Release Information – PSS®SINCAL Platform 22.5

This document describes the most important enhancements and changes in the new program version. See the product manuals for more detailed descriptions of the functionalities.

PSS®SINCAL

Example Networks

With this product version new and revised example networks are delivered. These example networks illustrate the basic use of the product features and can be used to test the various calculation modules.

Network model	Description
Example BAS	This example demonstrates the basics of using the program. Detailed instructions on creating new geographic network graphic views and using background maps are now available.
Example TSDI	The example has been extended to demonstrate the creation and configuration of load containers, as well as their use with different load modeling approaches (TSDI and relative time series).
Example Renewables	This example demonstrates the dynamic modeling of inverter-based renewable energy sources and doubly-fed induction generators (DFIGs). The DFIGs have been updated and now use the native dynamic input dialog boxes.
Example TRV	The example illustrates a transient voltage recovery (TRV) study. Two dedicated equivalent models for transmission lines, suitable for TRV studies, are now available.
Example NR	The example is refreshed and includes now also a complete tutorial on static network reduction.
Example NMM	The example has been extended to showcase the automated import via the Shape2Sin using the command-line interface version of the software, the definition of user-defined background maps via "Maps.ini", and a complete description of the CGMES 3.0 CIM export with configurable options.
Example Imp Excel	This example has been adapted to demonstrate the automatic coordinate transformation from other projections into geographical network views and the automatic drawing of network graphics based on the network node coordinates in case the input data contain no explicit network graphic data.
Example AF	The example has been revised and updated.
Example Industry	The example has been completely rewritten (replacing the previous MS example) and now serves as a general reference for calculation methods covering a wide range of topics, from power flows and dynamics to protection modeling.
Example LV	The example has been expanded with the appropriate modeling for feeder tracing and demonstrates how to use the module for grid connection point determination as well as the route model.
Example MV 2	The example has been expanded with the appropriate modeling for feeder tracing and demonstrates how to use of the module for grid connection point determination as well as the use of the route model. In addition, the network development module is demonstrated (replacing the previous example LD).

Phase-out of Modules/Functions

The following export functions will no longer be available from version 23.5 onward.

Module	Note
UCTE ASCII File	Exporting the network model to a UCTE ASCII file, Version 02 – May 1, 2007.
DGS Exchanges Format	Export the network model to a PowerFactory DGS ASCII file, version 4.0.
DVG Exchange Format	Export the network model to a DVG data exchange format file, version 0001/2000.
CYMDIST	Export the network model to a CYMDIST 5.0, 7.x, or 8.0 file.
Graphic (Google Earth)	Export the basic structure of a geographical view to a KML file.

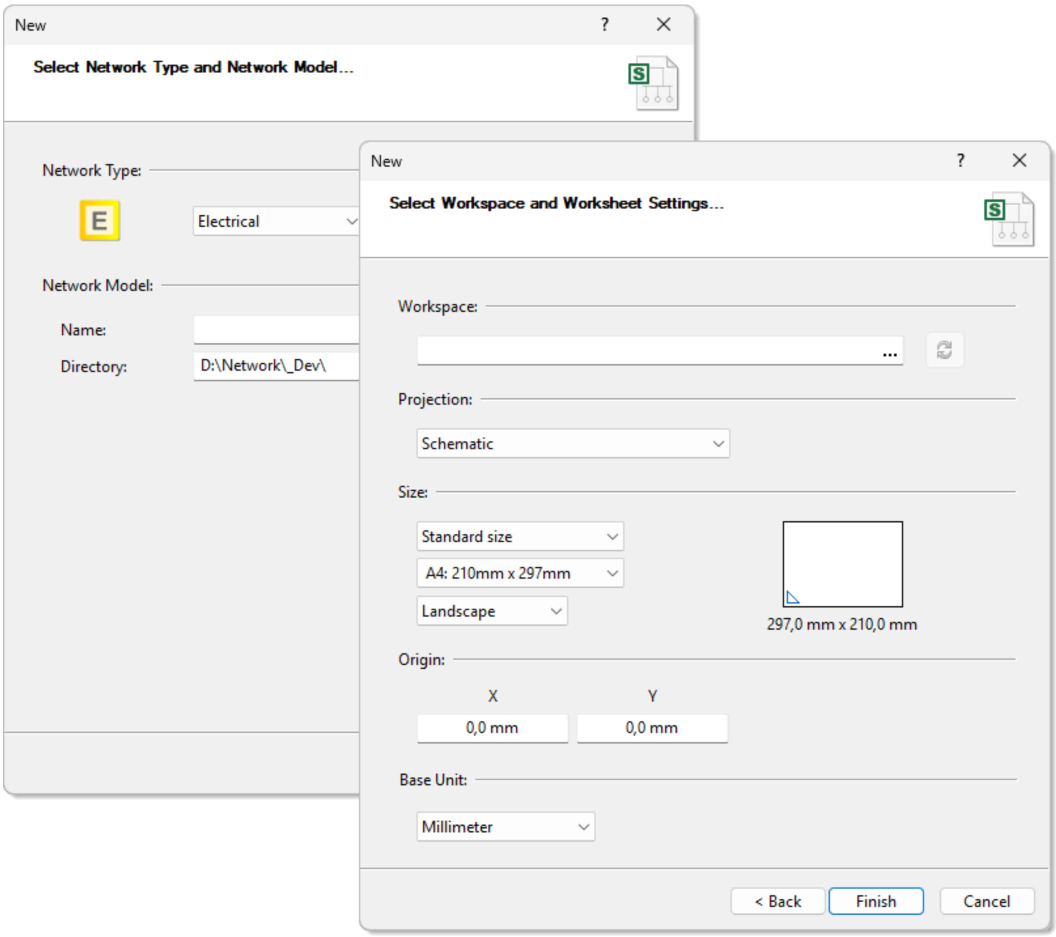
Starting with this product version, these features are disabled in the user interface and can only be re-enabled as needed by configuring a registry parameter.

Graphical User Interface

General Extensions

Create a New Network Model

The wizard for creating new network models has been redesigned. The wizard now consists of only two pages, where you select the network type, specify the name and location, and define the style sheet and worksheet for the network view.



When creating a new network model, the wizard allows you to configure the worksheet. You can choose between a schematic view or a geographical view. Additionally, you have the option to select a **Workspace** directly when creating the network model. With a workspace selected, all essential configuration settings for the new network model – such as color selection, settings, filters, annotations, tabular views, and user-defined tabular views – are automatically applied based on the configuration of another network model the workspace has been exported before.

Importing Network Models with Variants

Using the **File – Import – PSS SINCAL** function, you can import a complete PSS SINCAL network model into an existing one, allowing separate network models to be combined into a single, unified model.

Network models with variants are now supported. The currently selected variant is used during the import process. Note that network models with multiple graphic views are still excluded. Moreover, if the graphic view names do not match, the network model will be imported into a new graphic view.

Excel Import

Using the **File – Import – Excel** function, model data for PSS SINCAL network elements can be imported from an Excel Worksheet.

The options for importing graphic data have been expanded, making this process more rigorous. The Excel table **GraphicAreaTile** specifies whether the view is of schematic or geographical type. Schematic views typically contain only the name, while geographical views also specify the scale and EPSG code. It describes the projection in which the coordinates of the graphic data are available prior to import. The following **EPSG codes** are supported:

- EPSG 4326: geographical coordinates (longitude and latitude)
- EPSG 3857: geographical coordinates using the Web Mercator projection

In accordance with the EPSG code, the graphic positions in the **GraphicNode** and **GraphicElement** tables are automatically converted to EPSG 3857 during import and saved in the network database.

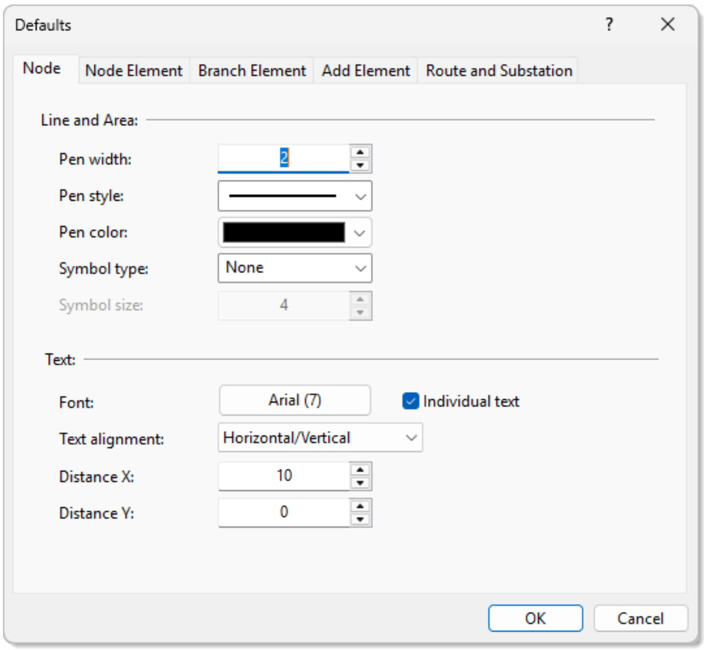
Another feature is the automatic visualization of the network model based on the longitudes and latitudes specified in the node data. When importing geographical views without explicit graphic data, PSS SINCAL automatically generates the corresponding graphical representation of the network model based on this positional information.

The "Example Imp Excel" application example demonstrates how to import network model and graphic data into the various view types, as well as how to use the automatic network graphic generation. The example provides a step-by-step guide on how to import the relevant data from an Excel spreadsheet and which settings to consider during the import process.

Network Graphic

Changed Default Values

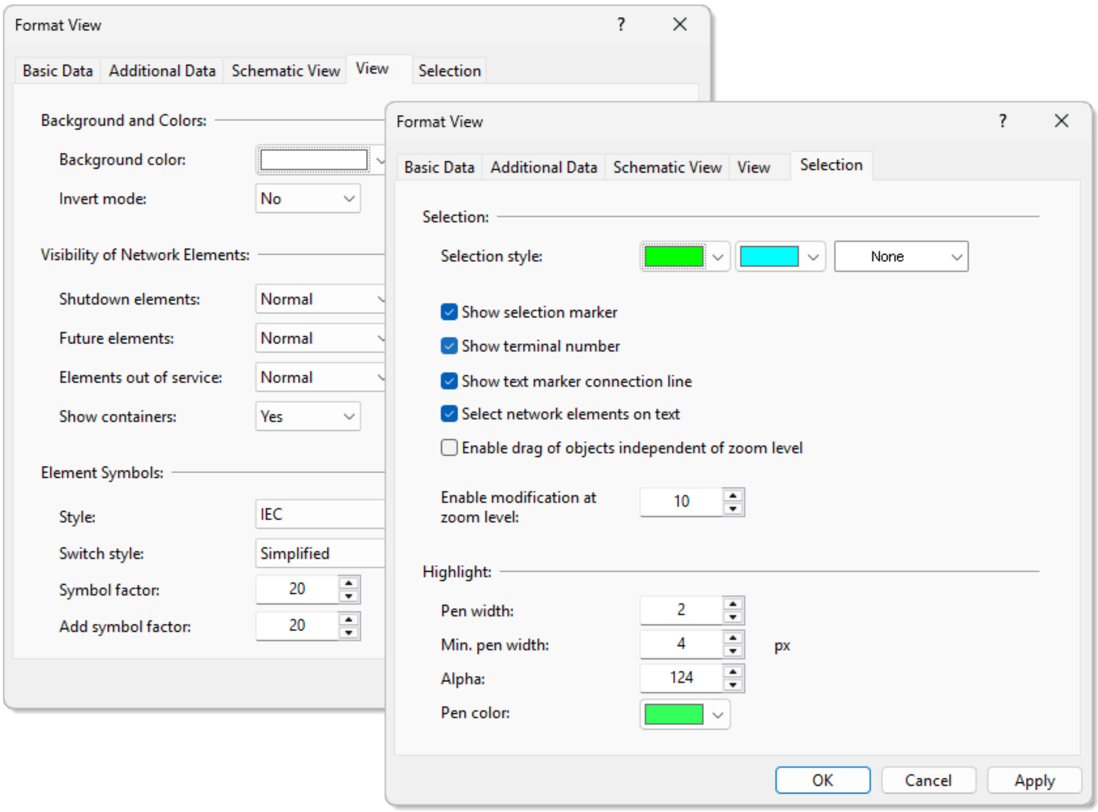
The graphical default settings for new network elements are now configured individually for each view using the **Format – Defaults** function. The dialog box contains the same settings as before, but it is now available in the Format menu alongside all other network view functions.



All functions for inserting new network elements (e.g., using the toolbox) and for automatically generating network graphic elements (e.g., Excel import, network browser – update graphics, API functions, etc.) rely on these default values.

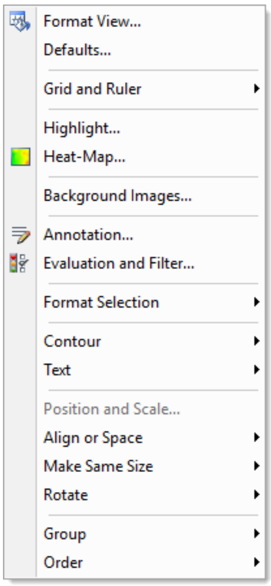
Format View

The **Format – Format View** dialog box provides all the important options for configuring the view. The user interface has been simplified and is now more intuitive.



The available options are now organized by topic, making it easier to configure the view.

The **Format** menu has also been redesigned. It now provides, all in one place, all the options for configuring the active graphical view, including color **highlighting** and color **heat maps**, **background images**, as well as options for formatting and editing selected supplementary graphics objects and network element graphics.



Object Type for Substations

As with network elements, it is now possible to assign an object type to graphical substation elements. This allows you to configure the visibility, the dynamic size of the label text, and the scope of annotation in the network graphic individually, depending on the selected object type.

Evaluations

Evaluations for Additional Elements

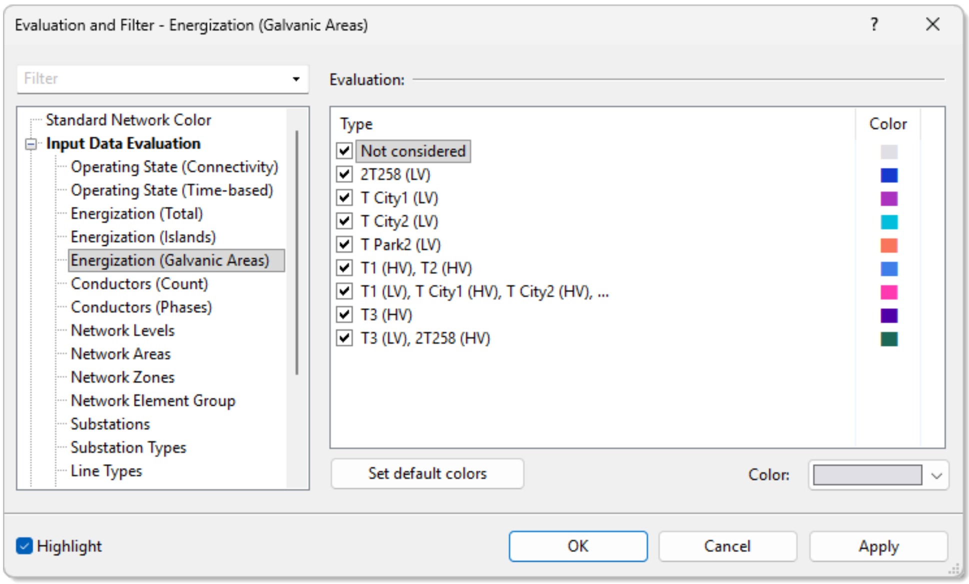
The **Evaluation and Filter** function allows you to color the network graphic based on specified selection criteria.

Until now, only network elements (nodes/busbars, node elements, and branch elements) were considered in the evaluations. Now, additional elements such as protection devices, fault observations, and measuring devices are also highlighted in the following evaluations:

- Operating state (connectivity)
- Operating state (time-based)
- Conductors (count)
- Conductors (phases)
- Layers
- Object types

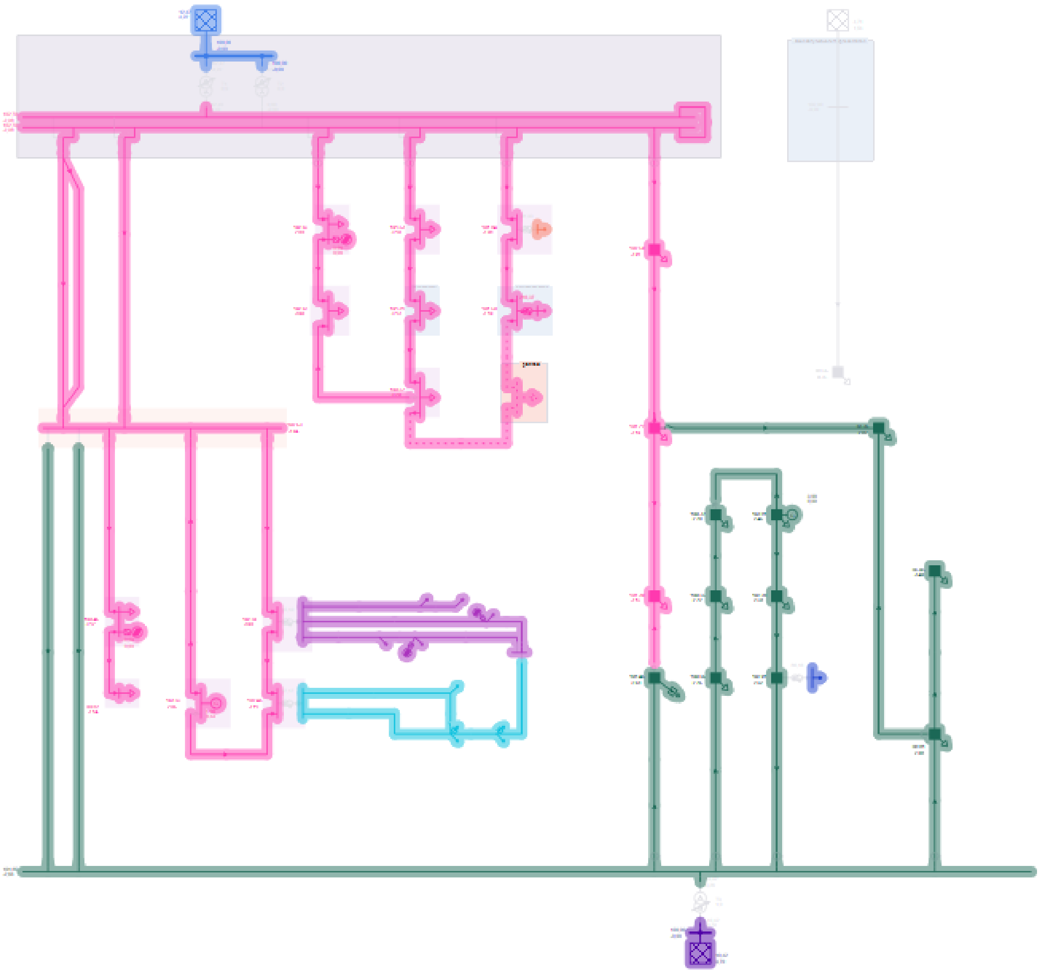
New Evaluation – Energization (Galvanic Areas)

For electrical network models, the new evaluation **Energization (Galvanic Areas)** is available. A transformer galvanically isolates the connected network areas from one another (this is also assumed, for simplicity, for autotransformers). This evaluation allows the visualization of all network elements located within the same area.



