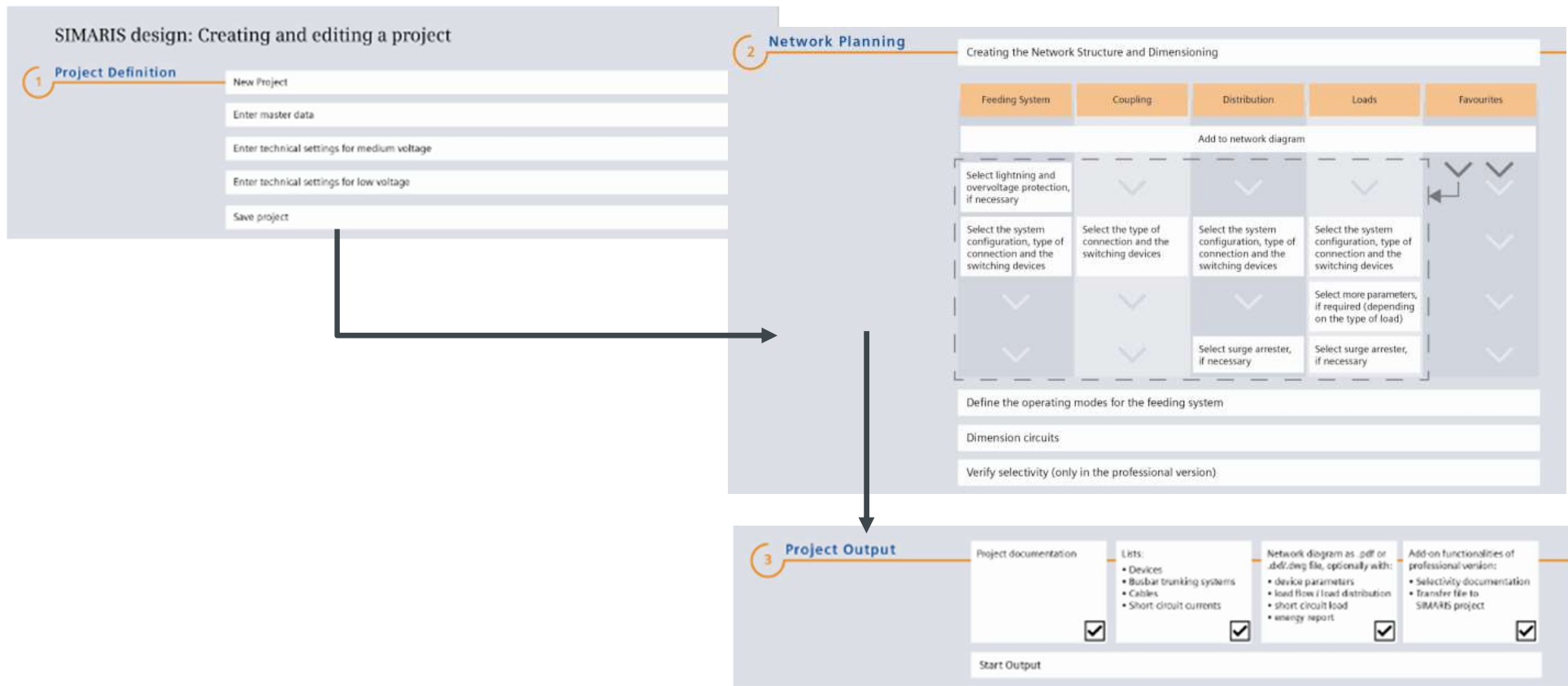
Message list



# Graphic network representation in SIMARIS design



# Project editing procedure in SIMARIS design



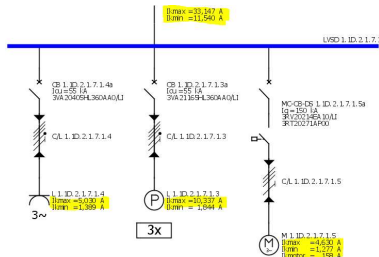
# SIMARIS design

Fast, easy to calculate the electrical data based on IEC standards

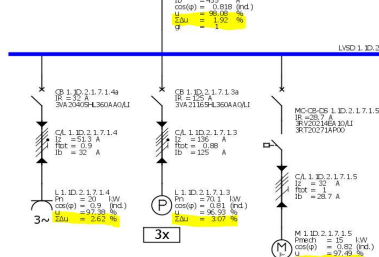


## Network calculation

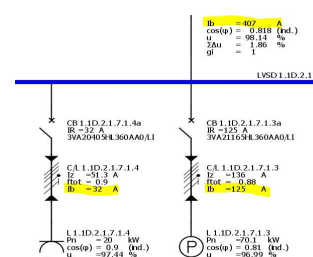
### Short circuit calculation



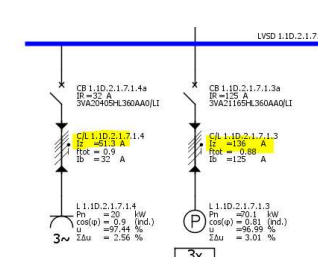
### Voltage drop calculation



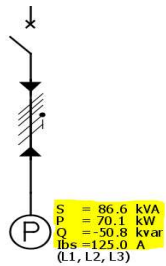
### Load flow calculation



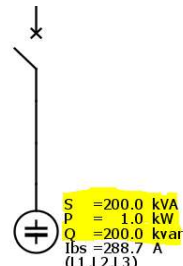
### Cables/wires dimensioning



### Energy balance calculation



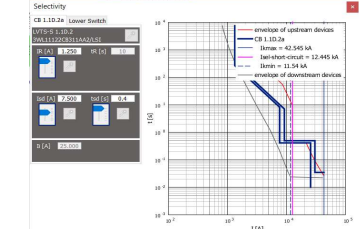
### Power compensation



### Power loss calculation

Circ.	S L	Pv	Pv	Su	cos	ΔU
LVT	82	11	13	-	0.8	0.3
LVM	77	9.6	12	-	-	-
LVM	60	8.3	13	-	-	-
LVS	10	3.9	0.3	-	0.8	0.6
Mot	30	3.6	12	-	0.9	2.27
L1	11	3.5	10	85	0.83	1.71
L1	86	3.3	12	100	0.81	3.01
FC	12	3.0	2.3	132	0.95	2.71
L1	11	2.2	0.6	110	0.8	2
Con	35	1.8	0.5	-	0.8	0.6
L1	10	1.7	1.6	150	0.81	3.44
Cou	37	1.7	0.4	-	0.8	1.29

### Overload and short circuit protection, selectivity



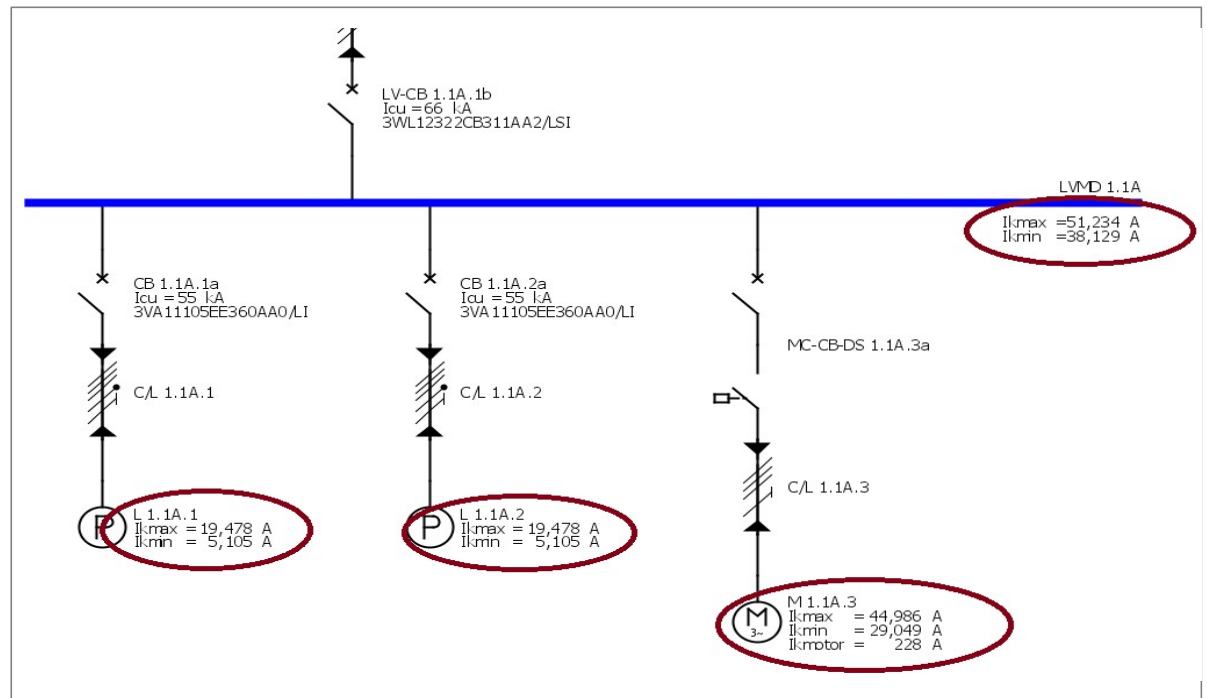
# Short circuit calculation

Highlight: calculate all types of short-circuit currents for each feeder based on IEC60909

