Release Information – PSS®SINCAL Platform 22.0

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.

General Remarks

Licensing

New license files are required for PSS SINCAL Platform 22.0. They can be requested at the **PSS SINCAL Platform Support** (sincal.support.it@siemens.com).

System Requirements

The following hardware and software requirements include the minimum requirements to operate an application of the PSS SINCAL Platform 22.0.

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

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 Imp Excel	Revision and expansion for simplified import of graphical positions (without SymCenter) of buckle points and import of network graphic element into geographical network views using native lat-lon coordinates.
Example LV	Revision of the previous "Example LP" as an example of a 3-phase symmetrical low-voltage network in which feeder tracing and evaluation, load flow-based operating and time series calculations (including time series data interface), and load assignment can be performed.
Example MV 2	Revision of the previous "Example ICA" as an example of a 3-phase symmetrical medium-voltage network in which feeder tracing and evaluation, load flow-based operating and time series calculation (including time series data interface) and the hosting capacity determination (in each case optionally also considering all operating or time points in a worst-case analysis) can be performed.
Example NMM	New example for creating a network model from ESRI Shape data using the Shape2Sin module, merging an outdated network model with the latest GIS update using the MERGE module, and generating a schematic network view (single-line diagram).
Example Gas	Revision of the geographical network view based on the recently released features for higher resolution and conversion to "Web Mercator" projection with background map.

Protection Devices

The library of protection devices has been expanded again in this product version. The new and modified devices are listed below. Comprehensive descriptions of the protective devices are available in the **Protection Coordination** and **Input Data** manuals.

Advanced Protection Devices

The following protection devices have been extended.

Protection device	Description
3WA1-ETU300	Enhancement activation Ig zone
3WA1-ETU600	Enhancement activation Ig zone
SPRECON-E-P DD6	Enhancement of device-specific UI and current pickup
7SA522	Enhancement of device-specific UI and current pickup
7SA610, 7SA611, 7SA612, 7SA631 and 7SA632	Enhancement of device-specific UI and current pickup
7SA64	Enhancement of device-specific UI and current pickup
7SA84, 7SA86, 7SA87 and 7SL86	Enhancement of device-specific UI and current pickup
RED670 und REL670	Enhancement of device-specific current pickup
REF630	Enhancement of device-specific UI and current pickup
MiCOM P43x	Enhancement of device-specific UI and current pickup
MiCOM P44x (P442 and P444)	Adaptation to device-specific pickup
EASERGY P3	Adaptation to device-specific pickup

PSS®SINCAL

Graphical User Interface

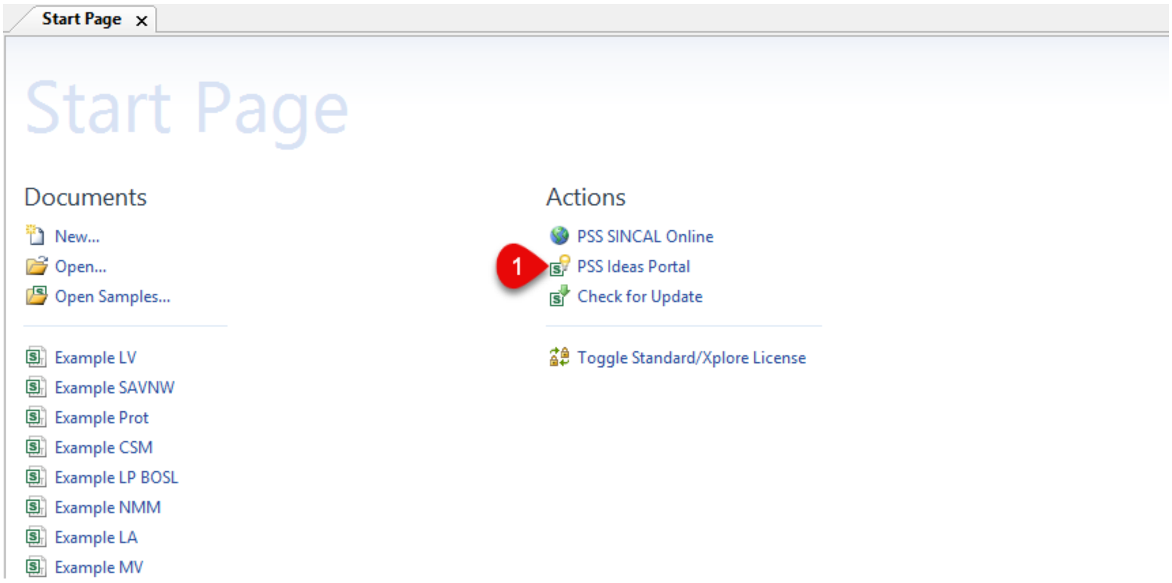
General Extensions

The general enhancements to the user interface improve the usability of the PSS SINCAL user interface.