The names of the areas are generated based on the names of the boundary transformers, and the system also indicates whether the area is assigned to the low-voltage side (LV) or the high-voltage side (HV).

The following image shows the new evaluation with highlighting enabled in the "Example MV" sample network model:



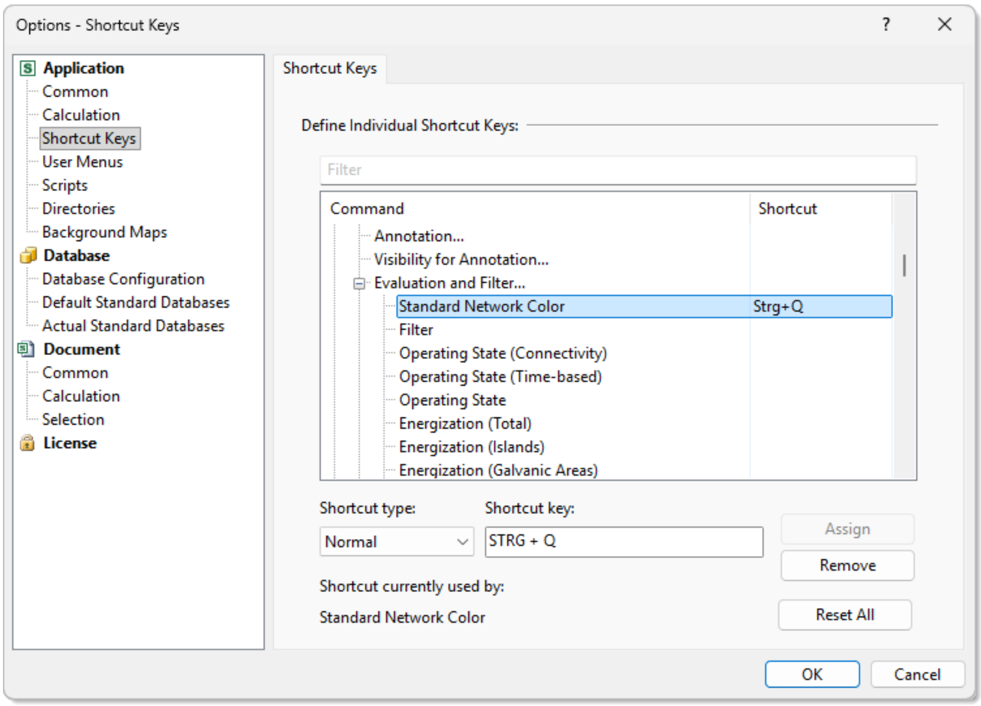
Selection Function in the Evaluation and Filter Dialog Box

For the following evaluations, a new function is now available in the pop-up menu of the dialog box. By right-clicking on an element, you can use this function to specifically select the relevant elements in either the graphic view or the tabular view:

- Operating state (connectivity)
- Operating state (time-based)
- Energization (total)
- Energization (islands)
- Energization (galvanic areas)
- Network levels
- Network areas
- Network zones
- Network element group
- Substations

Shortcut-Keys for Evaluations

Evaluation functions can now be activated directly via keyboard shortcuts. All available evaluation functions and their assigned shortcuts are listed in the **Options – Shortcuts** dialog box, where individual shortcuts can be customized.

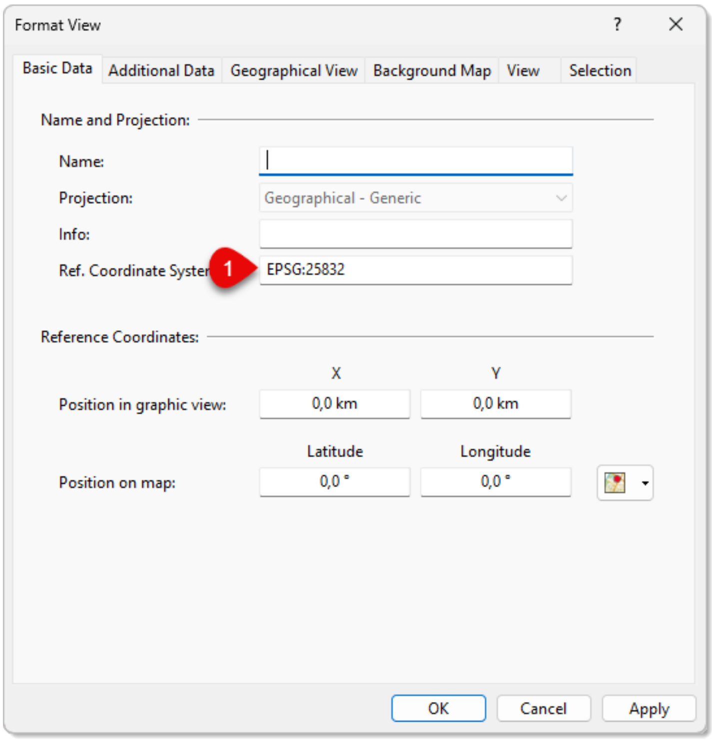


Enhancements to Geographic Views

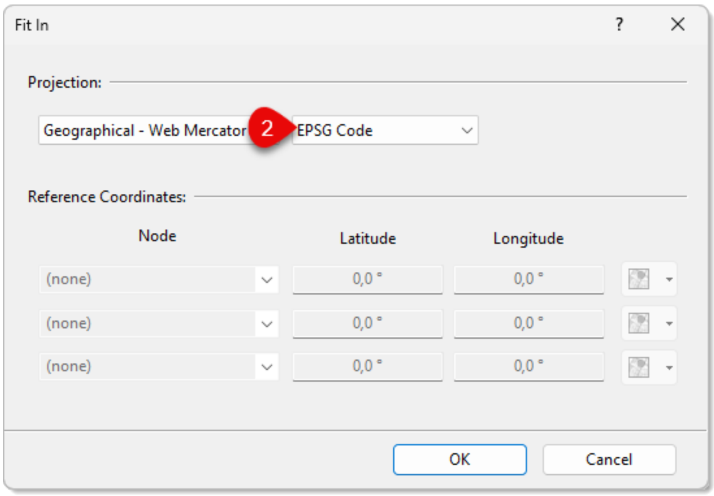
Advanced Fit In Feature

The feature for subsequent manual transformation of graphic element coordinates has been extended. With this extension, a geographical network model that is not yet in Web Mercator projection can be converted. In the process, all graphic positions in the view are automatically converted to Web Mercator projection.

If the projection method used in the existing network model is known, the corresponding EPSG code can be entered in the Format View dialog box in the **Ref. Coordinate System** field under **Basic Data** (#1).



This makes it particularly easy to convert the geographical view using the **Format – Fit In** function. No additional configuration is required; simply select the **EPSG Code** option (#2) and then click the OK button. The entire view will then be automatically converted to the Web Mercator projection.



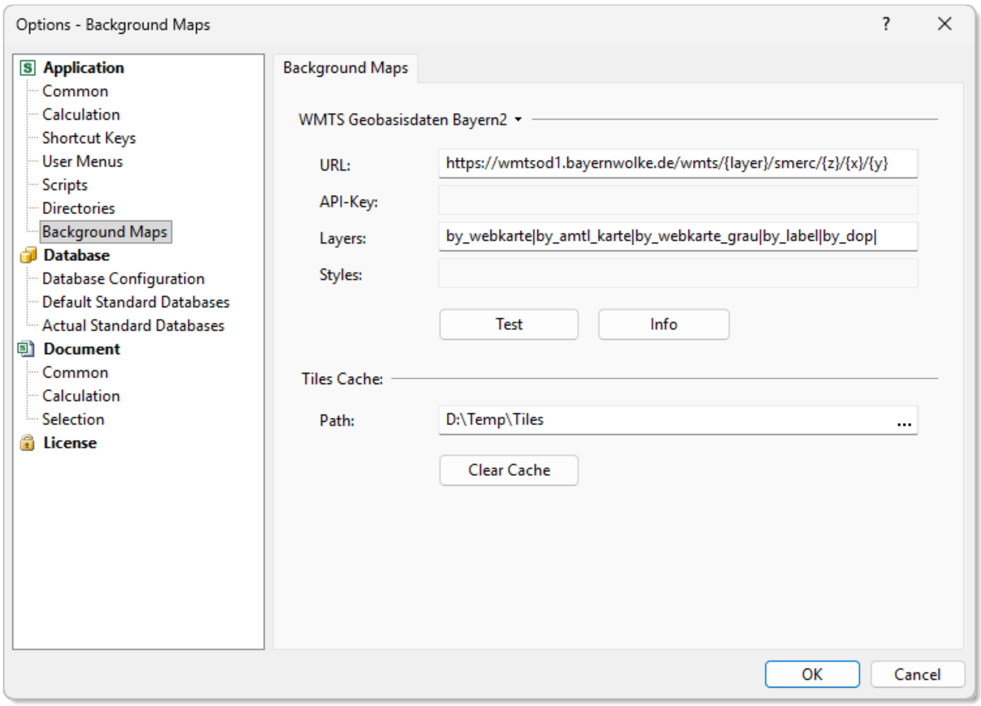
Please note the following: The EPSG code entered in the **Format View** dialog box must be valid and supported by PSS SINCAL. Currently, all UTM zones (North & South) are supported, as well as the major UTM projections for Europe, SWREF99 projections, and RT90 projections:

- **UTM:** EPSG:32601 – EPSG:32660, EPSG:32701 – EPSG:32760;
- **UTM for Europe:** EPSG:25830 – EPSG:25835;
- **SWREF99:** EPSG:3006 – EPSG:3018;
- **RT90:** EPSG:3019 – EPSG:3022, EPSG:3849 – EPSG:3850;

Note: This function is intended for manual, one-time use to adjust the projection. If the geographical network views of network models generated from interfaces are not currently in EPSG 3857, they must be adjusted.

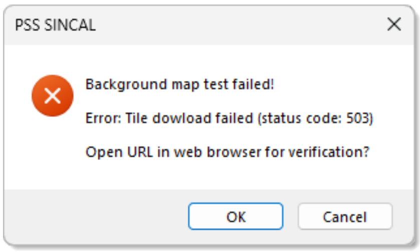
Extensions for Background Maps

PSS SINCAL offers additional extensions for using background maps. In addition to the **Styles** attribute, the **Layers** attribute is now also supported. Depending on the capabilities of the selected map provider, both attributes can be used in combination to configure the visualization of the background maps.



Furthermore, the JPEG image format is now supported for tiles in addition to PNG. This means that map providers that do not offer the PNG format can now also be used.

The function for testing the map provider's configuration, which is accessible via the Test button, has also been enhanced. Now, detailed error messages are displayed in case of configuration issues.

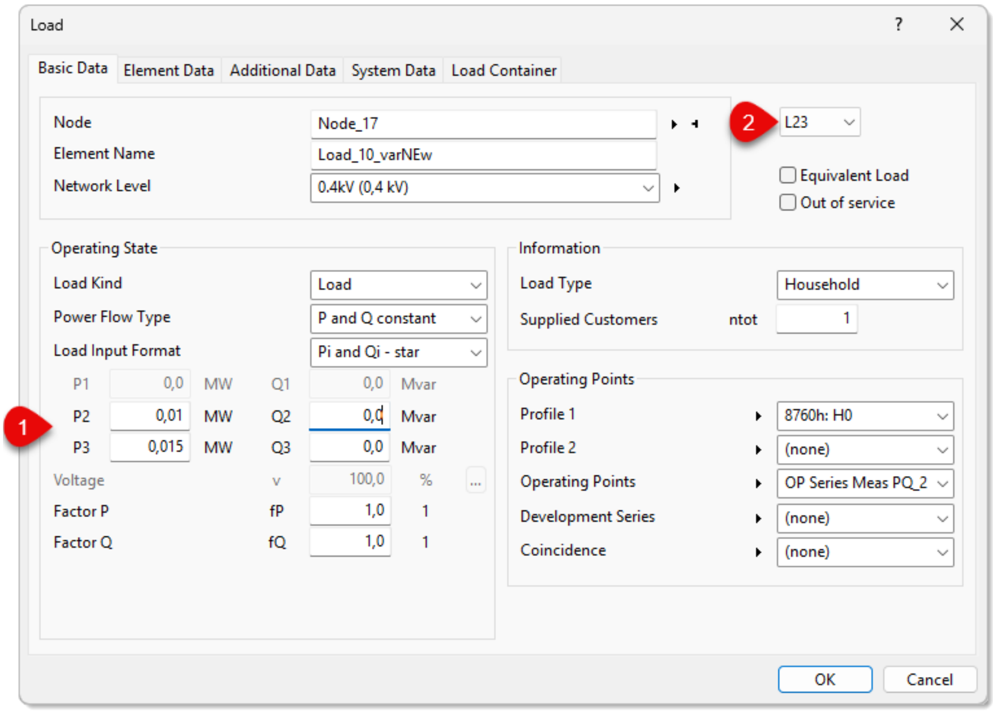


Electrical Networks

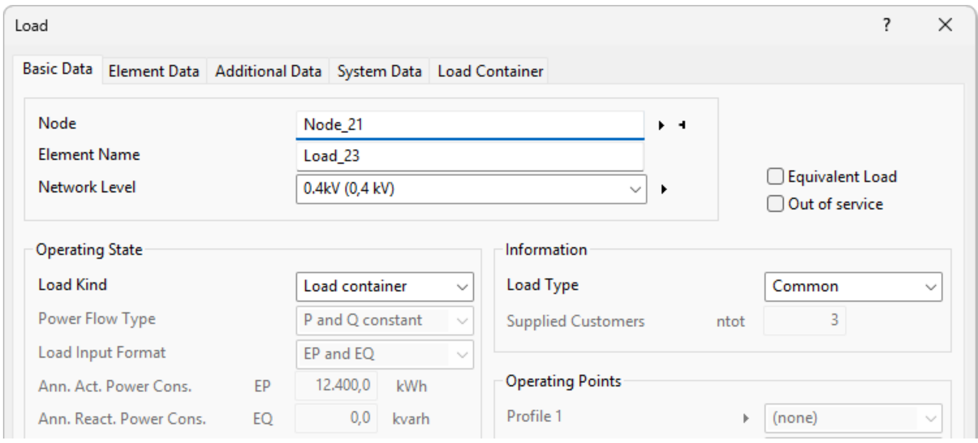
Enhancements for Network Elements

General Load

The input dialog box for unbalanced loads has been improved. When the **Load Input Format** "Pij and Qij – delta" or "Pi and Qi – star" is selected, only the input fields (#1) that correspond to the selected phases (#2) are available.

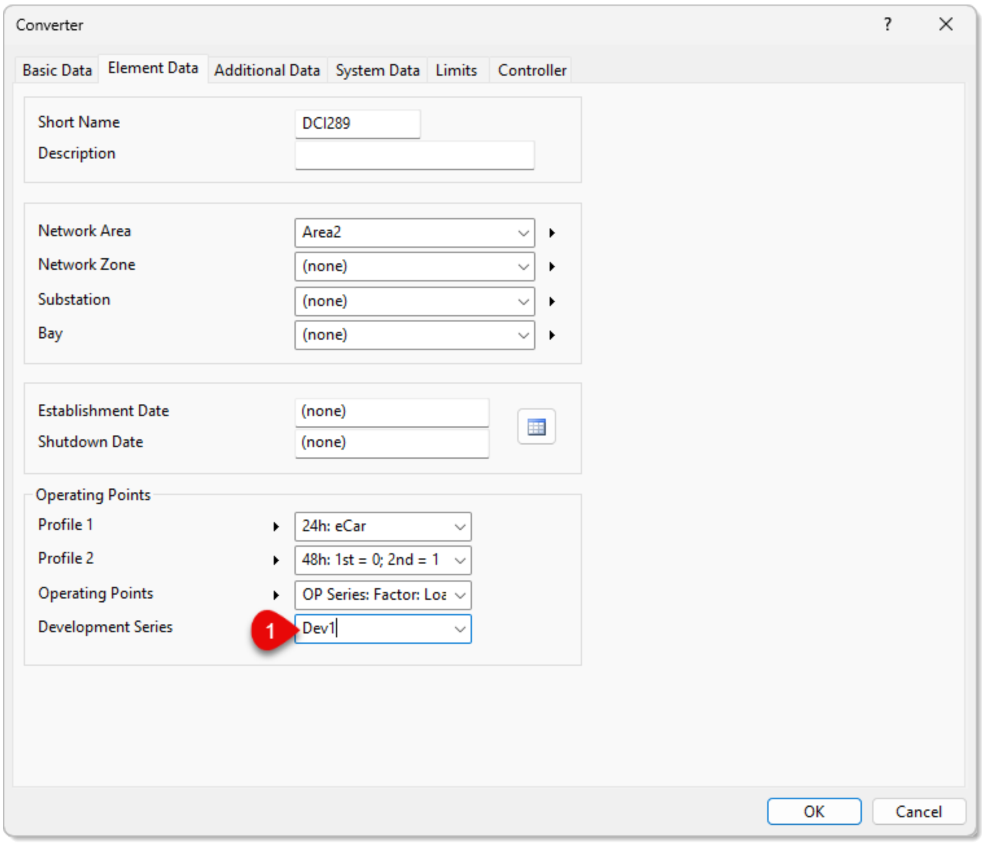


When the **Load Kind** is set to "Load container", the phase selection is generally hidden in the basic data, since this data is defined via the load container.