Max. short circuit current:  $I_{kmax}$

Min. short circuit current:  $I_{kmin}$

3-pole short-circuit current proportion of the motor:  
 $I_{kmotor}$

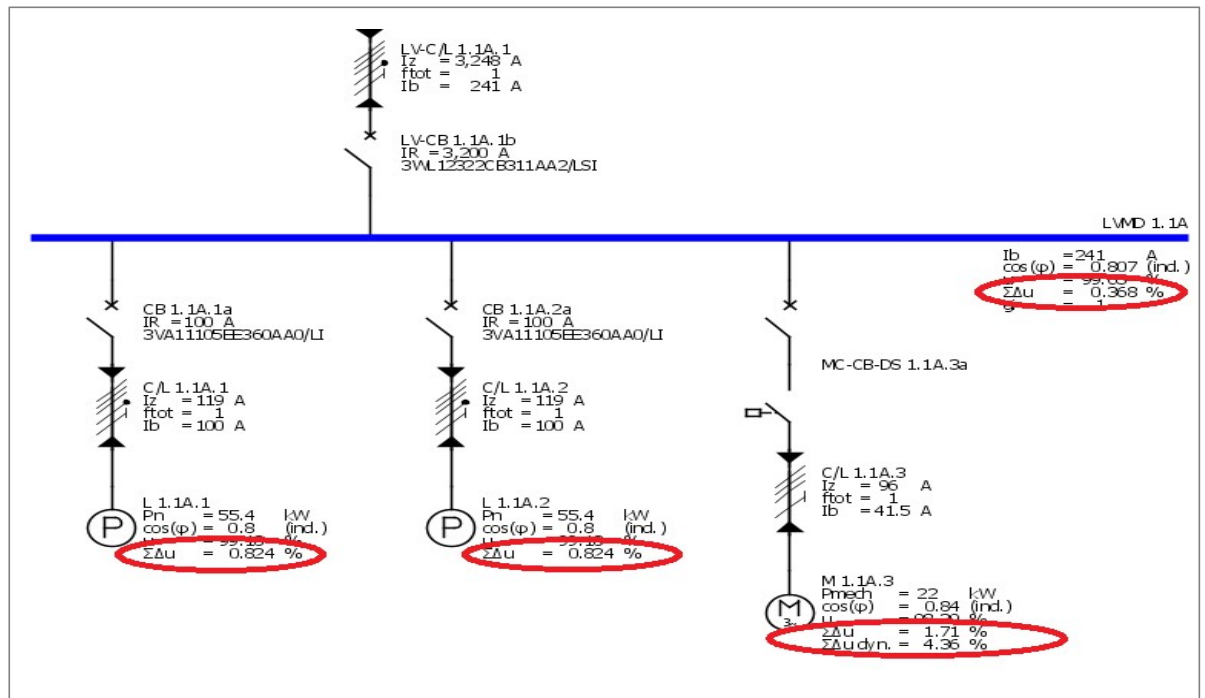




# Voltage drop calculation

**Highlight: calculate voltage drop of cable/busbar trunking system with temperature setting**

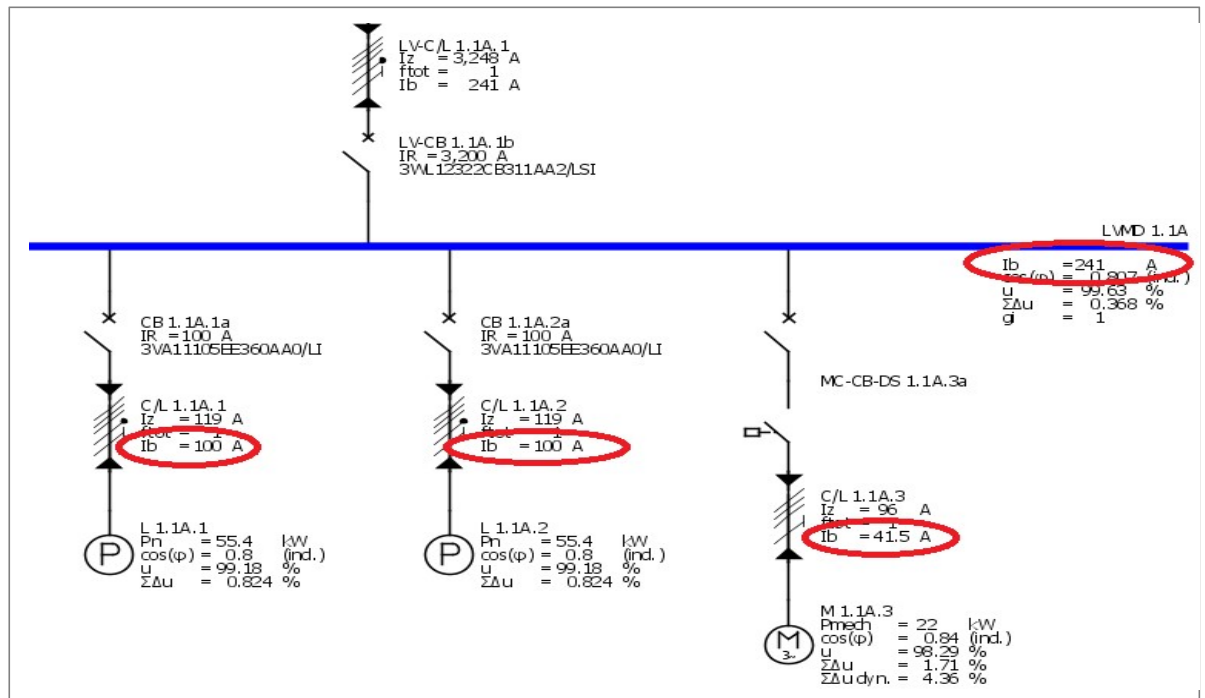
- **The maximum permissible voltage drop** for power consumers must be taken into account for cable rating.
- Owing to the high inrush current for accelerating the centrifugal mass and due to the fact that the inductive motor resistance is greatly reduced in the instant of on-switching, **the dynamic voltage drop must be considered** in this operating case in addition to the **static voltage drop**.
- Voltage tolerances for equipment and installations are defined in IEC60038



# Load flow calculation

## Highlight: calculate load currents considering simultaneity and capacity factors

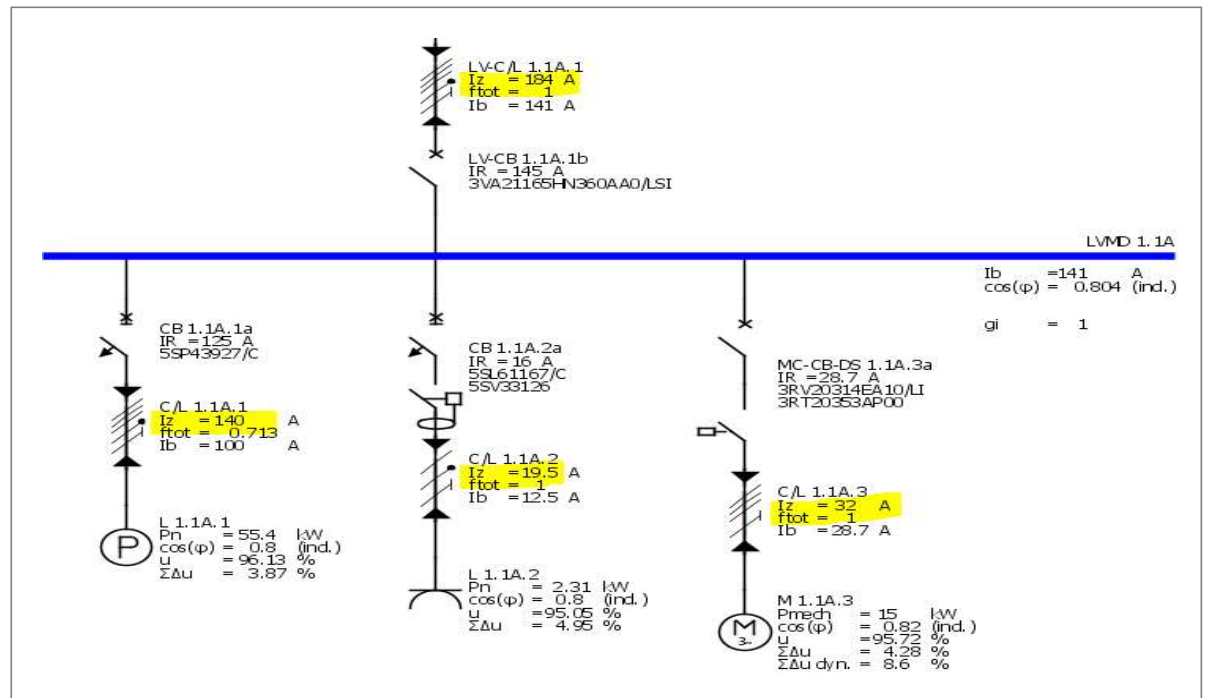
- Simultaneity and capacity factors are considered for load current calculation
- The **simultaneity factor gi** is the ratio of maximum power required compared to installed capacity.
- The **capacity factor ai** describes the load share which is taken into account in the energy balance of the network.
- 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.