PSS Ideas Portal

The Siemens PSS® Ideas Portal (https://siemens.com/pss-ideas) offers users a platform for sharing suggestions for future product development with the product management team and other users. All users can view, comment on, and rate submitted ideas.

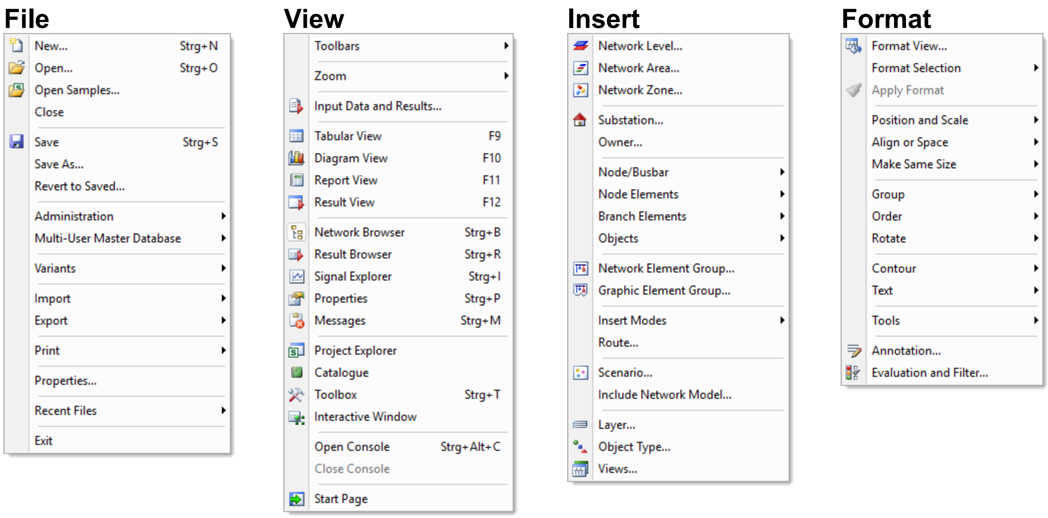
Direct access to the PSS Ideas Portal is now available via the **Start Page** (#1) and in the **Help** menu. This makes it easy to submit ideas and suggestions for further development of the product.



Clearer Menu Design

As part of the improvements to the graphical user interface, the menus have been revised. The aim of these adjustments was to make access to the program's various features easier and more intuitive.

The **File**, **View**, **Insert**, and **Format** menus have been revised.



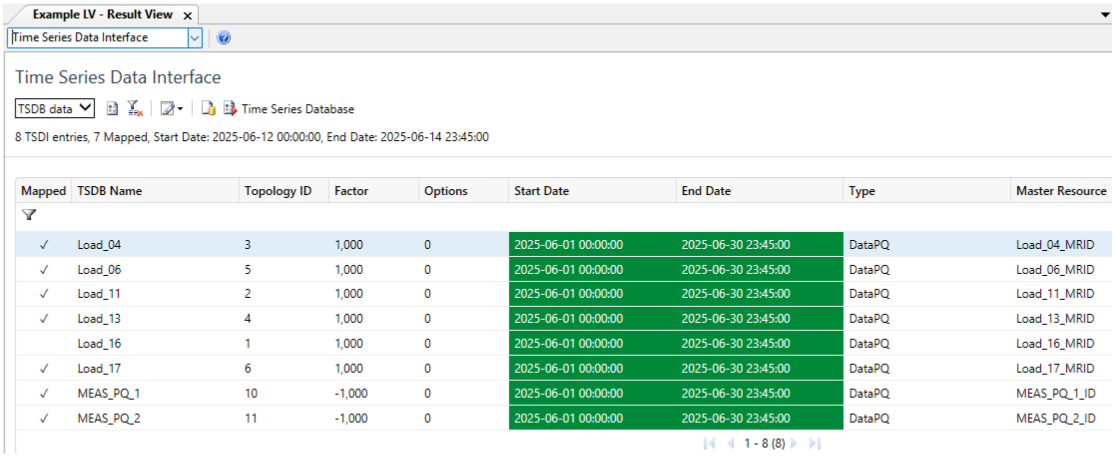
- **File**:
  Reduced number of entries, stronger focus on managing the network model file and databases.
- **View**:
  Access to the various components of the user interface (note: not to be mixed up with a "network view").
- **Insert**:
  Access to the structural categories of the network model (e.g., network levels), insertion of new network elements and groups. Access to the structural categories of the network graphics (e.g., graphics layers).
- **Format**:
  Access to settings such as scale, background map, or symbol sizes for network graphics, diagrams, and similar components, as well as their formatting options.