Converter

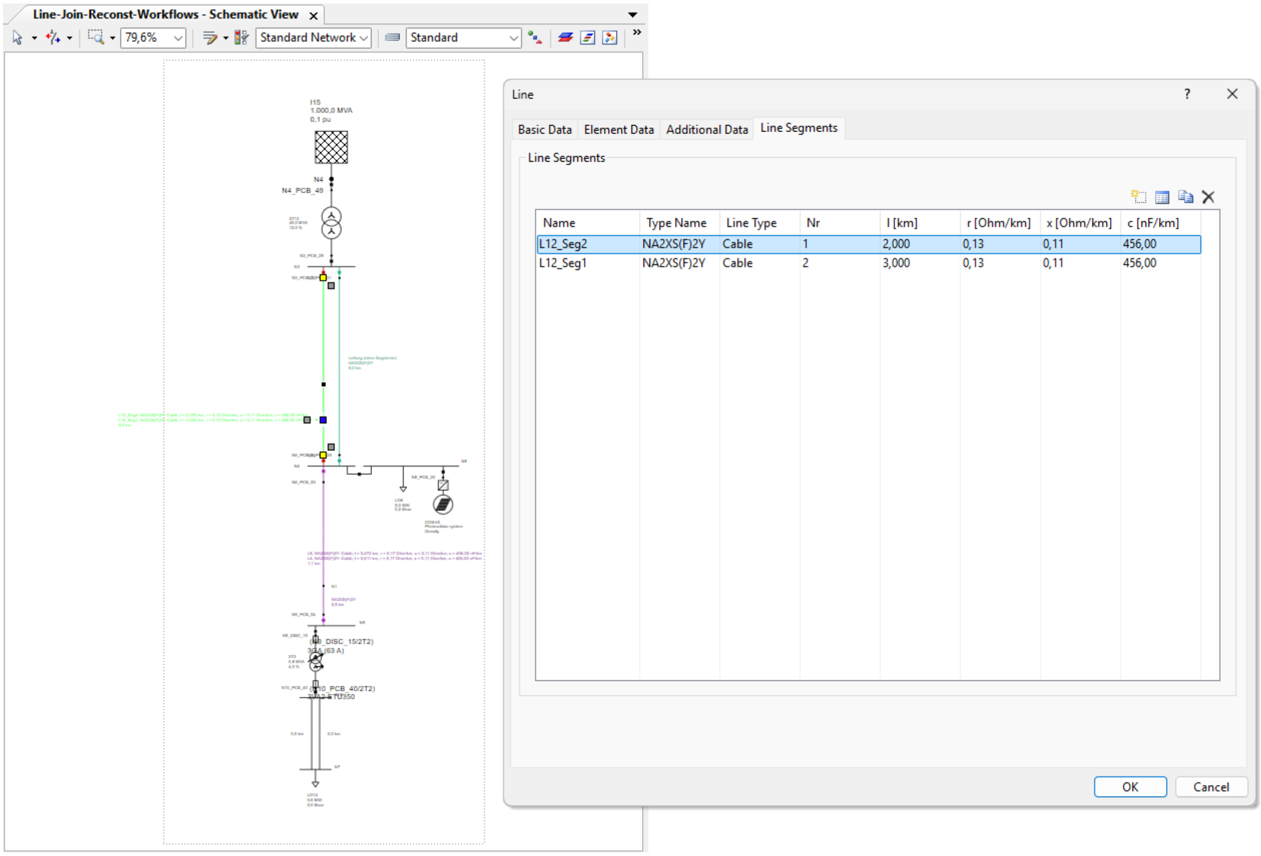
A **Development Series** (#1) can now also be assigned to the **Converter** network element. This allows these network elements to be integrated into strategic network planning (Network Development module) to reflect the increase or decrease in converter-based generating plants in boundary networks.



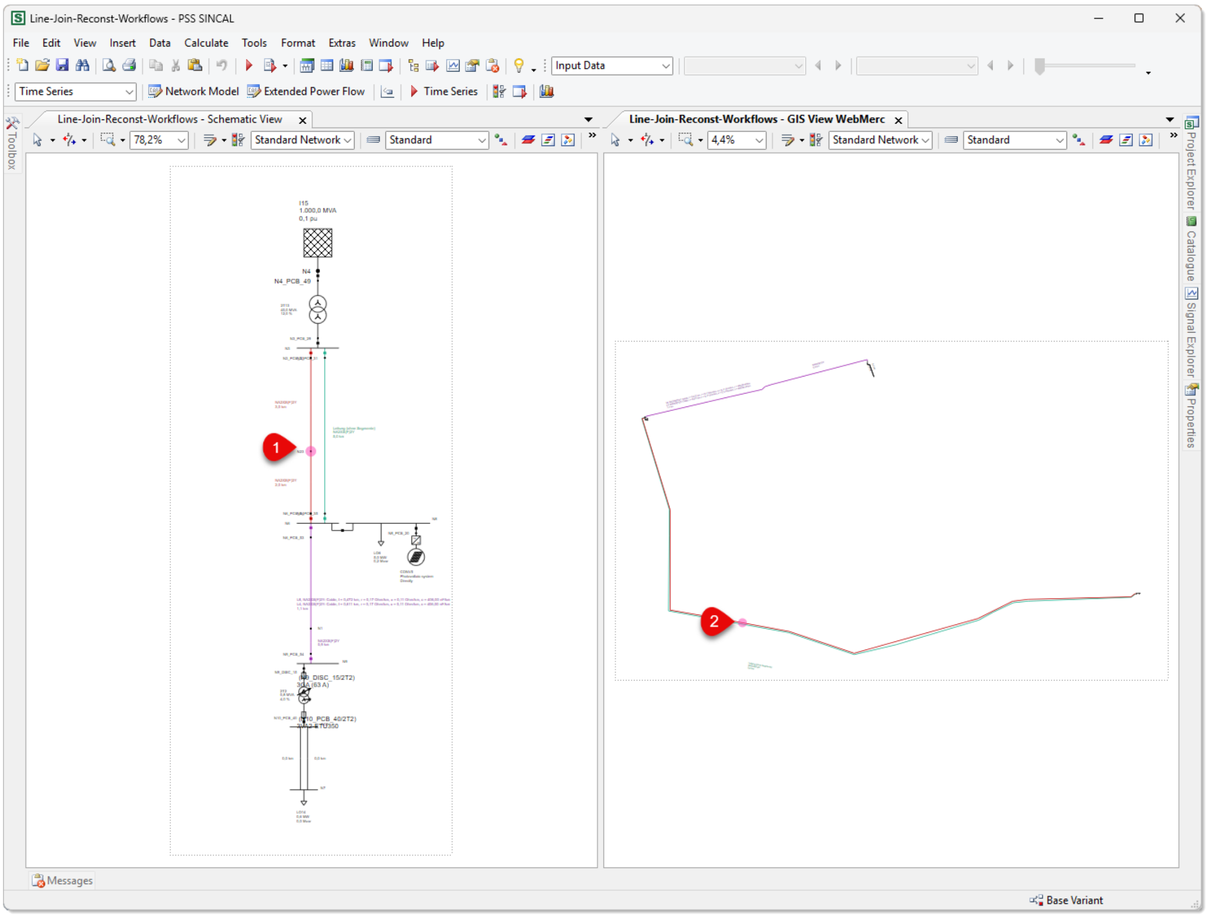
Line

The function for automatically synchronizing the network graphic when changes are made to lines has been enhanced. If a new netpoint is inserted into an existing line, all graphical views (both schematic and geographical) are automatically updated. The same applies when a line consisting of line segments is reconstructed into individual lines, or when lines are joined to form a single line consisting of line segments.

The following example shows a line with two line segments.



When the **Reconstitute from Segments** function is called, the line is converted back into two separate lines. The nodes are positioned according to the length of the line segments, both in the schematic view (#1) and in the geographical view (#2). The graphic attributes of the newly created lines are set to match those of the original line. The newly generated nodes are created using the default values for the view's graphic attributes.



The network graphic is updated as well if the graphical views are not opened.

This functionality is also implemented throughout the entire Application Programming Interface (API) (e.g., InsertNetpoint()) and can therefore be used completely independently of the user interface.

Feeder Tracing (FEEDER)

The primary objective of the feeder tracing module is to validate a distribution system network model by considering its "substations and feeders" and to present this domain specific topological evaluation of the network structure to the user based in a flexible way. This enables a topological analysis of the network model during model creation, model validation, and subsequently during network planning whenever needed.

Advanced Algorithm for Feeder Tracing

The algorithm for feeder tracing has been significantly expanded and now covers various aspects that improve the accuracy and functionality of automatic feeder tracing. At the same time, additional modeling aspects derived from real-world examples have been considered, and the functionality has been robustly enhanced to minimize the need for adjustments to existing network models and interfaces. The following lists the most important improvements and features of the algorithm:

- **Stop after Substation Detection**
  The algorithm can now stop after substation detection in order to offer both the substations defined in the substation model and the automatically detected substations for validation before tracing the feeders.

- **Substation Detection in Simplified Network Modeling**
  In the simplified network modeling (bus-branch) using node classification (instead of detailed substation modeling), all zero-impedance network elements (switches, connectors) and transformers are now grouped into an auto-detected substation. To achieve a more realistic substation model, switch states and element states are not considered.

- **Grouping Feeders**
  The algorithm automatically joins parallel lines into feeders that originate at the same substation boundary node or are assigned to the same substation bay/share the same circuit breaker.

- **Cable Distribution Cabinet and Switching Substation**
  It is now possible to individually control the tracing behavior for the following substation types: switching substation (in the medium-voltage system) and cable distribution cabinet (in the low-voltage system). These can be configured either as a new starting substation. Else the tracing at these substations "loops through" to follow the feeder is has been reached by. This can assist in identifying the individual sections between substations in main substations or external substations with feeder lines, or in meshed networks.

- **Criteria for Voltage Levels**
  In the calculation module's start dialog box, you can configure the voltage levels (medium voltage and low voltage) to be considered in the algorithm. The feeder tracing will then only consider the selected voltage levels.

  In addition, internal voltage limits have been introduced for the individual substation types. Depending on the substation type, feeders are calculated only if the following applies to the boundary node:
  Primary substation: <= 60kV
  Secondary substation: <= 1kV
  Customer substation: <= 1kV
  Cable distribution cabinet: <= 1kV

  For substations that contain multiple voltage levels, the calculation is performed for the lowest voltage level.

- **Energization and Operating Status**
  The feeder tracing is performed only on those boundary nodes of substations that are energized; that is, the boundary nodes must have a topologically closed connection to a supplying network element. The feeder tracing considers the current operational status as well as the establishment and shutdown dates of the network elements and substations.

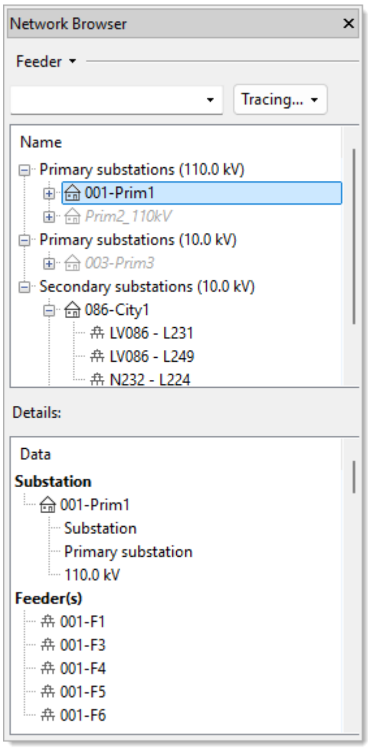
- **Originating Busbar**
  The feeders are grouped together based on their originating busbar within the substation.

The scope of calculation messages (errors, warnings, and informational messages) has also been expanded to enable a more detailed analysis of the network model and network structure.

Advanced Features in the Network Browser

The results of the feeder tracing are displayed in the network browser. Interactive evaluation tools are also available there. Both the scope of the display and the functionality have been expanded.

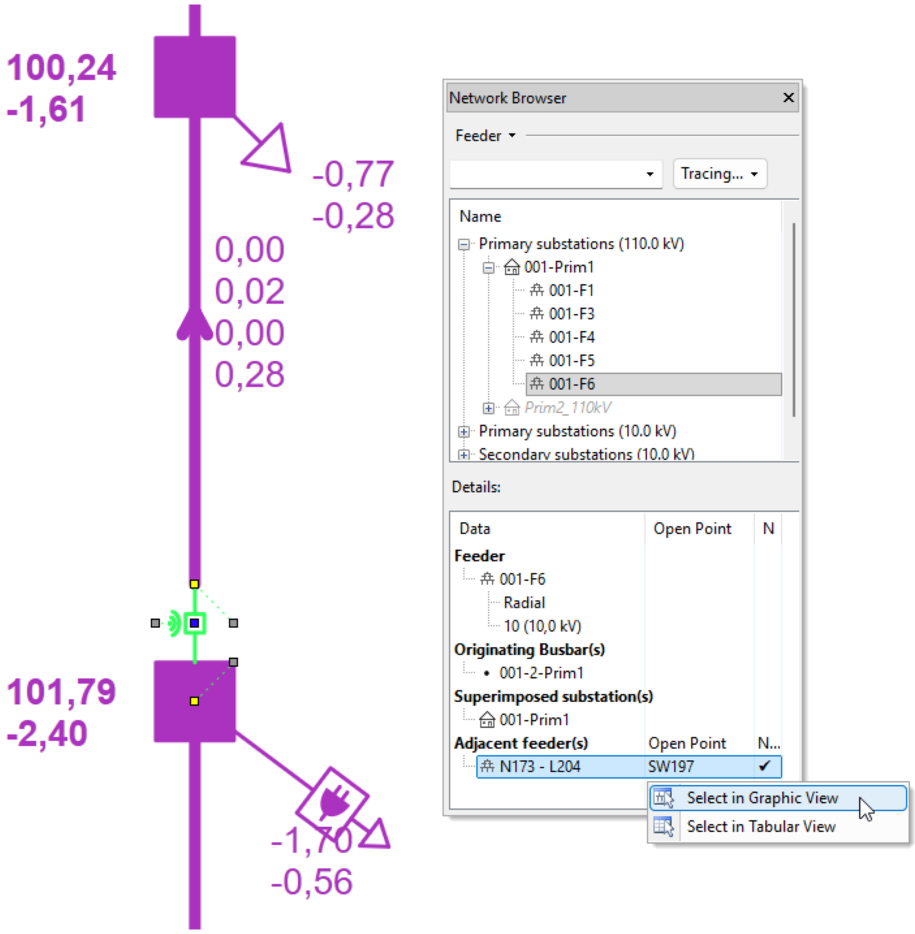
The results are now grouped by substation types. This provides a clearer structure even in complex network models with many substations.



You can also easily customize the display settings. Using the dropdown menu in the filter input field, you can easily enable or disable substation types.

Additional functions are available in the pop-up menu of the substation list and the feeder list. You can view and edit data for substations and network elements. You can also select items in the graphics editor and the tabular view (in the feeder tracing result tables).

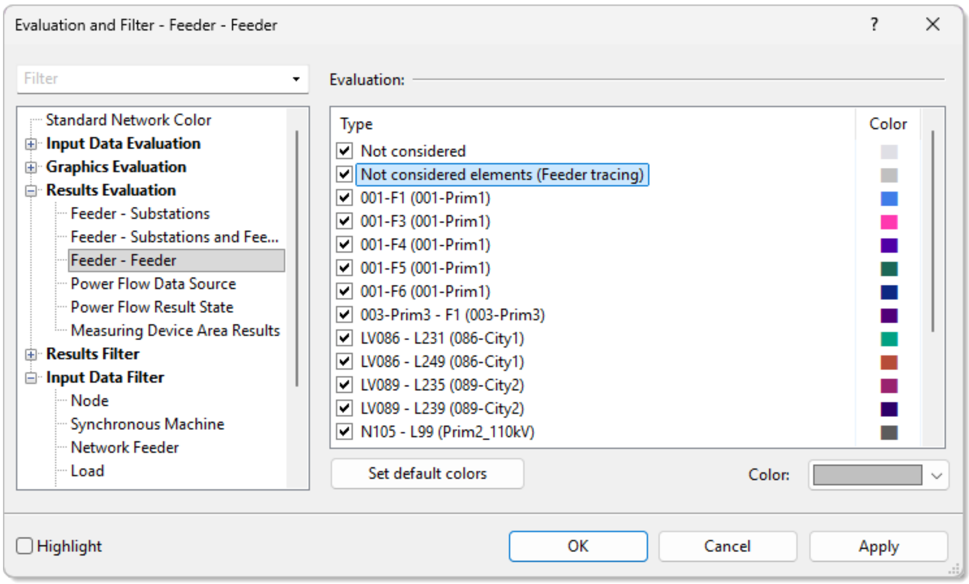
New features are also available for adjacent feeders. The network browser displays the open point where the adjacent feeder can be connected. Using the corresponding pop-up menu, you can select the exact switch for the separation point in graphic view.