# Cables/wires dimensioning(1)

**Highlight:** the permissible load capacity  $I_Z$  of cables or wires can be determined in accordance with the real wiring conditions.

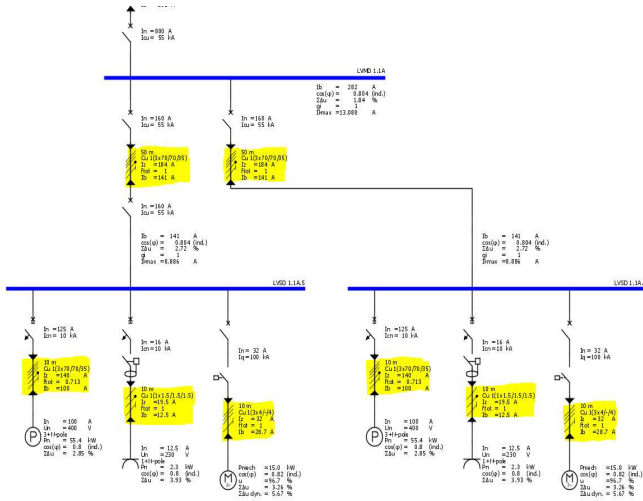
- When dimensioning cables and wires, SIMARIS design takes into account **the installation type** by means of appropriate adjustment factors in accordance with the international **standard IEC 60364-5-52**
- The selection of the installation type automatically factors in the appropriate rated values  $I_r$  for the cable's current carrying capacity in reference installation type A1, A2, B1, B2, C, D1, D2, E, F or G. A distinction is made according to **conductor material and conductor insulation material**.
- According to the standards relating to the permissible current carrying capacity, conversion factors for deviating conditions must additionally be factored in.  
 $I_z = I_r \cdot \Pi f$



# Cables/wires dimensioning(2)



## Configurable view



## Cables/wires property

Cables/wires	
Designation	<input checked="" type="checkbox"/> Automatic dimensioning C/L 1.1A.5
Functional endurance	none
Type of cable	Multi-core cable or light-plastic sheathed cable
Conductor material	Cu
Insulating material	PVC70
Cable designs	e.g. NYY, NYCWY, NYCY, NYKY
Installation type	C
Reduction factor f <sub>tot</sub>	1
Permissible voltage drop/section [%]	4
Temperatures [°C]	ΔU: 55; Ikmin: 80
Number of runs	1
Length [m]	50
Longest fire area [m]	0
Cross section of phase conductor [mm <sup>2</sup> ]	70
Cross section of N conductor [mm <sup>2</sup> ]	70
Cross section of PE conductor [mm <sup>2</sup> ]	35

As default      OK      Cancel

## Reduction factor f<sub>tot</sub>

Factor f <sub>tot</sub> selection							
Values							
Installation type	C						
Insulating material	PVC70						
Material for conductor	Cu						
Type of cable	Multi-core cable or light-plastic sheathed cables						
Factor f <sub>tot</sub>	0.609						
To be defined by user							
Ambient temperature [°C]	40						
Number of parallel cables	3						
Image	<table border="1"> <thead> <tr> <th>Image</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td></td> <td>Bundled directly on the wall, on the floor, in the wiring</td> </tr> <tr> <td></td> <td>Single-layer on the wall or on the floor with contact</td> </tr> </tbody> </table>	Image	Description		Bundled directly on the wall, on the floor, in the wiring		Single-layer on the wall or on the floor with contact
Image	Description						
	Bundled directly on the wall, on the floor, in the wiring						
	Single-layer on the wall or on the floor with contact						
Harmonics							
Harmonic content [%]	0 ... 15						

OK      Cancel

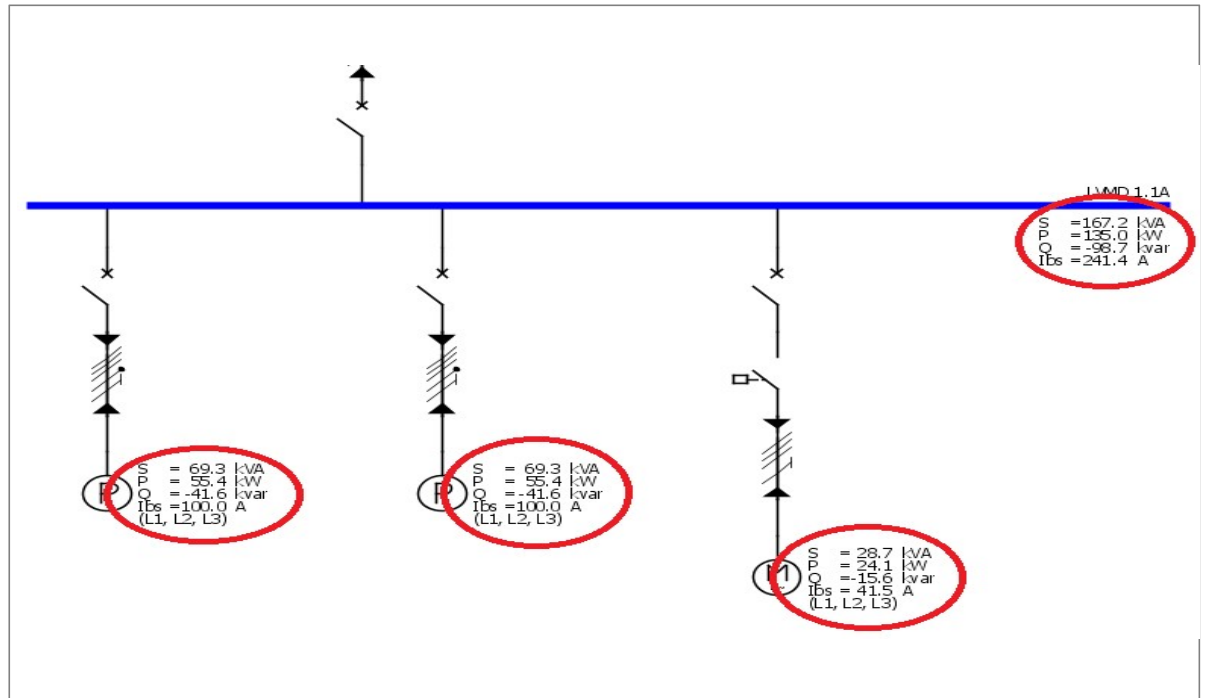


# Energy balance calculation

Highlight: calculate power including S, P, Q in each feeder

- the following information is displayed at every main distribution, sub-distribution and power consumer:

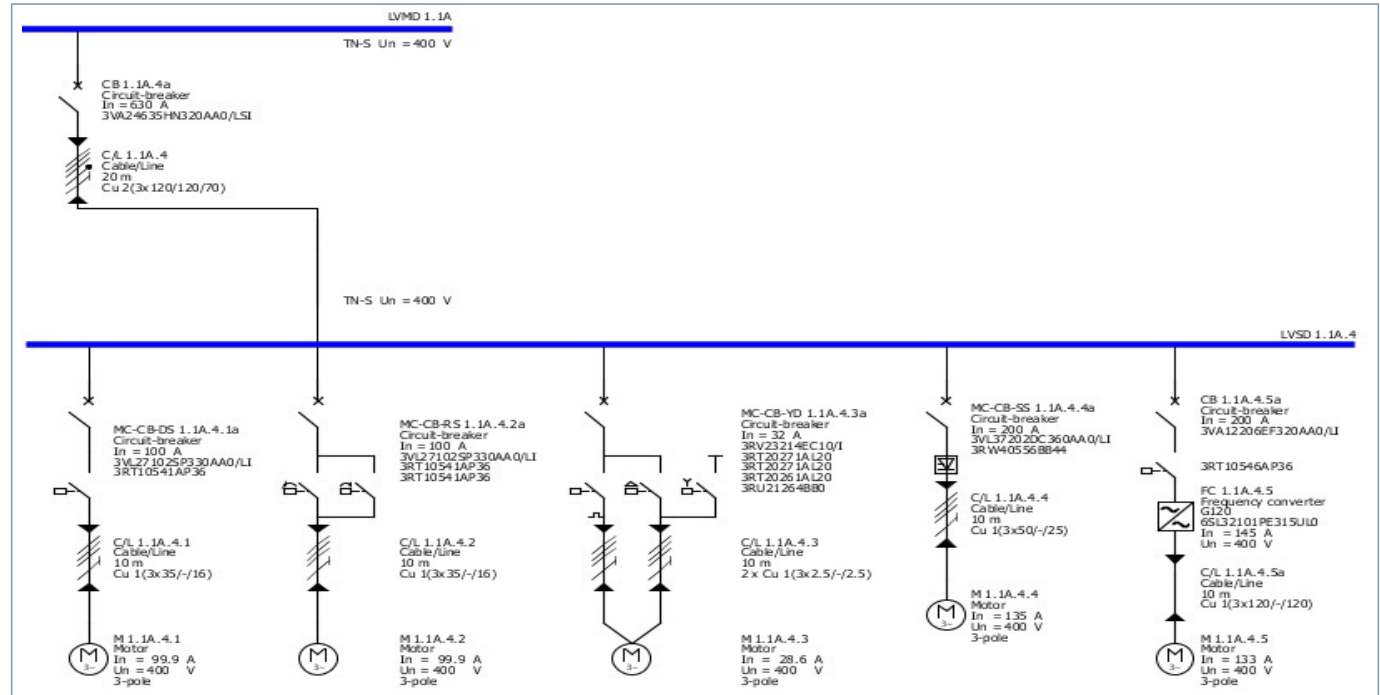
- apparent power
- active power
- reactive power
- rated apparent current
- loaded phase conductors