A description of all functions is available in the **System Manual**, in the **Network Browser – Feeders** chapter.

Advanced Evaluation for Feeders

The feeder evaluation can now also visualize those elements that were not considered in the tracing or could not be reached.

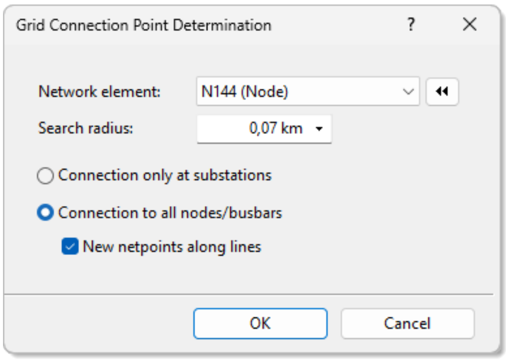


This supports the initial validation of the network model and verifying that the network model is correctly expanded during planning processes when including additional equipment or during switching operations.

Grid Connection Point Determination

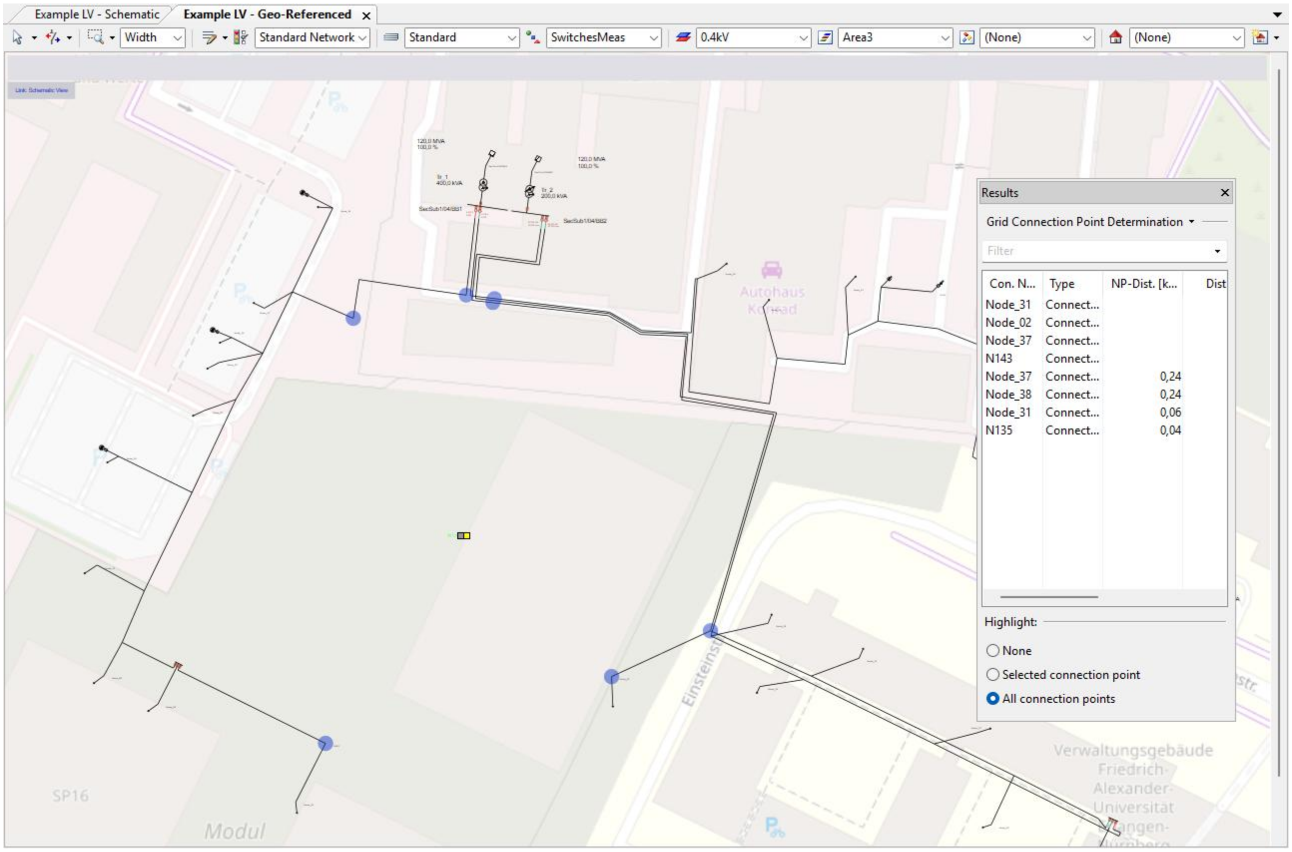
This calculation module identifies the possible connection points for a new node or network element to the existing network model in geographical views. The calculation module has been reimplemented and replaces the previously available **Load Allocation** feature. The new module can be used both interactively in the user interface and via the Application Programming Interface (API) using the GetConnectionPoints() function.

To determine the grid connection point, a new node or network element is added at the desired location in a geographical view. The module is then started via the menu item **Calculate – Grid Connection Point Determination**.



A configuration dialog box opens. The search radius defines the maximum distance between the connection point and the position of the new node. You can use the available options to configure which connection points are allowed.

The identified connection points are displayed in the result browser within the user interface and can also be interactively evaluated using highlighting. The results are available in the network database in the "GridConnectDetailResult" table.



Operating Points, Profiles, and Development Series (LP, LD)

The functionality of the calculation modules has been enhanced to enable a significantly more flexible combination of operating points with development series, particularly for strategic planning.

Another focus was on consolidating the available input format types for all equipment, as well as on clear and strict verification of the permissible combinations between the input formats of the equipment and the assigned operating points.

Combination of Operating Points and Development Series

This enhancement allows a more flexible combination of operating points with development series.

A typical workflow for using the new feature is as follows:

- Use the load assignment (LA) module to determine power values based on measured values and then assign this power to the loads as operating points.
- Using a development series to increase or decrease these absolute powers by relative factors, thereby modeling growth or decline scenarios during long-term planning workflows.

When using operating points and development series, both factors and absolute values can be applied. To ensure that all data is considered consistently and without errors, a clearly structured processing method is defined. This is the only way to ensure that the relevant values and factors are combined correctly, that the results are transparent, and that no values need to be discarded.

The table illustrates the use of operating points (OP) and development series (LD) with PQ values and factors.

Input data			Processing in the calculation			
Element data	Operating point	Development	Element data	Operating point	Development	State
PQ	-	-	PQ	1	1	OK
PQ	-	f_LD	PQ	1	f_LD	OK
PQ	-	PQ_LD	1	1	PQ_LD	OK
PQ	f_OP	-	PQ	f_OP	1	OK
PQ	f_OP	f_LD	PQ	f_OP	f_LD	OK
PQ	f_OP	PQ_LD	1	f_OP	PQ_LD	OK
PQ	PQ_OP	-	1	PQ_OP	1	OK
PQ	PQ_OP	f_LD	1	PQ_OP	f_LD	OK
PQ	PQ_OP	PQ_LD	PQ	PQ_OP	PQ_LD	KO
PQ	fPV_OP	-	PQ	fPV_OP	1	KO
PQ	PV_OP	-	PQ	PV_OP	1	KO

Processing of the data assigned to the network element in the calculation algorithm:

- If no data is available for the operating point or development series, a factor of 1 is used.
- If an absolute power value is specified for the operating point or the development series, the value 1 is entered in the basic data, thereby "overwriting" it.
- All combinations of an absolute development series value and one or two additional factors are multiplied together.
- If absolute values are specified for the operating point and the development series, this is not permitted.
- If operating points or development series of an incompatible type are assigned to the network element's input type, this is not permitted.

In the calculation algorithm, the assigned data values are multiplied to determine the current value:

$$PQ_{calc} = Basic\ Data \times Operating\ Point \times Development\ Series$$

Stricter Verification of Basic Data and Assigned Operating Points/Development Series

The validation of combinations between the input formats of the equipment and the assigned operating points/profile format has been made more stringent. If an invalid combination is detected, the calculation will generate an error message.

The following table provides an overview of which input format can be assigned to which element. "=" indicates that the element's input format must match the profile's/operating point's input format, while "✓" indicates that it is always available.

Element Type	f	fP and fQ	fP and fV	f and cosφ	P and Q	P and cosφ	I and cosφ	S and cosφ	Pi and Qi	P and V	T
Load	✓	✓		✓	✓	=	=	=	=		
Converter	✓	✓	=	✓	=	✓		✓		✓	
Network Feeder	✓	✓	=		=	=		=		=	
Synchronous Machine	✓	✓	=		=	=		=		=	
Power Unit	✓	✓	=		=	=		=		=	
Asynchronous Machine	✓	✓	✓		✓						
Variable Shunt Element	✓	✓	=	✓	✓					=	

Serial DC Element	✓	✓	✓		✓						
Measuring Device	✓	✓		✓	✓	=	=	=	=		
Network Area	✓	✓			✓					✓	✓

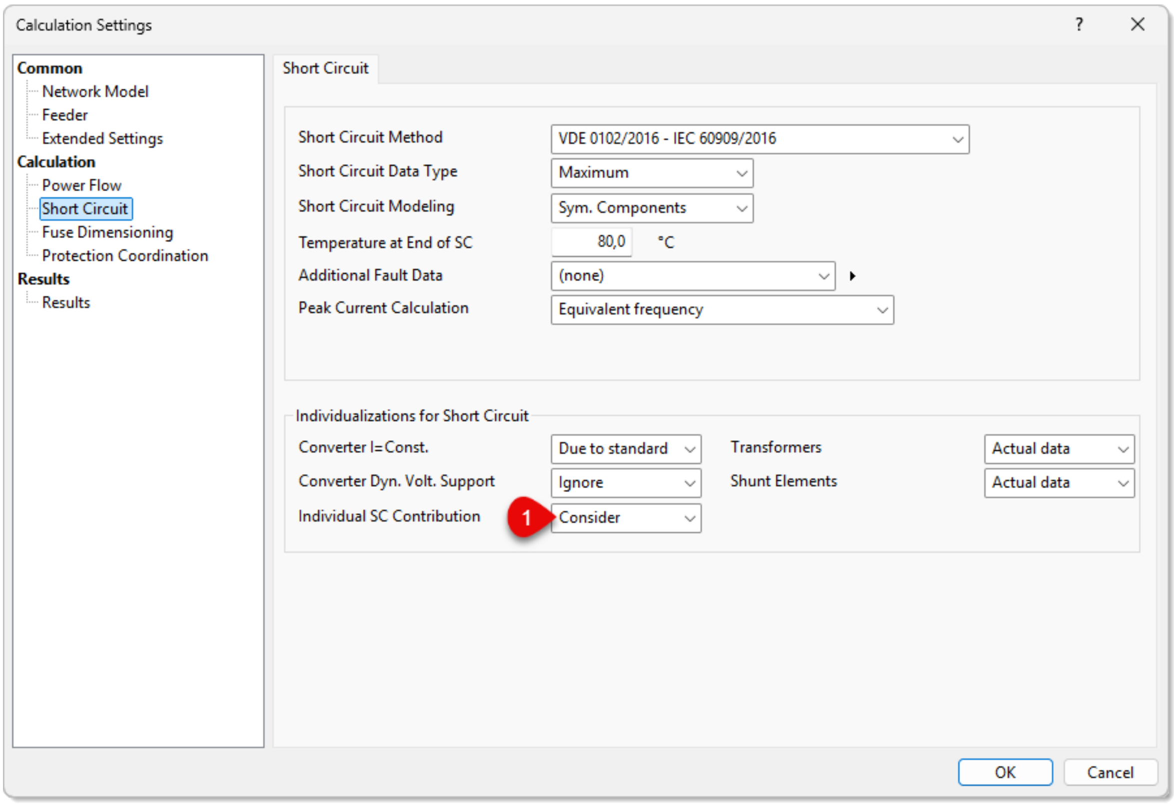
Short Circuit (SC)

New Options for Customizing the SC Contribution for Converters and Machines

The options for customizing the short-circuit calculation have been expanded.

Until now, in short-circuit calculations according to IEC 60909, the short-circuit current contributions from wind and PV systems have been set to zero for the minimum short circuit condition, as this is explicitly required by the standard. However, other systems connected via converters continue to contribute to the short-circuit current.

As a result, the short circuit calculation produces a network simulation that can deviate significantly from reality, particularly in networks dominated by converters. To give users greater flexibility in simulating the network during short circuit calculations, the option **Individual SC Contribution** (#1) is now available in the **Calculation Settings – Short Circuit** dialog box:



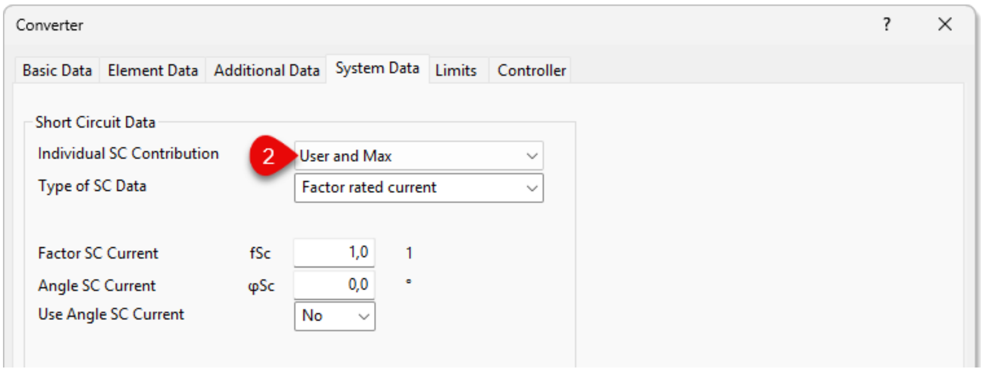
This option in the calculation settings allows you to specify, for the entire network model, whether the short-circuit contribution should be determined in accordance with the standard or whether custom definitions of short-circuit contributions for individual network elements should be considered.

An individual definition of the short-circuit contribution is possible for the following network elements:

- Converter

- Asynchronous machine
- Synchronous machine
- Power unit
- Static compensator
- AC/DC converter

This is configured in the **System Data** tab using the **Individual SC Contribution** option (#2):

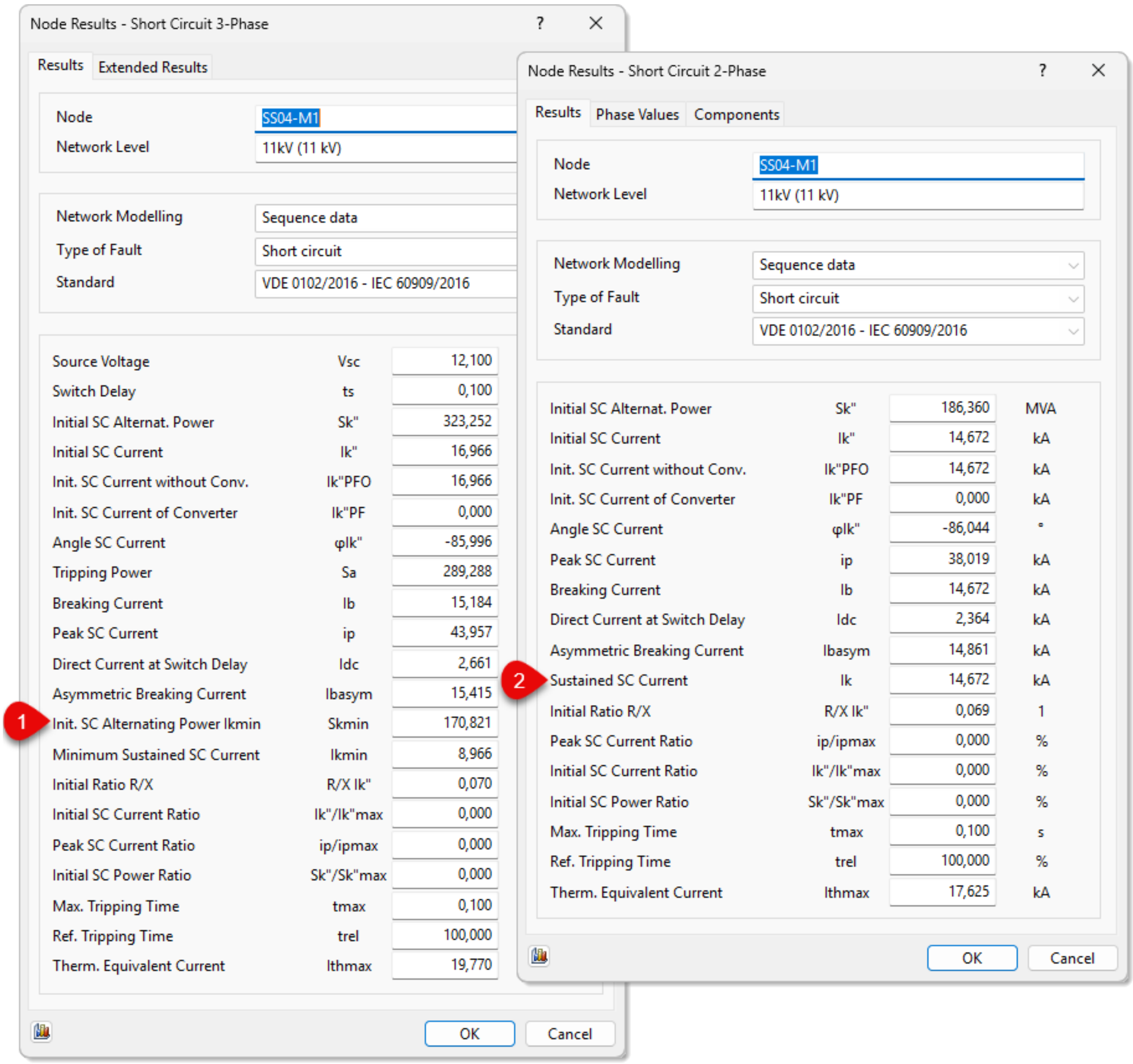


Here, you can enable custom settings that deviate from the standard in the short circuit scenario according to the following options:

- No indiv. SC contribution:
  The individual SC contribution is ignored, and the element behaves as defined in the calculation settings and the standard.
- Sc contribution always zero:
  No current flows during a short circuit.
- Min, Max and User:
  Contribution to all short-circuit calculations (User, Min, Max).
- User:
  Contribution with user-defined short-circuit calculation.
- Min:
  Contribution with minimal short-circuit calculation.
- Max:
  Contribution with maximal short-circuit calculation.
- User and Max:
  Contribution with user-defined and maximum short-circuit calculations.
- User and Min:
  Contribution with user-defined and minimal short-circuit calculation.
- Min and Max:
  Contribution with minimum and maximum short-circuit calculations.

Extended Results

When performing a short-circuit calculation, new attributes are made available in the node results. For a 3-phase short circuit, the **Initial SC Alternating Power Skmin** (#1), based on the minimum sustained SC current Ikmin, is now available; for 2-phase and 1-phase short circuits, the **Sustained SC Current** Ik (#2) is available.



New and Modified Protection Devices

The library of protection devices has been expanded in this product version. The added devices are listed below. Detailed descriptions of the protection devices are available in the **Protection Coordination** and **Input Data** manuals.

Advanced Protection Devices

The following protection devices have been extended.

Protection device	Description
7ST86	New distance protection device
REL670	Extension of the load cut out and device-specific earth factor for impedance pickup
SIP4	Operating modes for pickup
SIP5	Operating modes for pickup
SPRECON	Operating modes for pickup
Schneider P43x	Operating modes for pickup
REL511	Device-specific earth factor for impedance pickup

REF630	Introduction of base values for pickup and earth Fault detection
7SJ80	Adjusted step size – current settings
3WA1-ETU300	Extended rated current specification
3WA1-ETU600	Extended rated current specification

A detailed description of the protection devices' functionality can be found in the **Protection Coordination** manual, in the **Protection Simulation** chapter.

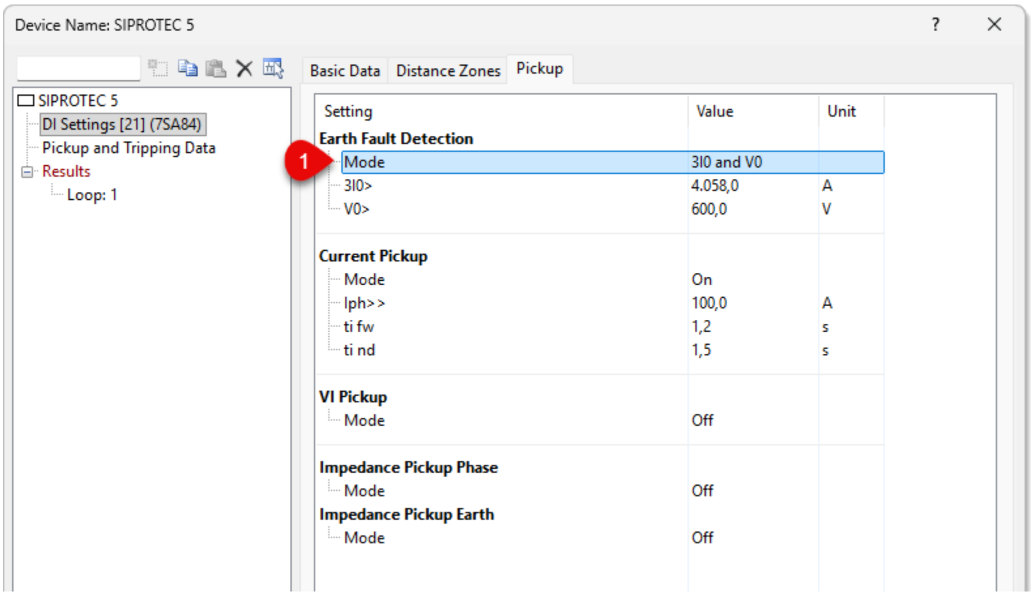
Manufacturer-Specific Earth Fault Detection for DI Devices

The purpose of earth fault detection is to determine whether an earth fault is present. If an earth fault is detected, the phase-ground loops are enabled for evaluation. To trigger a response in the event of a phase-ground fault, an additional pickup condition must be met in addition to the earth fault detection.

Device-specific earth fault detection is now available in PSS SINCAL for the following distance protection devices:

- MiCOM P43x
- MiCOM P44x
- REF630
- REL670
- SIPROTEC 4
- SIPROTEC 5
- SPRECON-E-P DD6
- EASERGY P3

The following image shows an example of the dialog box for configuring the pickup settings of a SIPROTEC 5 device.



Earth fault detection for the protection device is configured in the section of the same name in the dialog box (#1). Here, you can choose from the three modes supported by the device (3I0> and U0>, 3I0> or U0>, or 3I0> only). The parameters are also displayed according to the selected mode.

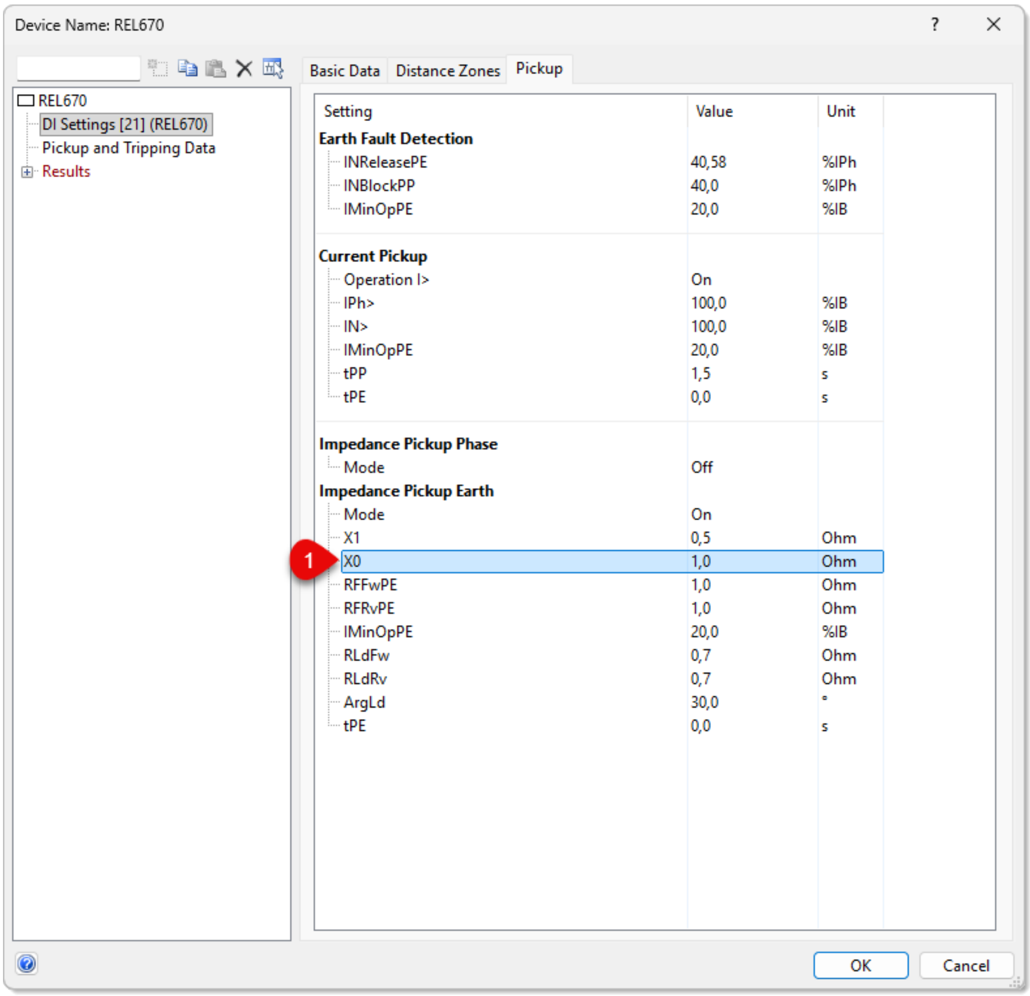
A detailed description can be found in the Protection Coordination manual, in the chapter titled **Protection Simulation – Distance-Protection Devices – Earth Fault Detection**.

Earth Factors for Impedance Pickup Device-Specific

The definition of the earth factors for impedance pickup in the RED670/REL670 and REL511 protection device types is now device-specific (#1). For the REF630 and REL316 protection device types, the earth factor is internally set to 1 during calculation. For the REL316, this is done in accordance with the actual device, and for the REF630, it is done for display purposes in the diagrams.

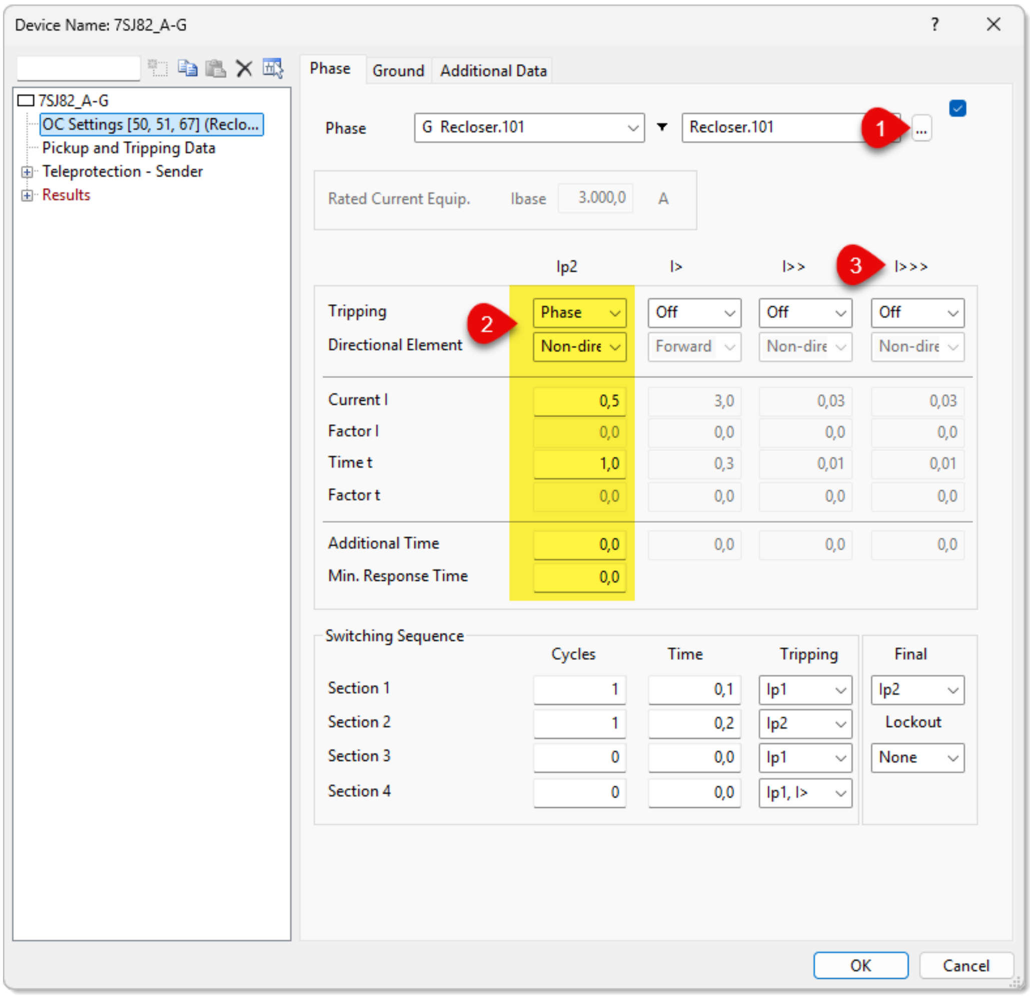
For all other distance protection devices with impedance pickup and defined zones, the ground factors are now specified globally, in line with actual devices. This is done in PSS SINCAL under the "Distance Zones" tab; the ground factors listed here are used for both the impedance pickup and tripping areas.

All distance protection devices with impedance pickup that do not define the protection zone – i.e., those that define only the load cut out – do not require earth factors; therefore, the earth factor can no longer be specified for these devices in the impedance pickup settings.



Enhancements for OC Devices

For reclosers, two different characteristic curves can be used in PSS SINCAL: Ip1 and Ip2. The characteristic curve is selected in the protection device dialog box under the **Phase** and **Ground** tabs of the **OC Settings** (#1).



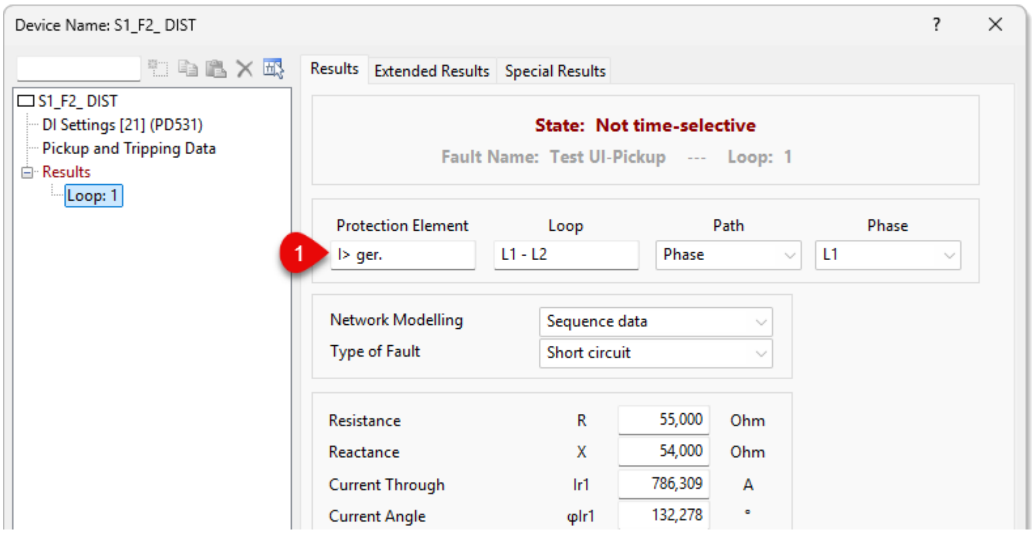
A new feature is that a complete set of configuration parameters is now also available for the second characteristic curve (#2). The new parameters are stored in the "ProtOCSetting" table, just like the existing ones.

Device-specific step names are now available for overcurrent-time-based protection functions. A tooltip next to the step names (#3) displays the device-specific step names if they differ from the standard names used in PSS SINCAL.

Protection Coordination (OC, SZ, DI)

Extended Results for the Protection Simulation

For protection simulation, additional results related to pickup are available. The states of the individual fault steps are now displayed more clearly. If a distance protection device is in the pickup state, the activated pickup function is displayed under Protection Element as I>, VI, Viφ, Z<. If a distance protection device is in the tripping state, the activated tripping zone or final time is displayed under Protection Element.



The following is now displayed for the **Protection Element** (#1):

- **Tripping zone**
  The name of the tripped **Zone (1–6)**.
- **Current pickup**
  I> is displayed for the current pickup.
- **VI pickup**
  VI is displayed for the VI pickup.
- **VIφ pickup**
  VIφ is displayed for the VIφ pickup.
- **Impedance pickup**
  For impedance pickup, **Z<** is displayed.

If the pickup types with a final time result in tripping, the system indicates whether the event is tripped by the directional (**dir**) or non-directional (**non-dir**) final time.

Support for Directional/Non-Directional OC Protection in Teleprotection

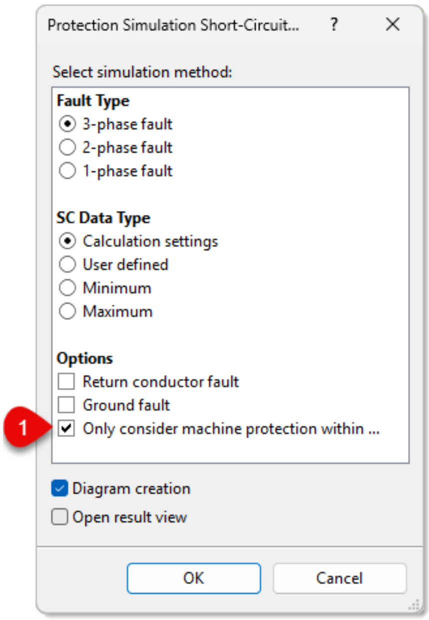
The teleprotection functionality in the protection simulation has been enhanced. Directional signals are now also available for OC protection devices. This enables both directional and non-directional teleprotection.