# Motor protection design

## Highlight: motor starter combination with type-tested device combination

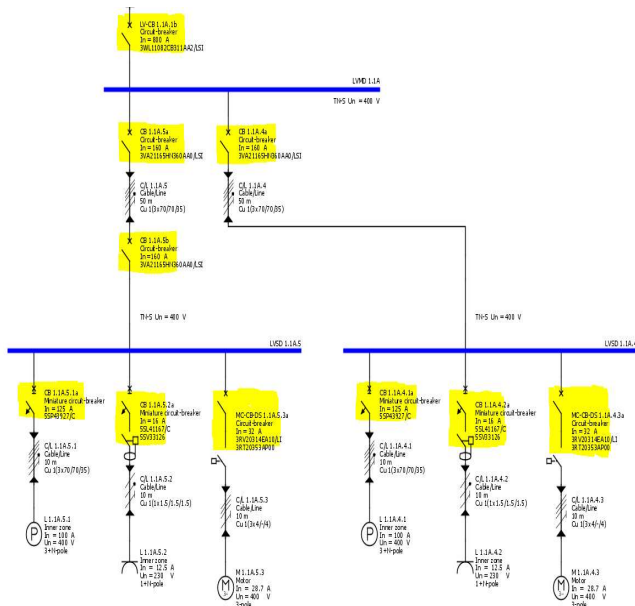
- Since motor starter combinations are type-tested device combinations which must not be changed, the technical data of the dimensioned switching devices are only displayed once it has been selected and dimensioned (**direct on-line starter, reversing mode, star-delta starter or soft starter**).



# Product configuration and selection



## View with device parameters



## Product property

**Circuit-breaker, LV**

Automatic dimensioning

Designation:

Earth fault detection:

Circuit-breaker

Catalog reference:

In / Icu:

Protective feature:

RCD

Catalog reference:

In / IΔn:

Type:

## Product catalog

**Catalog**

Search:

**Product groups**

- └ Circuit-breakers (ACB/MCCB/MSP) / Miniature circuit-breakers (MCB)
  - └ Air circuit-breakers (ACB)
  - └ Moulded case circuit-breakers (MCCB)
    - └ Circuit-breaker 3VA (In up to 1000 A, Icu up to 150 kA)
      - └ **Moulded case circuit-breakers 3VA**
        - └ Circuit-breakers 3VT (In up to 1600 A, Icu up to 65 kA)
        - └ SENTRON 3VL (In up to 1600 A, Icu up to 200 kA)
        - └ Circuit-breakers 3VF2 (In up to 100 A, Icu up to 65 kA)
        - └ Miniature circuit-breakers (MCB)
        - └ Circuit-breakers (MSP)
        - └ MCCB, MCB, combined devices (MCCB)

**Product**

Molded case circuit-breakers 3VA  
3VA21165HN360AA0

**Attributes**

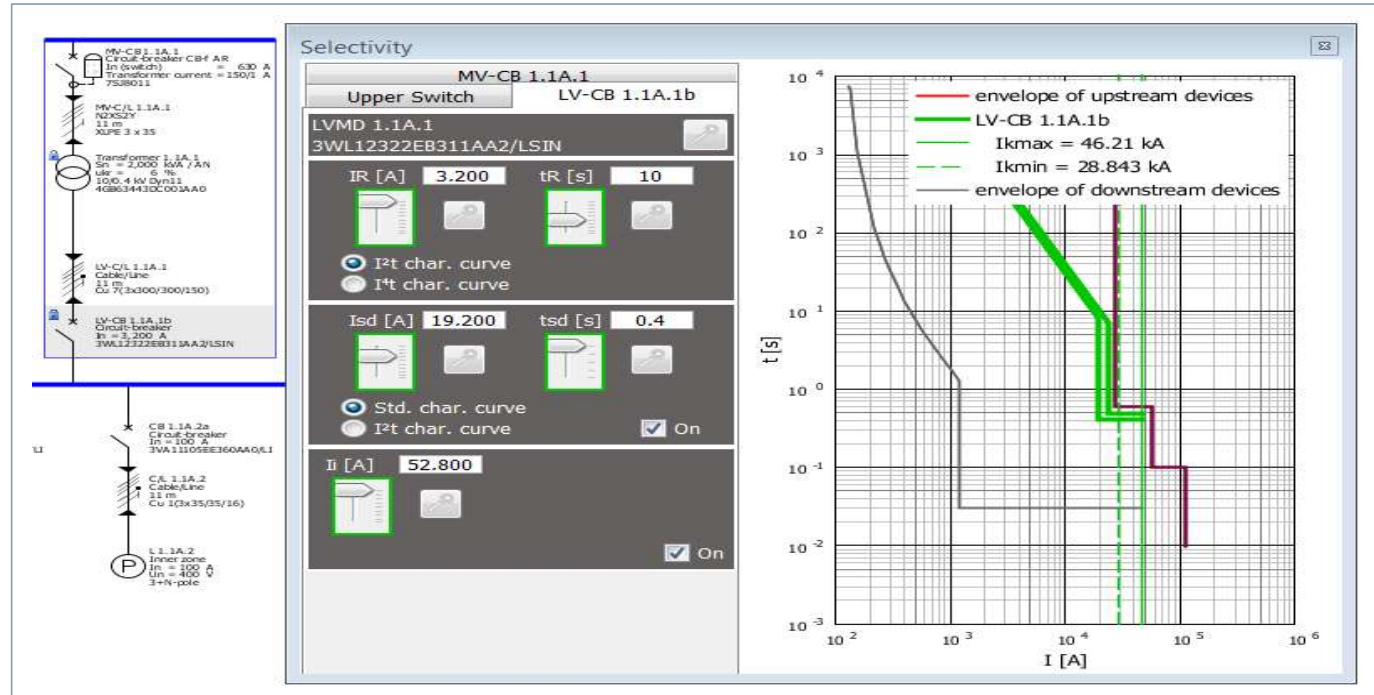
Operating voltage [V]	415
Number of poles	3
Rated current [A]	160
Rated breaker current L...	160
Overcurrent release	ETU350
Protective functions	LSI
Overcurrent release adj...	Yes
Instantaneous short-circ...	No
Rated ultimate short-cir...	55 @ 415V
Performance class	M
Field of application	System protection
Type of connection, mai...	Box terminals

Order number: 3VA21165HN360AA0

# Vivid selectivity evaluation

Highlight: automatic selectivity evaluation, optimize selectivity with visualization

- The selectivity view displays the characteristic curves of the elements currently selected in the network diagram in the corresponding circuit.
- Selectivity evaluation is performed on the basis of existing limit values in the overload range  $< I_{kmin}$  and in the short-circuit range  $> I_{kmin}$ . The upper tolerance band of the respective switching device is compared to the envelope curve of the lower tolerance band of all upstream switching devices.