- Signals available so far:
  - OC Ip non-directional
  - OC I> non-directional
  - OC I>> non-directional
  - OC I>>> non-directional
- New added signals:
  - OC Ip forward
  - OC I> forward
  - OC I>> forward
  - OC I>>> forward
  - OC Ip backward
  - OC I> backward
  - OC I>> backward

- OC I>>> backward

Machine Protection in the Protected Zone

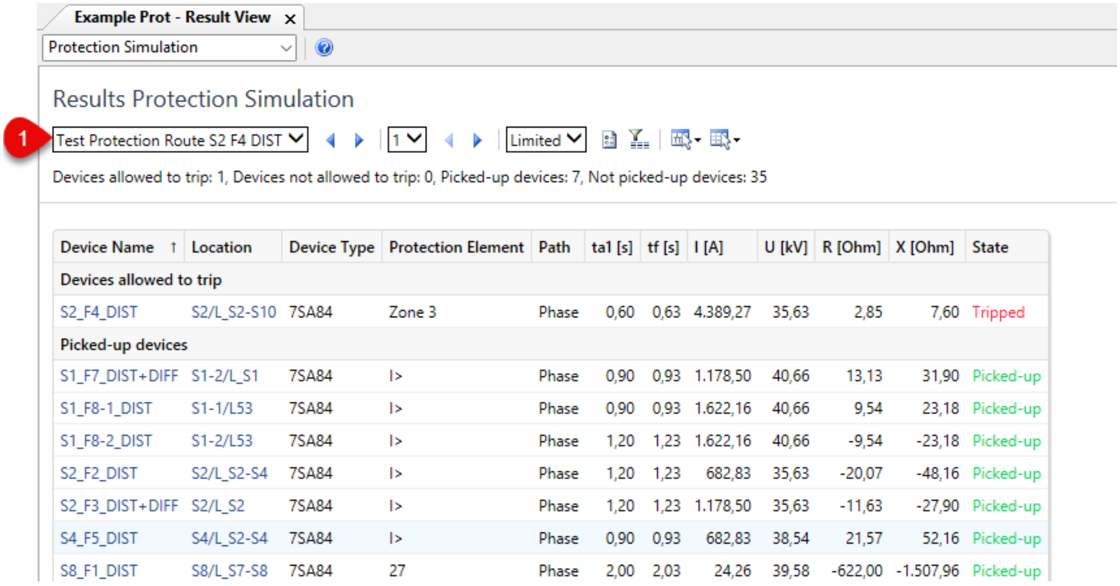
For the protection simulation, the new option **Only consider machine protection within the protection area** is available. This option can be enabled directly in the protection simulation's start dialog box (#1).



Machine protection refers to protection devices with frequency and/or voltage protection. When this option is enabled, machine protection is only considered in the selectivity analysis if these protection devices are located within the protection zone under consideration.

Expanded View in the Result View

The result view of the protection simulation has been enhanced. The active fault observation and the loop are now displayed in selection fields (#1) in the header of the result view. This allows you to conveniently select the data to be displayed directly in the result view. Buttons for navigating forward and backward are also available.

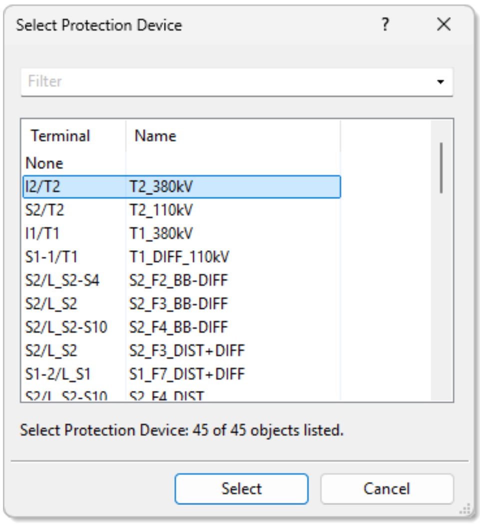


Device Name	Location	Device Type	Protection Element	Path	ta1 [s]	tf [s]	I [A]	U [kV]	R [Ohm]	X [Ohm]	State
Devices allowed to trip											
S2_F4_DIST	S2/L_S2-S10	7SA84	Zone 3	Phase	0,60	0,63	4.389,27	35,63	2,85	7,60	Tripped
Picked-up devices											
S1_F7_DIST+DIFF	S1-2/L_S1	7SA84	I>	Phase	0,90	0,93	1.178,50	40,66	13,13	31,90	Picked-up
S1_F8-1_DIST	S1-1/L53	7SA84	I>	Phase	0,90	0,93	1.622,16	40,66	9,54	23,18	Picked-up
S1_F8-2_DIST	S1-2/L53	7SA84	I>	Phase	1,20	1,23	1.622,16	40,66	-9,54	-23,18	Picked-up
S2_F2_DIST	S2/L_S2-S4	7SA84	I>	Phase	1,20	1,23	682,83	35,63	-20,07	-48,16	Picked-up
S2_F3_DIST+DIFF	S2/L_S2	7SA84	I>	Phase	1,20	1,23	1.178,50	35,63	-11,63	-27,90	Picked-up
S4_F5_DIST	S4/L_S2-S4	7SA84	I>	Phase	0,90	0,93	682,83	38,54	21,57	52,16	Picked-up
S8_F1_DIST	S8/L_S7-S8	7SA84	27	Phase	2,00	2,03	24,26	39,58	-622,00	-1.507,96	Picked-up

Duplicating Protection Devices

The user interface now includes a new feature for duplicating an existing protection device. This is useful when you need to insert protection devices with the same configuration into a network model (e.g., GIS export, Excel import, etc.).

For this purpose, select all network elements in the graphic view where protection devices are to be inserted at their terminals. Then, access the new function via the **Tools – Duplicate Protection Device** menu. In the dialog box that appears, you can then select the protection device to be duplicated.

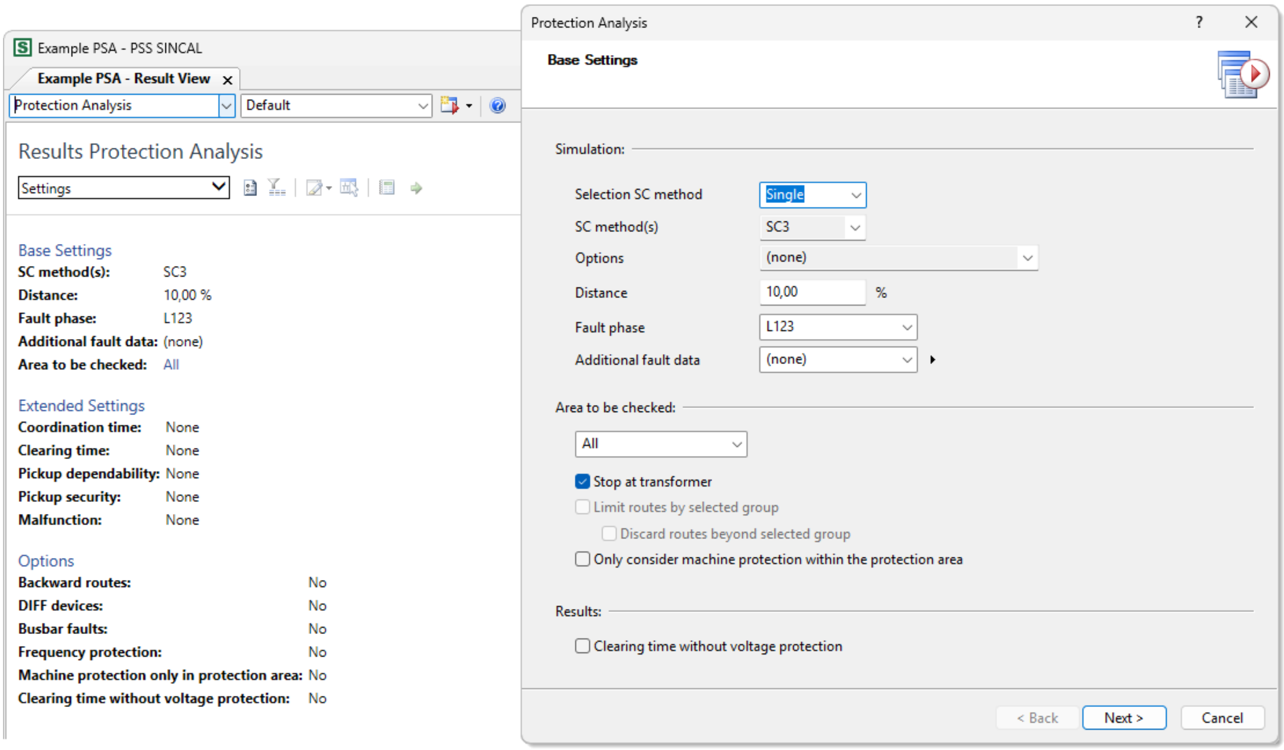


Clicking **Select** inserts the selected device into the terminals of all selected network elements.

Protection Analysis (PSA)

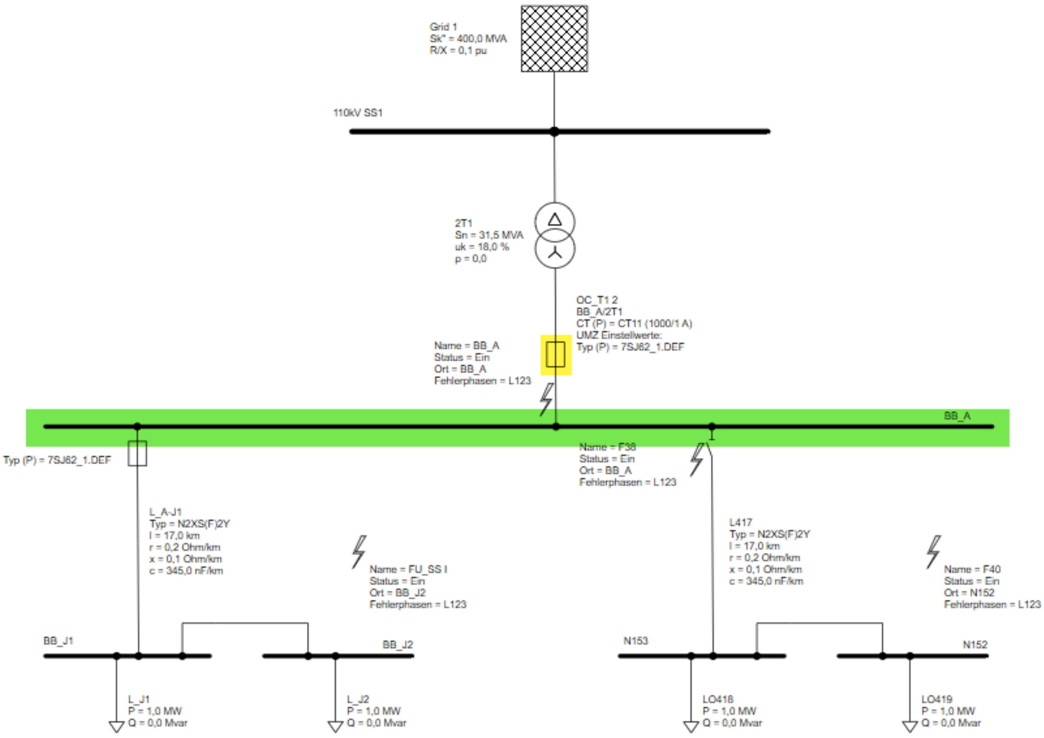
Revision of the Display of Settings in the Result View

The display of settings in the protection analysis result view has been revised. The scope and order now better correspond to the settings available in the start dialog box.



Busbar Protection on the Transformer

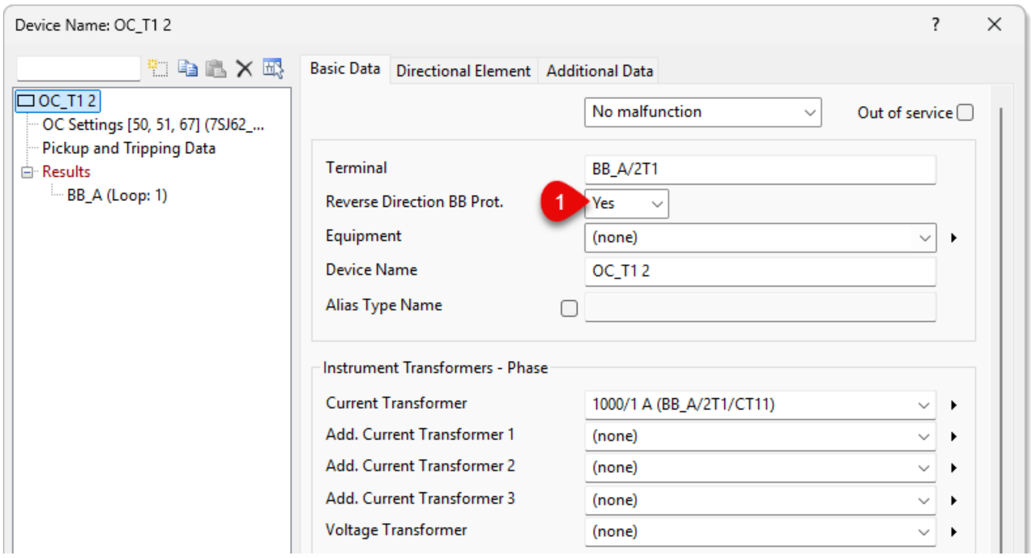
In network models, busbar protection is often modeled directly on the transformer. The following figure shows an example of such a network model. The protection device "OC_T1 2" (highlighted in yellow) is intended to protect the busbar "BB_A" (highlighted in green).



The problem with this, however, is that when the device is placed on the transformer, the main protection area is automatically defined in the direction of the transformer. In this case, the directional element setting in the protection device must be set to **backward** so that the protection behave as expected in PSS SINCAL.

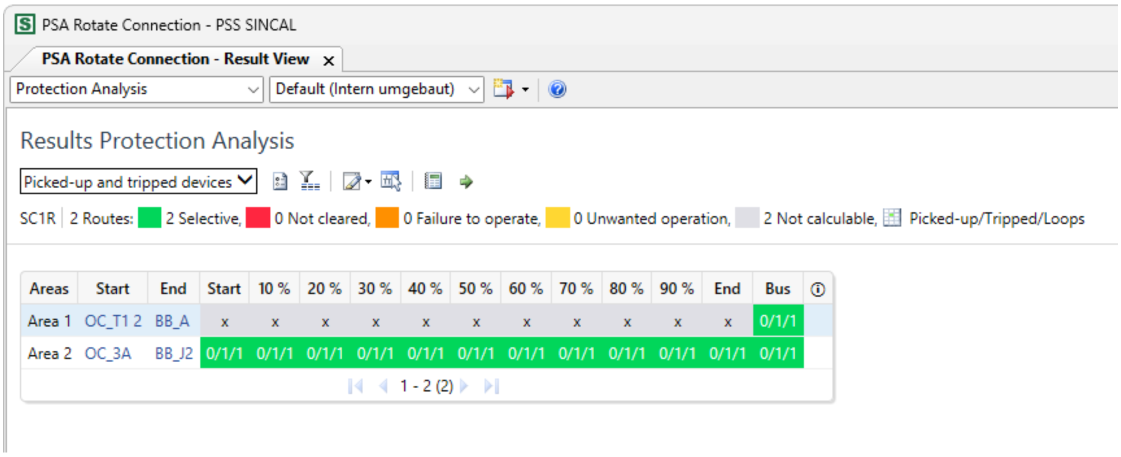
To ensure proper operation of the directional element without any adjustments, a different modeling approach would need to be used in PSS SINCAL. A connection would need to be established between the busbar and the transformer, and the protection device would need to be placed at the transformer-side node. The main direction of protection would then be toward the busbar.

To simplify this specific modeling of busbar protection, the protection device now offers a new option: **Reverse Direction BB Protection** (#1). This activates a different internal processing routine in PSS SINCAL and reverses the main protection direction.



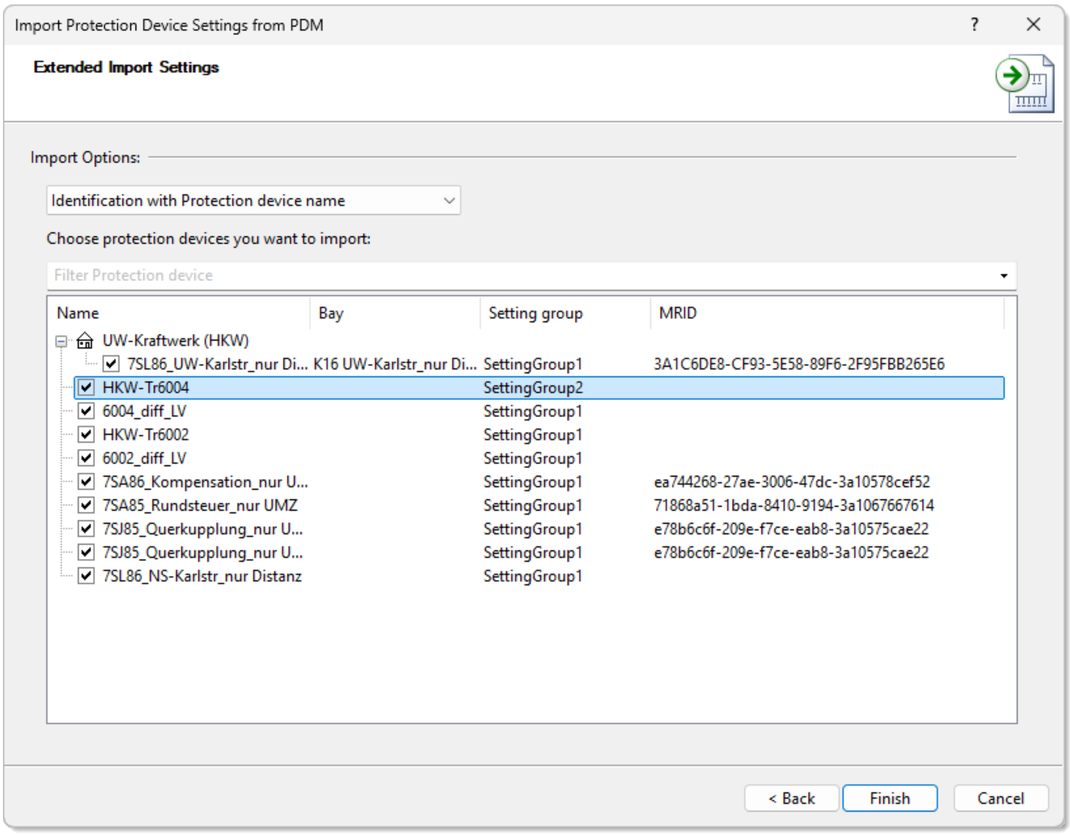
This function is only available at the low-voltage terminals of transformers. If it is used elsewhere, the option is ignored and a warning message is displayed.

The display of results in the protection analysis has also been adapted for this specific modeling. For the protection device "BB_A", only the busbar state is displayed (#2).



Protection Data Manager (PDM)

The functions for importing and exporting protection device settings to PDM have been made more user-friendly. The selection of setting groups has been revised.



Dynamics (ST, EMT)

Models

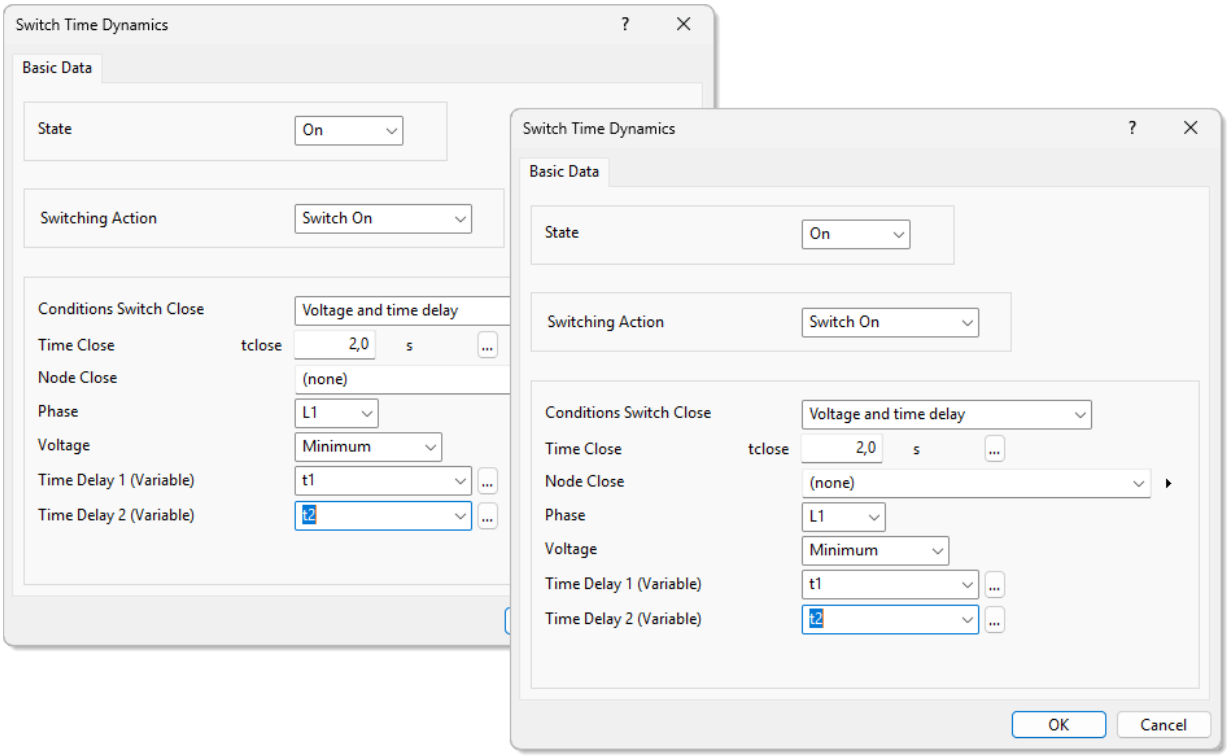
The following exciter models for synchronous machines have been added or updated. A detailed description of the models can be found in the Online Help.

Model	Change	Description
DC1A	Updated	DC exciter model according to IEEE 421.5-1992
DC1C	New	DC exciter model according to IEEE 421.5-2016
DC2A	Updated	DC exciter model according to IEEE 421.5-1992
DC2C	New	DC exciter model according to IEEE 421.5-2016
DC3A	Updated	DC exciter model according to IEEE 421.5-1992
DC4B	Updated	DC exciter model according to IEEE 421.5-1992
DC4C	New	DC exciter model according to IEEE 421.5-2016
AC3C	New	DC exciter model according to IEEE 421.5-2016
AC5C	New	DC exciter model according to IEEE 421.5-2016
AC6C	New	DC exciter model according to IEEE 421.5-2016
AC7C	New	DC exciter model according to IEEE 421.5-2016
AC8C	New	DC exciter model according to IEEE 421.5-2016

Dynamic Parameter Variation

Using the dynamic parameter variation feature available since the last product release, simulation parameters can be varied automatically. In this process, the network model is calculated completely dynamically for each individual parameter value. This enables an efficient analysis of different settings or scenarios and a targeted investigation of their effects on the overall system. The process runs automatically, so that a separate simulation can be performed for each variation, and the system behavior can be comprehensively evaluated.

To make the function even more flexible, additional parameters have been added to the **Switch Time Dynamics** and **Fault Observations** to allow for further variation.



The following parameters can now also be varied automatically:

- Switch time dynamics
  - Voltage Vclose
  - Time delay 1 (dt1)
  - Time delay 2 (dt2)
- Fault observation
  - Voltage
  - Current Ioff
  - Time delay 1 (dt1)
  - Time delay 2 (dt2)

CIM Export & Import

Improved CIM Roundtrip with PSS ODMS for Consistent Data Exchange

The CIM interface in PSS SINCAL has been enhanced to ensure consistent PSS SINCAL-PSS ODMS round-trip functionality. Improvements, particularly in graphical mappings during import and export, now enable bidirectional model consistency. The next planned step is to obtain ENTSO-E certification for CIM import and export.

Enhanced Functionality during CIM Import and Export

The import and export implementations for the CIM standards CGMES 2.4.15 and CGMES 3.0 have been extended as follows:

- **Thermal limit current for lines**
  The import and export of thermal limit currents for lines has been enhanced. Newly implemented rules ensure that the thermal limit currents defined in CIM (PATL and TATL as "LimitKind") are now imported and exported correctly.

- **Operating state**
  CIM defines both the normal and current operational states of network elements. The import and export functions have been expanded and supplemented with new rules so that the available operational state is adopted. In PSS SINCAL, the current operational state from CIM is used when data (SSH profile) is available; otherwise, the normal operational is applied.

- **Input data for equipment**
  The calculation of input data for equipment has been revised. P and Q are taken directly from SSH if defined there; otherwise, they are derived from the rated power and power factor in EQ.

- **Phase information**
  PSS SINCAL now fully processes and supports the phase information for network elements stored in CIM.

- **Schematic views**
  For schematic views in CIM, the DiagramObject.rotation attribute is now supported during import and export for rotating and aligning network elements. The rotation is interpreted according to the CIM unit circle.

Advanced Import of Graphic Data

When importing geographical information via CIM (GL profiles), the EPSG:25832 projection method is now also supported. Imported data is automatically converted to the Web Mercator projection. This means that GL profiles with the following projections can be imported directly into PSS SINCAL:

- EPSG:4326, WGS84
- EPSG:3006, SWEREF99
- EPSG:25832, ETRS89, UTM32N

GL profiles using other projection methods are imported into the PSS SINCAL network model as a geographical view with a generic projection.

PSS E Import & CYMDIST Import

When importing via PSS E or CYMDIST, geographical data is now imported into PSS SINCAL network models using the Web Mercator projection.

Automation

The API functions of PSS SINCAL are available via COM interfaces. The COM objects for each installed version of PSS SINCAL are stored in the Windows Registry.

The following COM objects are the basis for all other automation functions:

COM object	Description
SIASincal.Application	Application object of the PSS SINCAL graphical user interface
Sincal.SimulationSrv	Simulation object as a standalone process
Sincal.Simulation	Simulation object as a DLL in the calling process
Sincal.DatabaseManager	Database manager for managing databases
Sincal.SinDBSrv	Multi-User Master Database Manager

These COM objects can be instantiated using their name and version number. To do so, specify the version number immediately after the COM object's name. If a COM object is instantiated without a version number, the default version registered on the computer is used.

The version numbers of the COM objects are bound to PSS SINCAL versions; however, they do not correspond to the product version – they are simply incremented.

PSS SINCAL product version	COM version	Example
22.5 2026Apr	28	SIASincal.Application.28
22.0 2025Oct	27	SIASincal.Application.27
21.5 2025Apr	26	SIASincal.Application.26

The following example shows how the application object can be created in Python with and without a version number.

```python
# Create an application object with specified version number
try:
    SincalApp = win32com.client.Dispatch("SIASincal.Application.28")
except:
    SincalApp = None
    print("Error: CreateObject SIASincal.Application failed!")

# Create an application object without version number (default is used)
try:
    SincalApp = win32com.client.Dispatch("SIASincal.Application")
except:
    SincalApp = None
    print("Error: CreateObject SIASincal.Application failed!")
```

Changes to the Automation Functions (API)

The following changes have been made to the automation functions of the PSS SINCAL Platform. For a more detailed description, refer to the **Automation** manual.

User Interface

Automation function	Change	Description
DocumentObject.ImportPDMSettings	New	Import protection device settings from PDM
DocumentObject.ExportPDMSettings	New	Export protection device settings for PDM

Calculation Methods

Automation function	Change	Description
CalculationObject.Item	Extended	Access to attributes of the calculation object. New topology attributes are available.
MessageObject.MessageId	New	Determine the message number.
DataObject.CreateGraphic	Extended	Default attributes from the view are considered when creating the graphic.
DatabaseObject.GetErrors	Extended	New error codes are available.
DatabaseObject.InsertNetzpoint	Extended	Inserting a netpoint into a line. Advanced application of graphic attributes.
DatabaseObject.JoinLines	Extended	Function to join lines. Enhanced functionality when updating the network graphic.
DatabaseObject.ReconstituteLines	New	New feature for reconstructing lines from segments.
DatabaseObject.GetConnectionPoints	Extended	Extended return value from the function used to determine possible connection points.

Automation of the Graphical User Interface

Import Protection Device Settings from PDM – ImportPDMSettings

This new function enables the import of protection device settings from a PDM exchange database.

The following Python snippet shows how it works:

```
# Import PDM Settings.
eIdentificationType_MRID                = 0
eIdentificationType_Name                = 1
eIdentificationType_Substation          = 3

iIdentification = eIdentificationType_MRID

SincalDoc.ImportPDMSettings(r"C:\PSS Files\Sincal\Samples\PDMExchange.db", iIdentification)
```

Export Protection Device Settings for PDM – ExportPDMSettings

This new function enables the export of protection device settings to a PDM exchange database.

The following Python snippet shows how it works:

```
# Export PDM Settings.
SincalDoc.ExportPDMSettings(r"C:\PSS Files\Sincal\Samples\PDMExchange.db")
```

Automation of the Calculation Methods

Extended Attributes for Calculation Objects – Item

Calculation objects provide access to element data of loaded models. For example, they can be used to read and modify the attributes of objects.

The following Python snippet shows how to access calculation objects and their attributes.

```
# Load data from DB
Simulation.LoadDB("LF")
if Simulation.StatusID == sincal.SimState.LoadDB_Failed:
    print(f"Error: Load database {strNetwDB} failed!")
    sincal.WriteMessages(Simulation)
    CleanupAndQuit()

# Get load object
LoadObj = Simulation.GetObj("LOAD", "Load1")
if LoadObj == None:
    print("Error: Load not found!")
    CleanupAndQuit()

# Get initial P/Q from load
dP = LoadObj.Item("P")
dQ = LoadObj.Item("Q")

# Get topology data from load object
strLoad = LoadObj.Item("TOPO.NAME")
iNodeID = LoadObj.Item("TOPO.NODE1.DBID")
iLoadID = LoadObj.Item("TOPO.DBID")
iNetworkLevelID = LoadObj.Item("NetworkLevel.ID")
```

Calculation objects also have topology attributes that contain references to the topological structures in the network model. These are referenced using the prefix "TOPO" with the Item() function.

The following new topology attributes are now available:

Attribute	Status	Description
Nodes		
TOPO.NetworkLevel.ID	Read	Internal ID of the network level of the node
TOPO.NetworkLevel.DBID	Read	Database ID of the network level of the node (VoltLevel_ID)
TOPO.NetworkArea.ID	Read	Internal ID of the network area (NetworkGroup) of the node
TOPO.NetworkArea.DBID	Read	Database ID of the network area (NetworkGroup) of the node (Group_ID)
Network Elements		
TOPO.NetworkLevel1.ID TOPO.NetworkLevel2.ID TOPO.NetworkLevel3.ID	Read	Internal ID of the element's network level at the respective terminal (up to 3 terminals possible, depending on the element type)
TOPO.NetworkLevel1.DBID TOPO.NetworkLevel2.DBID TOPO.NetworkLevel3.DBID	Read	Database ID of the element's network level at the respective terminal (up to 3 terminals possible, depending on the element type) (VoltLevel_ID)
TOPO.NetworkArea.ID	Read	Internal ID of the network area (NetworkGroup) of the element
TOPO.NetworkArea.DBID	Read	Database ID of the network area (NetworkGroup) of the element
TOPO.NetworkArea1.ID TOPO.NetworkArea2.ID TOPO.NetworkArea3.ID	Read	Internal ID of the network area (NetworkGroup) of the element at the respective terminal (up to 3 terminals possible, depending on the element type)
TOPO.NetworkArea1.DBID TOPO.NetworkArea2.DBID TOPO.NetworkArea3.DBID	Read	Database ID of the network area (NetworkGroup) for the element at the respective terminal (up to 3 terminals possible, depending on the element type)

For a detailed list of all available attributes, refer to the Automation Manual, chapter **Automation of the Calculation Methods – Attributes of Calculation Objects – General Topology Attributes**.

Creating Network Elements

When creating network elements , it was previously necessary to set the graphical attributes for the new network element using separate API calls before invoking the respective function. The automation functions now retrieve and apply the default values from the respective network view. Overriding these values is still possible.

Insert Netpoint – InsertNetpoint

When using the InsertNetpoint function, the graphical attributes and formatting of the original line are applied to the new line and nodes.

Join Lines– JoinLines

This function joins multiple adjacent lines into a single new line and returns the new line as an object. The network data for the new line is derived from the network data of the individual lines, and the original lines are stored as line segments within the new line.

The following Python snippet shows how it works:

```
# Join lines L1, L2, L3 to a new line
arLines = ["L1", "L2", "L3"]
objLine = DS.JoinLines(arLines)
```

Reconstruct Lines from Segments – ReconstituteLines

This function creates individual lines from the line segments of a line, returning a one-dimensional array (long integers) with the line IDs (database IDs) of the created lines.

The following Python snippet shows how it works:

```
# Create lines from line segments at L1
arLineIDs = DS.ReconstituteLines("L1")
```

Grid Connection Point Determination – GetConnectionPoints

This function identifies all possible connection points for a node or a position and returns the result as an array containing detailed information about the possible connection points.

Index	Designation	Data type	Description
[1]	Result Type	Integer	Result type 0 = Undefined 1 = Node result 2 = Element result
[2]	Element_ID	Long Integer	Element ID (only for element result)
[3]	Node_ID	Long Integer	Node ID (the terminal is identified via element ID and node ID)
[4]	Distance	Double	Distance to connection point [km]
[5]	Percent (Element)	Double	Distance of the connection point on the element in [%] of the total element length
[6]	ConnectionPos.X	Double	Connection point X [km]
[7]	ConnectionPos.Y	Double	Connection point Y [km]
[8]	ElementDistance	Double	Distance from the connection point to the element [km]

Added is the return value ElementDistance, which describes the distance from the element to Node_ID.