# Project output



## Options of documentation

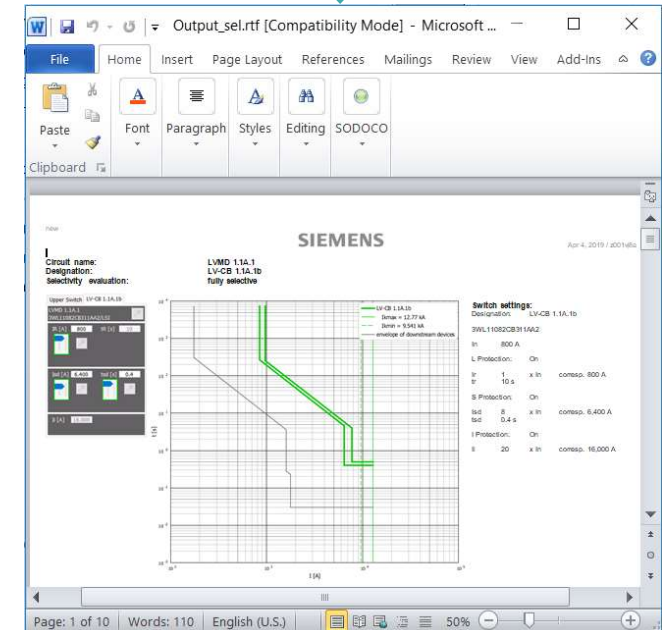
### Documentation types

- Project documentation
- Device list, sorted by distribution
- Device settings
- List of busbars
- List of cables
- Short-circuit currents
- Selectivity documentation
- Network diagram (PDF)
- Network diagram (DWG/DXF)
- SIMARIS exchange file (SX)

## Short circuit currents

	A	B	C	D	E	F	G
1		Ik1minph	φ1ph_n	Ik1minph	φ1ph_pe	Ik2min	φ2
2		[A]	[°]	[A]	[°]	[A]	[°]
3	LVMD 1.1A	10,913.18	-75.852	10,841.56	-74.43	9,540.73	-77.24
4	LVMD 1.1A	10,913.18	-75.852	10,841.56	-74.43	9,540.73	-77.24
5	LVSD 1.1A	4,758.27	-36.193	3,633.32	-26.802	6,083.57	-48.86
6	L 1.1A.4.1	4,195.15	-33.381	3,143.31	-24.346	5,583.89	-45.67
7	L 1.1A.4.2	645.215	-4.991	615.138	-4.757	-	-
8	M 1.1A.4.3	1,432.77	-11.054	1,294.10	-9.973	2,348.30	-17.69
9	LVSD 1.1A	4,758.27	-36.193	3,633.32	-26.802	6,083.57	-48.86
10	L 1.1A.5.1	4,195.15	-33.381	3,143.31	-24.346	5,583.89	-45.67
11	L 1.1A.5.2	645.215	-4.991	615.138	-4.757	-	-
12	M 1.1A.5.3	1,432.77	-11.054	1,294.10	-9.973	2,348.30	-17.69
13							
14							
15							

## Selectivity documentation

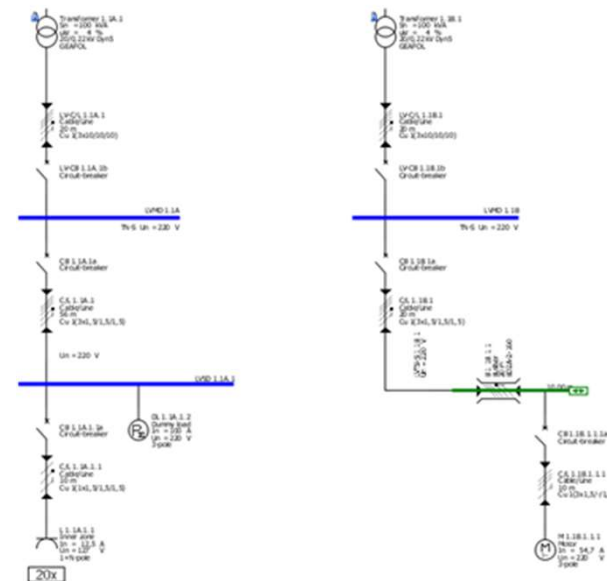
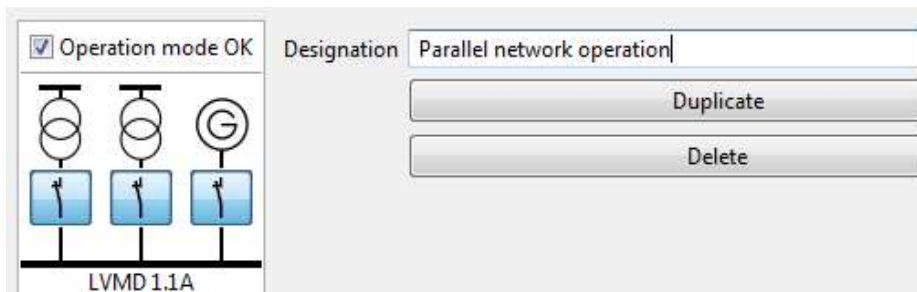


# SIMARIS design professional



- **Parallel network operation:**  
different power sources (e.g. transformers and generators) can be operated in the same network

- **Isolated networks:**  
Isolated networks can be planned and displayed within one project.

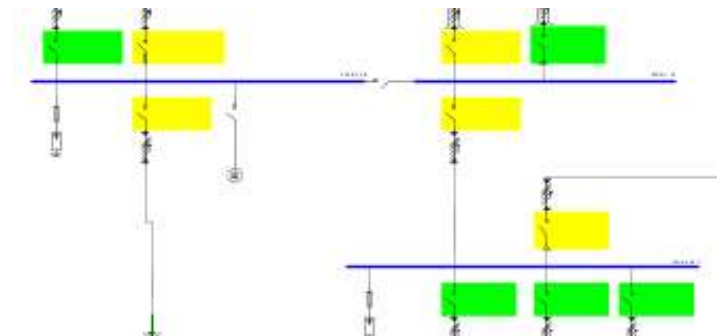
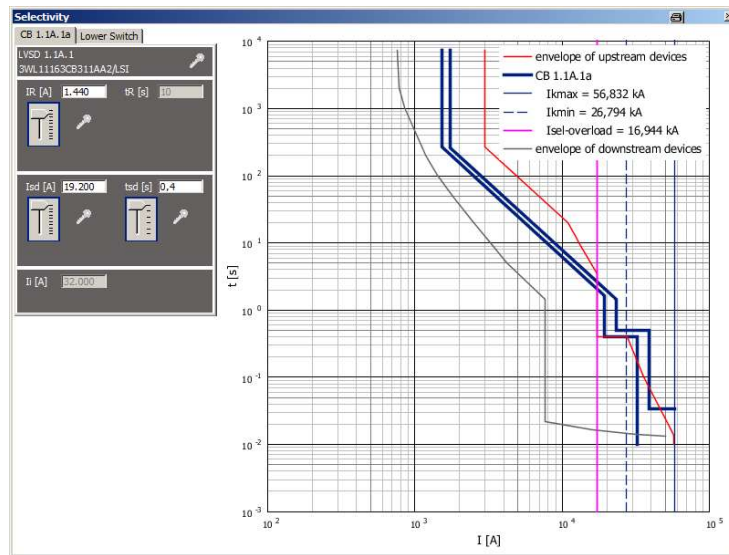


# SIMARIS design professional



- **Automatic selectivity evaluation:**  
Selectivity limits are shown automatically in addition to the current-time characteristic and the corresponding envelope curves.

- With activated selectivity evaluation,
- the fully selective devices are **marked green**,
  - the partially selective devices are **marked yellow** in the network diagram.



# SIMARIS design professional



- Possibility for consideration and optimization of energy efficiency for the planned network
- Active changeover in the emergency power supply: Integration of normal (= bidirectional) and unidirectional couplings (tie breakers) into the network diagram – also at the sub-distribution board level.

Verlustleistungen

Betriebsart: 1: Normal

Stromkreis	S [VA]	Pv abs [W]	Pv rel [%]	Kumulierte ...
LVMD 1.1A.1	843.840	10.354	1,227	-
LVMD 1.1B.1	428.830	5.917	1,38	-
LVSD 1.1A.1	919.284	3.702	0,403	-
L 1.1A.1.3	110.851	3.568	1,073	85
L 1.1B.1.1.7.1.3	86.603	3.381	1,301	180
Motor Bank	198.964	3.217	1,617	-
L 1.1C.1.2.2	110.851	2.279	0,685	110
L 1.1B.1.1.5	107.387	1.784	1,662	150
LVMD 1.1B.2	730.000	1.206	0,165	-
Compensati...	200.002	1.070	0,535	-
L 1.1B.1.1.4	45.726	1.064	2,326	150
L 1.1B.1.1.2	86.603	1.002	1,157	100
M 1.1A.1.1.7	38.000	967	2,544	137
LVTS-S 1.1B.1	824.016	879	0,107	-
L 1.1B.1.1.1	88.681	845	0,952	85
L 1.1B.1.1.3	145.492	751	0,516	110
LVSD 1.1C.1....	16.628	659	3,965	-
L 1.1C.1.3	110.851	547	0,164	38
Charging Un...	77.596	477	0,614	-
M 1.1A.1.1.8	19.841	434	2,188	120
M 1.1A.1.1.10	28.718	353	1,229	120
M 1.1A.1.1.5	10.944	327	1,606	115