The following Python snippet shows how it works:

```
# Determine all possible connection points for Node SS1*
DS.SetParameter("GraphicArea", "WGS84")
DS.SetParameter("NetworkLevel", "Low-Voltage")
DS.SetParameter("NETWORKLEVEL_LIMIT_MIN", 0.8)
DS.SetParameter("NETWORKLEVEL_LIMIT_MAX", 1.2)
DS.SetParameter("CONNECT_RADIUS", 10.0)

arResults = DS.GetConnectionPoints(0.0, 0.0, "SS4*")
for result in arResults:
    iResultType = result[0]
    lElementID = result[1]
    lNodeID = result[2]
    dDistance = result[3]
    dElementDistance = result[4]
    dConnectX = result[5]
    dConnextY = result[6]
    dElemDist = result[7]

# Determine all possible connection points for a position
DS.SetParameter("NETWORKLEVEL_VALUE", 11.0)
DS.SetParameter("NETWORKLEVEL_LIMIT_MIN", 0.8)
DS.SetParameter("NETWORKLEVEL_LIMIT_MAX", 1.2)
DS.SetParameter("CONNECT_RADIUS", 10.0)
arResults = DS.GetConnectionPoints(1803429.7918709135, 6094738.69730557, 0)
for result in arResults:
    # Process results
```

Network Model (Database)

Changes to the Network Model Schema (Data Model)

Electrical Networks

Tabelle	Feld	Datentyp	Einheit	Beschreibung	Anmerkg.
AsynchronousMachine	Flag_SC Contributi on	Integer		Short Circuit Contribution 0: SC contribution always zero 1: User 2: Min 3: User and Min 4: Max 5: User and Max 6: Min and Max 7: All 8: No indiv. SC contribution	new
CalcParameter	Flag_SC Contributi on	Integer		Individual Short Circuit Contribution 0: Due to standard 1: Consider	new
DCConverter	Flag_SC Contributi on	Integer		Short Circuit Contribution 0: SC contribution always zero 1: User 2: Min 3: User and Min 4: Max 5: User and Max 6: Min and Max 7: All 8: No indiv. SC contribution	new

DCInfeeder	Flag_SCContribution	Integer		Short Circuit Contribution 0: SC contribution always zero 1: User 2: Min 3: User and Min 4: Max 5: User and Max 6: Min and Max 7: All 8: No indiv. SC contribution	new
DCInfeeder	IncrSer_ID	Long Integer		Secondary Key – Development Series (Ind. Elements)	new
FeederParameter	Flag_StationDetect	Integer		Stop after Substation Detection 0: No 1: Yes	new
FeederParameter	Flag_SwS	Integer		Start Tracing at Switching Substation 0: No 1: Yes	new
FeederParameter	Flag_CC	Integer		Start Tracing at Cable Distribution Cabinet 0: No 1: Yes	new
FeederParameter	Flag_VoltageLevels	Integer		Voltage Levels for Feeder Tracing 1: Low voltage 2: Medium voltage	new
GraphicAreaTile	RefCoordSys	Text		Reference Coordinate System	new
GraphicBackgroundMap	Identifier	Text		Identifier	new
GridConnectDetailResult	Result_ID	Long Integer		Primary Key – Result	new
GridConnectDetailResult	Variant_ID	Long Integer		Secondary Key – Variant	new
GridConnectDetailResult	HeaderResult_ID	Long Integer		Secondary Key – Header Result	new
GridConnectDetailResult	Flag_Result	Integer		Result Type 1: Connected at Node 2: Connected on Line	new
GridConnectDetailResult	Node_ID	Long Integer		Secondary Key – Connecting Node	new
GridConnectDetailResult	Element_ID	Long Integer		Secondary Key – Connecting Element (Existing Line)	new
GridConnectDetailResult	Distance	Double	km	Distance to Connection Point	new
GridConnectDetailResult	PosX	Double	m	Connecting Position X	new
GridConnectDetailResult	PosY	Double	m	Connecting Position Y	new
GridConnectDetailResult	ElementDistance	Double	km	Distance of Connection Point on Existing Element	new
GridConnectDetailResult	ElementPercent	Double	%	Distance of Connection Point on Existing Element	new
GridConnectHeaderResult	Result_ID	Long Integer		Primary Key – Result	new
GridConnectHeaderResult	Variant_ID	Long Integer		Secondary Key – Variant	new
GridConnectHeaderResult	Flag_Result	Integer		Result Type 1: Node 2: Network element 3: Geographical position	new
GridConnectHeaderResult	Node_ID	Long Integer		Secondary Key – Connecting Node	new
GridConnectHeaderResult	Element_ID	Long Integer		Secondary Key – Connecting Element	new
GridConnectHeaderResult	PosX	Double	m	Connecting Position X	new

GridConnectHeaderResult	PosY	Double	m	Connecting Position Y	new
GridConnectHeaderResult	Flag_Options	Integer		Connection Options 1: Connection only at substations 2: Connection to all nodes/busbars 4: New netpoints along lines	new
GridConnectHeaderResult	Radius	Double	km	Connection Radius	new
GridConnectHeaderResult	Un	Double	kV	Rated Voltage	new
GridConnectHeaderResult	uul	Double	%	Voltage Upper Limit	new
GridConnectHeaderResult	ull	Double	%	Voltage Lower Limit	new
Infeeder	Sk2max	Double	MVA	Max. Short Circuit Power	changed
Infeeder	Sk2min	Double	MVA	Minimum Short Circuit Power	changed
LoadCustomer	Flag_Phase	Integer		Phasing 1: L1 2: L2 3: L3 4: L12 5: L23 6: L31 7: L123	changed
PowerRel	IncrSer_ID	Long Integer		Secondary Key – Development Series (Ind. Elements)	changed
PowerUnit	Flag_SC Contribution	Integer		Short Circuit Contribution 0: SC contribution always zero 1: User 2: Min 3: User and Min 4: Max 5: User and Max 6: Min and Max 7: All 8: No indiv. SC contribution	new
ProtDIRelais	Flag_Trace_E	Integer		Criteria for Earth Fault Detection 0: I AND V 1: I OR V 2: I 3: |3I0|	removed
ProtDIRelais	Ie_Trace	Double	A	Measured Current for Earth Fault Detection	removed
ProtDIRelais	Ue_Trace	Double	V	Measured Voltage for Earth Fault Detection	removed
ProtDIRelais	I_3_0_Trace	Double	A	Calculated Current for Earth Fault Detection	removed
ProtDIRelais	U_3_0_Trace	Double	V	Calculated Voltage for Earth Fault Detection	removed
ProtDIRelais	INReleasePE	Double	%	3I0 Limit for Releasing Phase-Ground Measuring Loops	removed
ProtDIRelais	INBlockPP	Double	%	3I0 Limit for Blocking Phase-Phase Measuring Loops	removed
ProtDIRelais	IMinOp	Double	%	Minimum Tripping Differential Current in % of Ibase	removed
ProtLocation	PDMSettings	VarString		Settings for PDM Exchange	new
ProtLocation	RotateConnection	Integer		Rotate Connection 0: No 1: Yes	new
ProtOCFault	Flag_On_Voltage	Integer		Flag Close Voltage 0: Value 1: Variable	new

ProtOCFault	On_Voltage_var	Text	pu	Close Voltage (Variable)	new
ProtOCFault	Flag_on_dt1	Integer		Flag Close Time Delay Next Phase 0: Value 1: Variable	new
ProtOCFault	on_dt1_var	Text	s	Close Time Delay Next Phase (Variable)	new
ProtOCFault	Flag_on_dt2	Integer		Flag Close Time Delay Previous Phase 0: Value 1: Variable	new
ProtOCFault	on_dt2_var	Text	s	Close Time Delay Previous Phase (Variable)	new
ProtOCFault	Flag_Off_Current	Integer		Flag Off Current 0: Value 1: Variable	new
ProtOCFault	Off_Current_var	Text	MVA	Off Current (Variable)	new
ProtOCResult	u_0a	Double	kV	Voltage Zero-Phase System – Absolute	changed
ProtOCResult	u_0i	Double	kV	Voltage Zero-Phase System – Imaginary	changed
ProtOCResult	u_0r	Double	kV	Voltage Zero-Phase System – Real	changed
ProtOCResult	u_nulla	Double	kV	Voltage Displacement – Absolute	changed
ProtOCResult	u_nulli	Double	kV	Voltage Displacement – Imaginary	changed
ProtOCResult	u_nullr	Double	kV	Voltage Displacement – Real	changed
ProtOCSetting	sw1_2	Integer		Tripping Ip2 (Phase) 0: Off 1: Phase 3: Pos 5: Neg 7: Phase (-) 9: Pos (-) 11: Neg (-)	new
ProtOCSetting	p_dir1_2	Integer		Directional Element Ip2 (Phase) 0: Non-directional 1: Forward 2: Reverse	new
ProtOCSetting	ip2	Double		Current Ip2 (Phase)	new
ProtOCSetting	f_ip2	Double		Factor for Current Ip2 (Phase)	new
ProtOCSetting	f_tp2	Double		Factor for Time tp2 (Phase)	new
ProtOCSetting	esw1_2	Integer		Tripping Iep2 (Ground) 0: Off 1: Phase 3: Pos 5: Neg 7: Phase (-) 9: Pos (-) 11: Neg (-)	new
ProtOCSetting	e_dir1_2	Integer		Directional Element Iep2 (Ground) 0: Non-directional 1: Forward 2: Reverse	new
ProtOCSetting	iep2	Double		Current Iep2 (Ground)	new
ProtOCSetting	f_iep2	Double		Factor for Current Iep2 (Ground)	new
ProtOCSetting	f_tep2	Double		Factor for Time tep2 (Ground)	new
ProtPickup	Flag_EFD	Integer		Criteria for Earth Fault Detection 0: I AND V 1: I OR V 2: I 3: |3I0|	new
ProtPickup	EFD_Ie	Double	A	Measured Current for Earth Fault Detection	new

ProtPickup	EFD_Ue	Double	V	Measured Voltage for Earth Fault Detection	new
ProtPickup	EFD_I_3_0	Double	A	Calculated Current for Earth Fault Detection	new
ProtPickup	EFD_U_3_0	Double	V	Calculated Voltage for Earth Fault Detection	new
ProtPickup	Flag_EFD_I	Integer		Criteria for Earth Fault Detection (Current) 0: None 1: Enabled	new
ProtPickup	Flag_EFD_U	Integer		Criteria for Earth Fault Detection (Voltage) 0: None 1: Enabled	new
ProtPickup	EFD_INBlockPP	Double	%	3I0 Limit for Blocking Phase-Phase Measuring Loops	new
ProtPickup	EFD_INReleasePE	Double	%	3I0 Limit for Releasing Phase-Ground Measuring Loops	new
ProtPickup	e_x0_fw	Double	Ohm	Setting X0 forward (Ground Fault)	new
ProtPickup	e_x0_rv	Double	Ohm	Setting X0 reverse (Ground Fault)	new
ProtPickup	Flag_EFD_VM	Integer		Value for Earth Fault Detection (Current) 1: Measured 2: Calculated	new
ProtPickup	BV_VoltPP	Double	kV	Base value for Voltage (Phase to Phase)	new
ProtPickup	BV_CurrPH	Double	A	Base value for Current (Phase)	new
ProtSet	UnitSec	Text		Secondary Unit	new
SC1BranchResult	Ikmin	Double	kA	Minimum Sustained Short Circuit Current	new
SC1BranchResult	Sk2min	Double	MVA	Short Circuit Alternating Power for Minimal Current	new
SC1NodeResult	Ikmin	Double	kA	Minimum Sustained Short Circuit Current	new
SC1NodeResult	Sk2min	Double	MVA	Short Circuit Alternating Power for Minimal Current	new
SC1ObsBranchResult	Ikmin	Double	kA	Minimum Sustained Short Circuit Current	new
SC1ObsBranchResult	Sk2min	Double	MVA	Short Circuit Alternating Power for Minimal Current	new
SC2BranchResult	Ikmin	Double	kA	Minimum Sustained Short Circuit Current	new
SC2BranchResult	Sk2min	Double	MVA	Short Circuit Alternating Power for Minimal Current	new
SC2NodeResult	Ikmin	Double	kA	Minimum Sustained Short Circuit Current	new
SC2NodeResult	Sk2min	Double	MVA	Short Circuit Alternating Power for Minimal Current	new
SC2ObsBranchResult	Ikmin	Double	kA	Minimum Sustained Short Circuit Current	new
SC2ObsBranchResult	Sk2min	Double	MVA	Short Circuit Alternating Power for Minimal Current	new
SC3BranchResult	Sk2min	Double	MVA	Short Circuit Alternating Power for Minimal Current	new
SC3NodeResult	Sk2min	Double	MVA	Short Circuit Alternating Power for Minimal Current	new
SC3ObsBranchResult	Sk2min	Double	MVA	Short Circuit Alternating Power for Minimal Current	new
SerialCondensator	R0_R1	Double	pu	Ratio Zero-Phase to Positive-Phase Resistance	changed

SerialCondensator	X0_X1	Double	pu	Ratio Zero-Phase to Positive-Phase Reactance	changed
SerialDualReactor	R0_R1	Double	pu	Ratio Zero-Phase to Positive-Phase Resistance	changed
SerialDualReactor	X0_X1	Double	pu	Ratio Zero-Phase to Positive-Phase Reactance	changed
SerialReactor	R0_R1	Double	pu	Ratio Zero-Phase to Positive-Phase Resistance	changed
SerialReactor	X0_X1	Double	pu	Ratio Zero-Phase to Positive-Phase Reactance	changed
ShuntSwitchTime	Flag_On_Voltage	Integer		Flag Close Voltage 0: Value 1: Variable	new
ShuntSwitchTime	On_Voltage_var	Text	pu	Close Voltage (Variable)	new
ShuntSwitchTime	Flag_on_dt1	Integer		Flag Close Time Delay Next Phase 0: Value 1: Variable	new
ShuntSwitchTime	on_dt1_var	Text	s	Close Time Delay Next Phase (Variable)	new
ShuntSwitchTime	Flag_on_dt2	Integer		Flag Close Time Delay Previous Phase 0: Value 1: Variable	new
ShuntSwitchTime	on_dt2_var	Text	s	Close Time Delay Previous Phase (Variable)	new
StaticCompensator	Flag_SCContribution	Integer		Short Circuit Contribution 0: SC contribution always zero 1: User 2: Min 3: User and Min 4: Max 5: User and Max 6: Min and Max 7: All 8: No indiv. SC contribution	new
StdSerialDualReactor	R0_R1	Double	pu	Ratio Zero-Phase to Positive-Phase Resistance	changed
StdSerialDualReactor	X0_X1	Double	pu	Ratio Zero-Phase to Positive-Phase Reactance	changed
StdThreeWindingTransformer	R0_R1_12	Double	pu	Ratio Zero-Phase to Positive-Phase Resistance	changed
StdThreeWindingTransformer	R0_R1_23	Double	pu	Ratio Zero-Phase to Positive-Phase Resistance	changed
StdThreeWindingTransformer	R0_R1_31	Double	pu	Ratio Zero-Phase to Positive-Phase Resistance	changed
StdThreeWindingTransformer	X0_X1_12	Double	pu	Ratio Zero-Phase to Positive-Phase Reactance	changed
StdThreeWindingTransformer	X0_X1_23	Double	pu	Ratio Zero-Phase to Positive-Phase Reactance	changed
StdThreeWindingTransformer	X0_X1_31	Double	pu	Ratio Zero-Phase to Positive-Phase Reactance	changed
StdTwoWindingTransformer	R0_R1	Double	pu	Ratio Zero-Phase to Positive-Phase Resistance	changed
StdTwoWindingTransformer	X0_X1	Double	pu	Ratio Zero-Phase to Positive-Phase Reactance	changed

SynchronousMachine	Flag_SC Contribution	Integer		Short Circuit Contribution 0: SC contribution always zero 1: User 2: Min 3: User and Min 4: Max 5: User and Max 6: Min and Max 7: All 8: No indiv. SC contribution	new
ThreeWindingTransformer	R0_R1_12	Double	pu	Ratio Zero-Phase to Positive-Phase Resistance	changed
ThreeWindingTransformer	R0_R1_23	Double	pu	Ratio Zero-Phase to Positive-Phase Resistance	changed
ThreeWindingTransformer	R0_R1_31	Double	pu	Ratio Zero-Phase to Positive-Phase Resistance	changed
ThreeWindingTransformer	X0_X1_12	Double	pu	Ratio Zero-Phase to Positive-Phase Reactance	changed
ThreeWindingTransformer	X0_X1_23	Double	pu	Ratio Zero-Phase to Positive-Phase Reactance	changed
ThreeWindingTransformer	X0_X1_31	Double	pu	Ratio Zero-Phase to Positive-Phase Reactance	changed
TwoWindingTransformer	R0_R1	Double	pu	Ratio Zero-Phase to Positive-Phase Resistance	changed
TwoWindingTransformer	X0_X1	Double	pu	Ratio Zero-Phase to Positive-Phase Reactance	changed

Pipe networks

Tabelle	**Feld**	**Datentyp**	**Einheit**	**Beschreibung**	**Anmerkg.**
FlowGraphicAreaTile	RefCoordSys	Text		Reference Coordinate System	new
FlowGraphicBackgroundMap	Identifier	Text		Identifier	new

Information Technology

Licensing

PSS SINCAL 22.5 uses the same license file as the preceding PSS SINCAL 22.0 version. To activate the software, simply assign the license file to the new version using the PSS Tool utility.

For a new license file or any licensing-related questions, please contact the **PSS SINCAL Platform Support** (sincal.support.it@siemens.com).

Installation

With version 22.5, the installer technology has been switched from InstallShield to Wix.

The interactive installation remains unchanged for users. The silent installation (i.e., automated installation) has been simplified, but the command syntax differs from previous versions:

- **Silent Install**: SincalSetup.exe /install /quiet
- **Silent Uninstall**: SincalSetup.exe /uninstall /quiet

In addition, the default installation path has been updated from "C:\Program Files\PTI\PSS SINCAL Platform 22.5" to "C:\Program Files\Siemens\PSS SINCAL Platform 22.5".

System Requirements

PSS SINCAL User Interface – Client Computer

The following hardware and software requirements specify the minimum requirements for running applications on the PSS SINCAL Platform with a graphical user interface.

Hardware Requirements
PC or Notebook
CPU: x64, MultiCore
RAM: >= 16 GB
Free hard disk space: >= 50 GB
Graphics card: >= 1920 x 1200, True Color
Operating Systems Supported
Windows 10
Windows 11
Windows Server 2016
Windows Server 2019
Windows Server 2022
Windows Server 2025
Database Systems Supported
SQLite 3.x
Oracle 18c
Oracle 19c
Oracle 21c
SQL Server 2016

SQL Server 2017
SQL Server 2019
SQL Server 2022

PSS SINCAL Engine – Server Computer

The following hardware and software requirements specify the minimum requirements for running the calculation module of the PSS SINCAL Platform on a server computer without a graphical user interface.

Hardware Requirements
PC or Notebook
CPU: x64, MultiCore
RAM: >= 16 GB
Free hard disk space: >= 50 GB
64-bit Server Operating Systems Supported
Windows Server 2016
Windows Server 2019
Windows Server 2022
Windows Server 2025
Database Systems Supported
SQLite 3.x
Oracle 18c
Oracle 19c
Oracle 21c
SQL Server 2016
SQL Server 2017
SQL Server 2019
SQL Server 2022

PSS SINCAL License Server – Server Computer

The following software requirements must be met to run the PSS SINCAL Platform License Server.

64-bit Server Operating Systems Supported
Windows Server 2016
Windows Server 2019
Windows Server 2022
Windows Server 2025

There are no specific hardware requirements. Any x64 server computer that meets the requirements of the supported server operating systems is suitable.