Projekt

S = 1.993 kVA  
Pv abs = 64,5 kW  
Pv rel = 3,24 %

Stromkreis

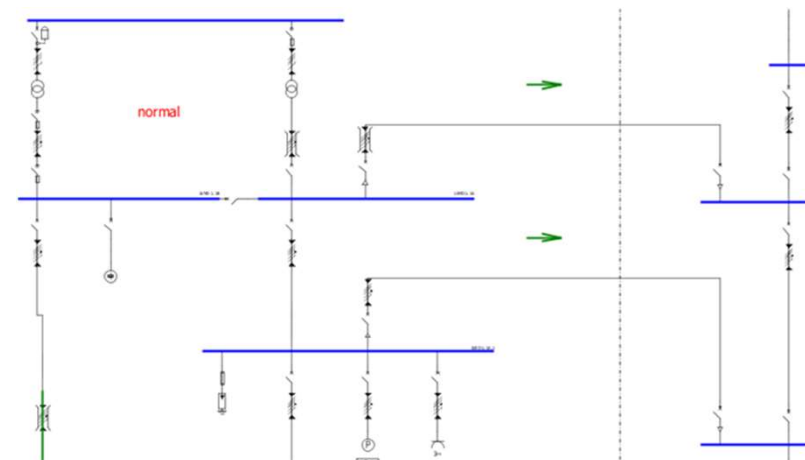
Pv abs = 4.978 W  
Gerät ändern...

Pv abs = 271 W  
Gerät ändern...

Pv abs = 397 W  
Gerät ändern...

Pv abs = 271 W  
Gerät ändern...

Start Export (\*.csv) ... OK





## SIMARIS design comes in two variants



**SIMARIS design professional**

**SIMARIS design**

	Every functionality for dimensioning electric networks	Special electrical engineering features	Online registration
<b>SIMARIS design professional</b>	✓	✓	Nominal charge
<b>SIMARIS design</b>	✓	—	<b>Free of charge</b>

## Table of content



- Overview
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- SIMARIS curves 5.2
- Marketing Support

## SIMARIS project overview

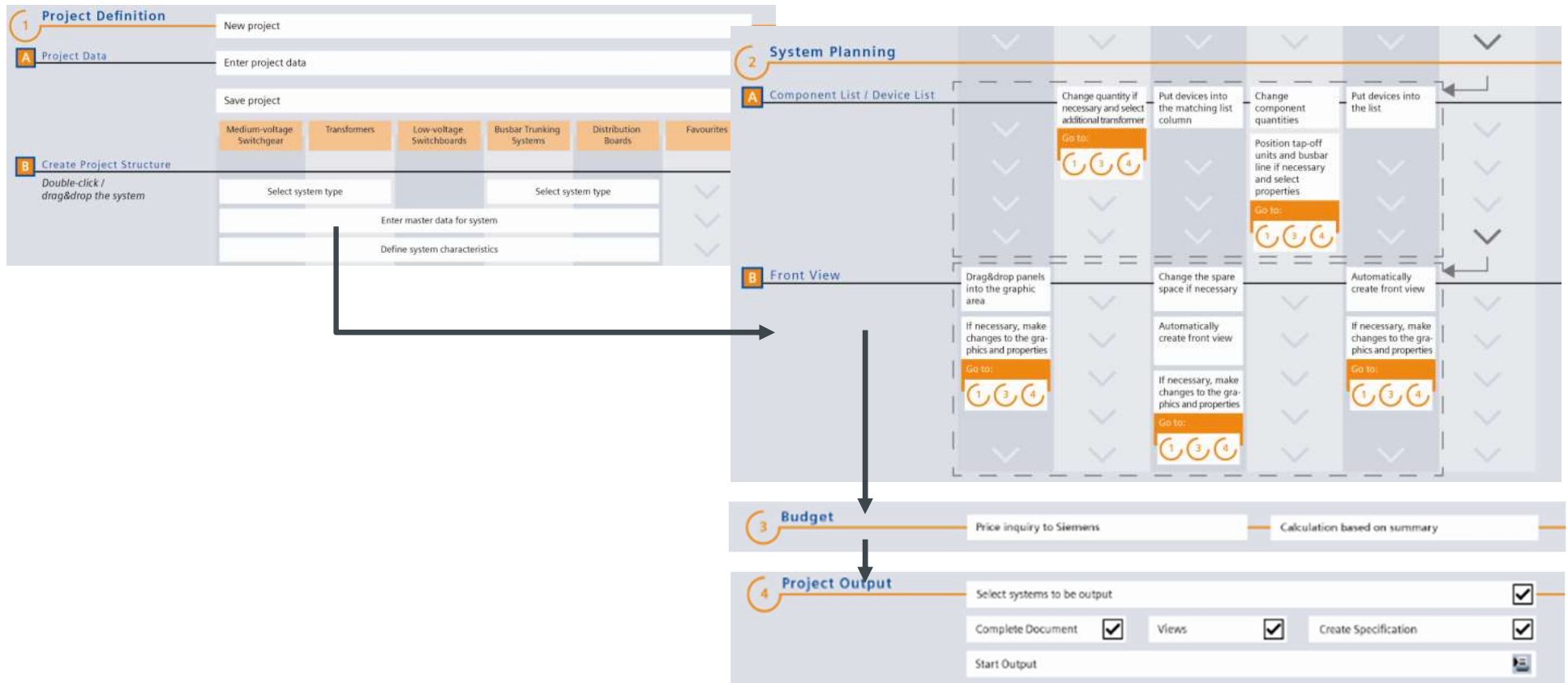
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### Highlights

- Fast overview of the budget and the space requirements inside buildings necessary for a power distribution system that ranges from the medium-voltage switchgear, transformers, low-voltage switchboards and busbar trunking systems to the distribution boards.
- Automatic system selection and placement based on the parameters that were entered
- Convenient output variants for documentation purposes, e.g. graphic views and technical specifications



# Project editing procedure in SIMARIS project



# Overview of the project structure



The screenshot shows the SIMARIS software interface with the following components:

- Workflow Bar:** 1 Project Definition, 2 System Planning, 3 Budget, 4 Project Output. Active step: System Planning.
- Buttons:** Project Data, Create Project Structure.
- Project Tree:**
  - Demo: SIMARIS-project 51
    - MPS
      - Transformer 1
        - Busbar Transformer 1 - LVDB
        - Busbar Transformer 2 - LVDB
      - LVDB
        - Schienenverteiler Werkstatt/Busbar Workshop
        - Etage 1/Floor 1
          - ALPHA 630 DIN
        - Etage 2/Floor 2
          - ALPHA 160 DIN
        - Etage 3/Floor 3
          - ALPHA 160 DIN

- Product Type and Product Table:**

Product Type	Product
BDH	Medium-voltage switchgear
GEAFOL Basic transformers Eco-design	Transformers
LI	Busbar Trunking System
LD	Busbar Trunking System
SVACON 58	Low-voltage switchgear
BD2	Busbar Trunking System
ALPHA 630 DIN	Distribution board
ALPHA 160 DIN	Distribution board
- Subproject data:**
- Subproject name: LVDB
- Editor: SIMARIS project user
- Created at: January 28, 2016
- Modified at: February 21, 2017
- System Library:**
- Medium-voltage switchgear
- Transformers
- Low-voltage switchgear
- Busbar Trunking System
- Distribution board
- Charging units for electric-vehicles
- Component List
- Favorites:** (Empty)
- MyLibrary:** (Contains a small image of a switchgear unit)

Systems library

Project tree

Favoriten

System data

# Overview of the System Planning step → Front view



**Library for SIVACON SB**

- 01\_Circuit-breaker design
- 02\_In-line switch disconnectors with fuses, horizontal
- 03\_In-line fuse switch disconnectors, vertical
- 04\_Withdrawable unit design with front doors
- 05\_Fixed-mounted design with front doors
- 06\_Fixed-mounted design with front covers
- 07\_Fixed-mounted design for frequency conversion
- 08\_Reactive power compensation 7%
- 09\_Special cubicles

**Front View**

LVDB (SIVACON SB)

Properties: LVDB

Name:	LVDB	Plant type:	SIVACON SB	Nominal voltage [V]:	AC 400V
Frequency [Hz]:	50	Ambient temperature [°C]:	35	Degree of protection:	IP40
Design:	Single front	Application:	Standard	Standard:	IEC 61439-2
Mimic diagram:	Bonded	Color enclosure parts:	RAL7035	Busbar system:	L1-L3, PE, N
Main busbar position:	Rear top	Main busbar current [A]:	1280	Rated short-time withstand current Icw [kA, 1s]:	50
Position PE MBB:	Bottom	Arc resistance upgrade:	Without	Cubicle height [mm]:	2200
Base height [mm]:	100	Plant depth [mm]:	600		

Library

Graphics window

Properties



# BIM output with SIMARIS project 5.2

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The screenshot displays the SIMARIS project 5.2 software interface. At the top, there are four navigation tabs: 1 Project Definition, 2 System Planning, 3 Budget, and 4 Project Output (which is currently selected). Below the tabs is the SIEMENS logo. The main workspace is divided into three panels:

- Project Tree:** A hierarchical list of project components including MV1, Transformer 1, Transformer 2, Busbar Transformer 1 - LVDB, Busbar Transformer 2 - LVDB, LVDB, Schienenverteiler Werkstatt/Busbar Workshop, Etage 1/Floor 1, Etage 2/Floor 2, and Etage 3/Floor 3.
- Product Table:** A table with columns for Product Type, Product, and Output. It lists various electrical components like 8DJH, GEAFOL Neo transformer, LD, SIVACON SB, BDZ, and ALPHA 630 DIN, with checkboxes in the Output column.
- Output Configuration Panel:** A panel on the right with three sections:
  - Output of all-in-one document:** Includes a checked option for 'Complete Document according to selection' and a 'Views' section with options for 'Cover sheet per plant', 'Front View per Plant Compressed', 'Single Line', and 'System drawing'.
  - Create Specification:** Includes a 'Language' dropdown set to 'English' and checkboxes for 'GAEB XML 3.2 or GAEB 90 file according to selection' and 'RTF document according to selection'.
  - Output IFC:** Includes a checked option for 'IFC 4.0'.

A large teal arrow points from the Product Table towards the Output Configuration Panel.

**New output:  
IFC for Building  
Information  
Modeling**

**SIMARIS BIM  
Plug-In for  
Autodesk Revit  
available at**

**[www.siemens.com/  
simarisproject/bim](http://www.siemens.com/simarisproject/bim)**

## Table of content



- Overview
- SIMARIS design 9.2
  - Single line diagram
  - Network calculation
  - Cable dimensioning
  - Product configuration and selection
  - Selectivity
  - Project output
  - Special features in professional version
- SIMARIS project 5.2
- **SIMARIS curves 5.2**
- Marketing Support

## SIMARIS curves

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## SIMARIS curves

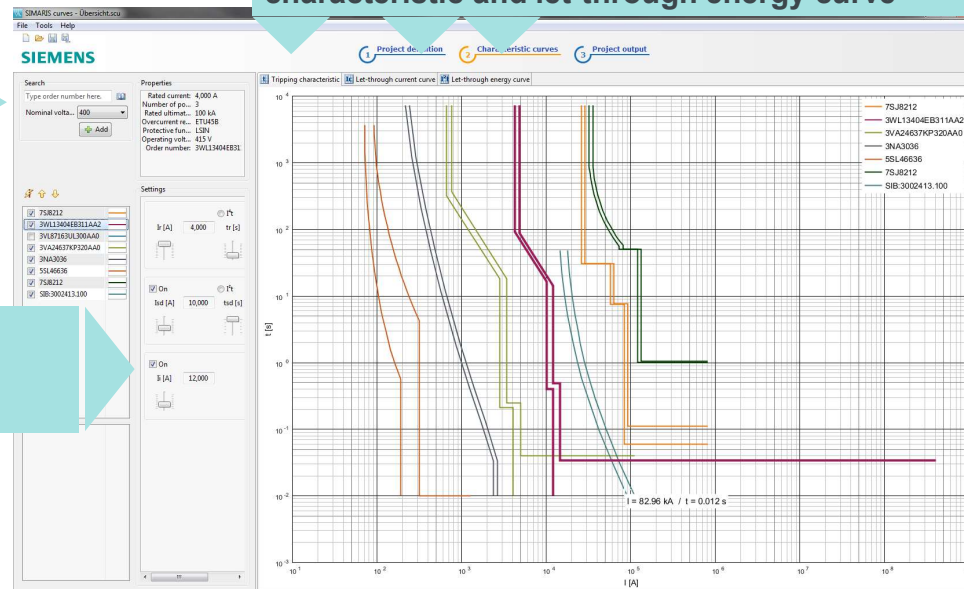
- Visualization and evaluation of tripping characteristics including the option to simulate device settings
- Visualization of characteristic cut-off current and let-through energy curves
- Device selection per order number or easy-select feature
- Saving selected devices as favorites
- Saving several characteristic curves plus settings as overall project

# Display of characteristic curves in SIMARIS curves 5.2

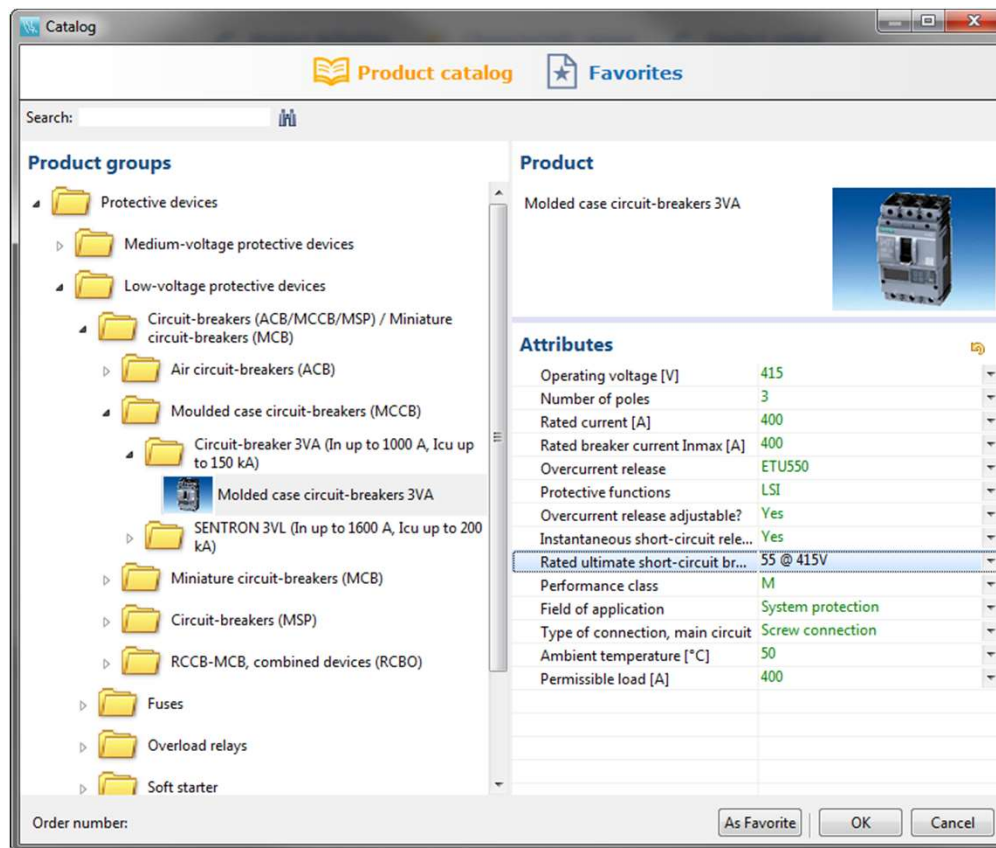
Display of tripping characteristic, cut-off current characteristic and let-through energy curve

Product selection per order number or catalogue

Simulation of device settings



# Product selection from the catalogue in SIMARIS curves 5.2



Product specification based on technical data

## SIMARIS curves app

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### SIMARIS curves

is also available as app for apple and android devices (smartphones and tablet PCs).

This allows for mobile use, e.g. to transmit device settings determined during plant installation.



The link for app download can be found at:  
[www.siemens.com/simariscures](http://www.siemens.com/simariscures)



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- Overview
- SIMARIS design 9.2
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  - Cable dimensioning
  - Product configuration and selection
  - Selectivity
  - Project output
  - Special features in professional version
- SIMARIS project 5.2
- SIMARIS curves 5.2
- **Marketing Support**

# Download



[www.siemens.com/simaris/download](http://www.siemens.com/simaris/download)

Download option for:

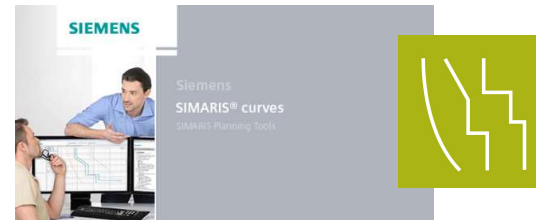
All of the 3 tools can be requested per download.



**SIMARIS design 9.2**



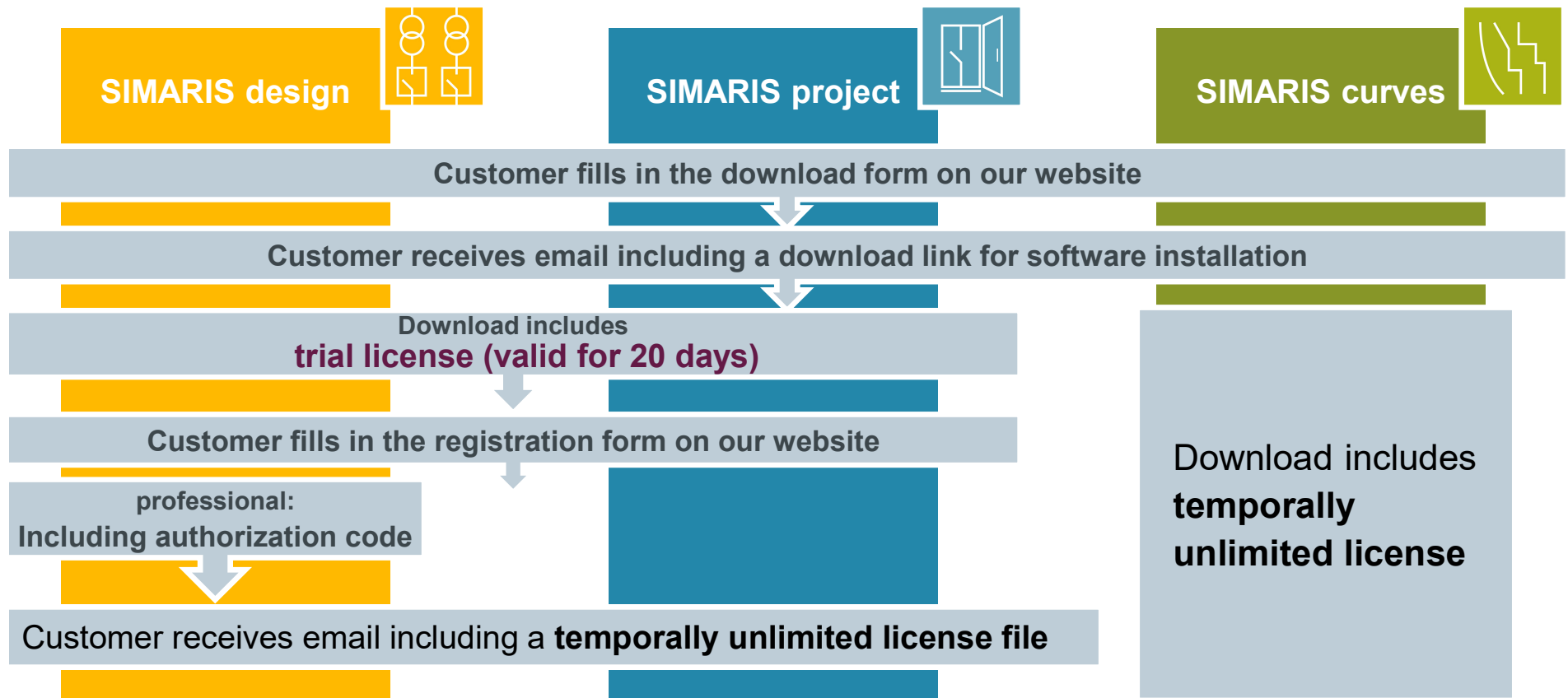
**SIMARIS project 5.2**



**SIMARIS curves 5.2**

**SIMARIS design** and **SIMARIS curves** are automatically updated online

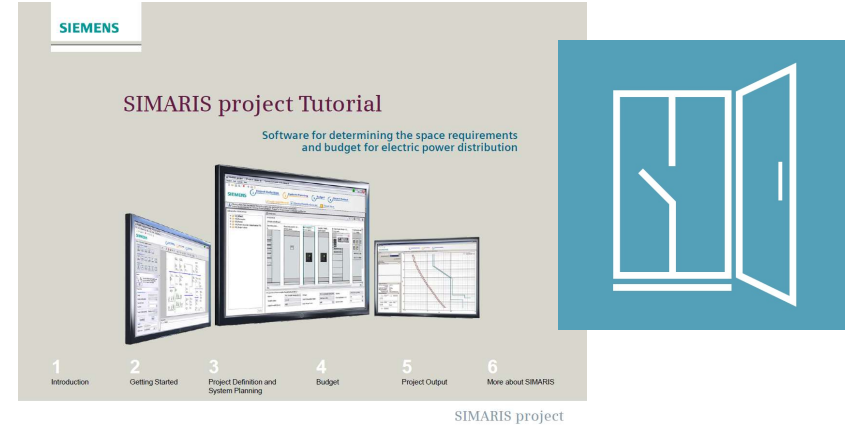
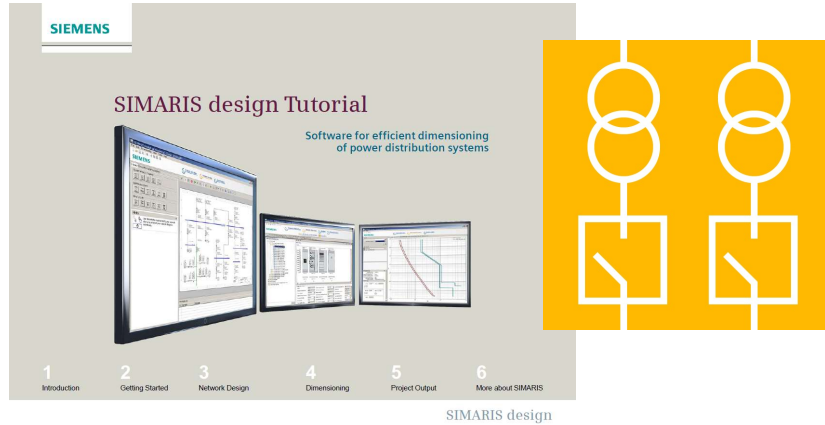
# Download / Registration process SIMARIS planning tools



# Tutorials



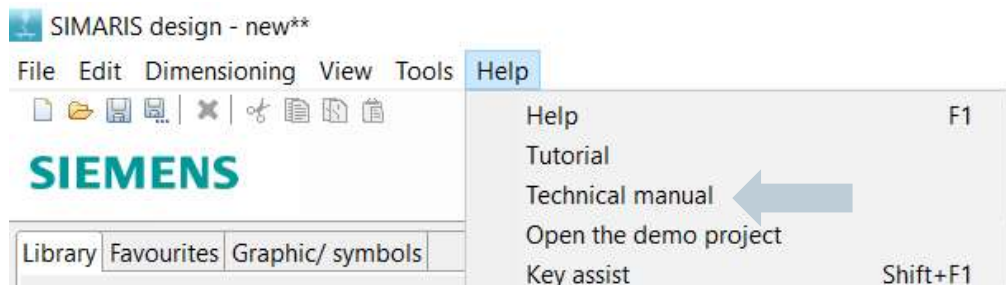
- You can open these tutorials via the Help menu → "Tutorial", or download them from [www.siemens.com/simaris/tutorial](http://www.siemens.com/simaris/tutorial).
- Tutorial for **SIMARIS design 9** available in English
- Tutorial for **SIMARIS project 5** available in English



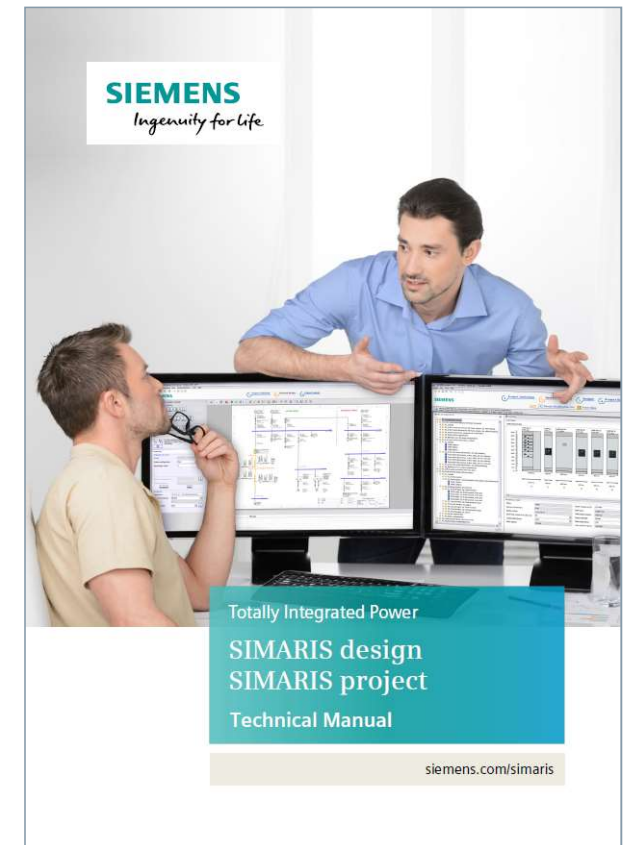
# Technical Manual SIMARIS planning tools

## Contents

- Basic and specific information about network calculation and system planning using the SIMARIS planning tools
- Specific technical information about network calculation using **SIMARIS design**
- Specific technical information about network calculation using **SIMARIS project**
- Available in **English**



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Thanks for your attention

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