Highlight

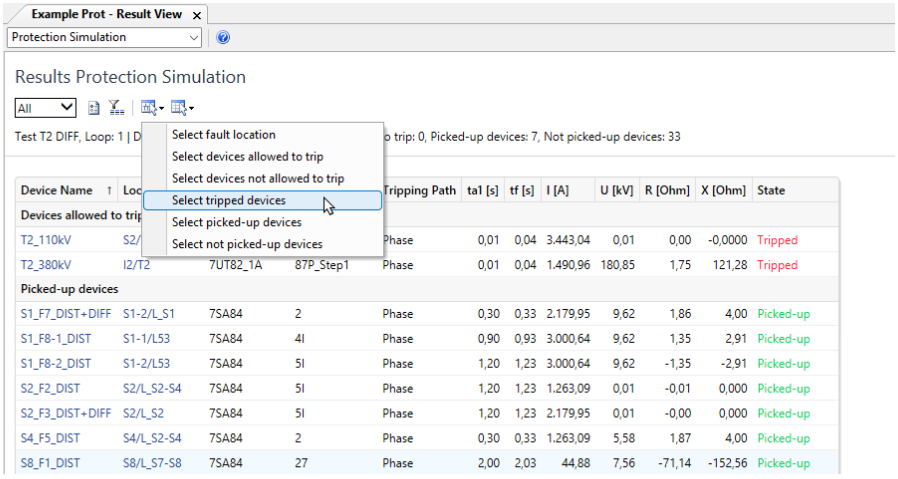
A new feature for selecting folder visibility is available in the network browser for highlighting. With the new pop-up menu functions **Expand All** and **Collapse All**, all folders in the browser can be opened or closed.

Result View

The performance of the result view for the **Time Series Data Interface** has been revised to ensure adequate performance using large databases.



A new function is available in the result view of the **Protection Simulation**, which can be used to mark the protection devices tripped in the fault and loop shown in the graphics editor and in the tabular view.



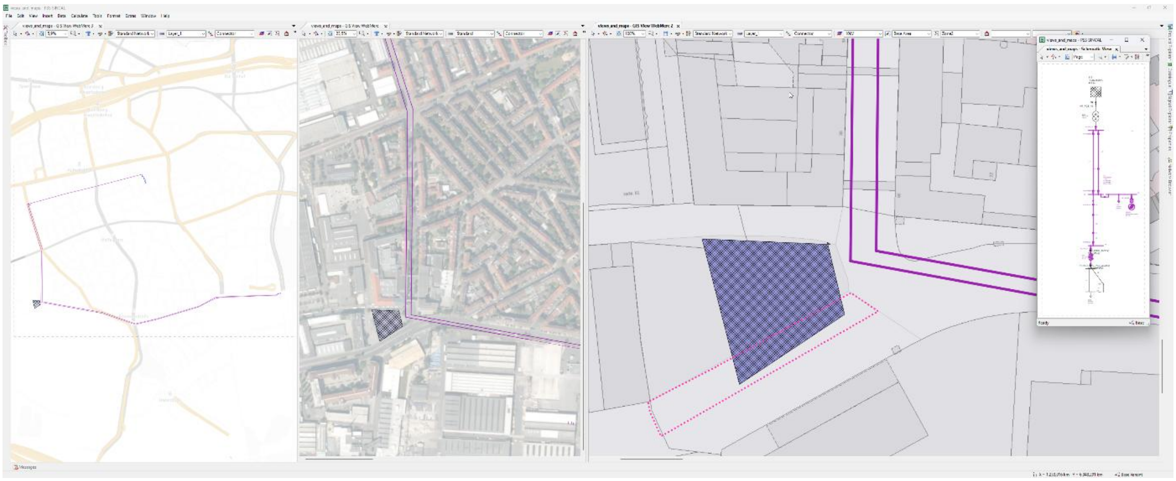
Tabular View

The **Select in Tabular View** function (CTRL + F9) has been enhanced. Now, all connected node and branch elements of the selected nodes are also visible in the tabular view tables.

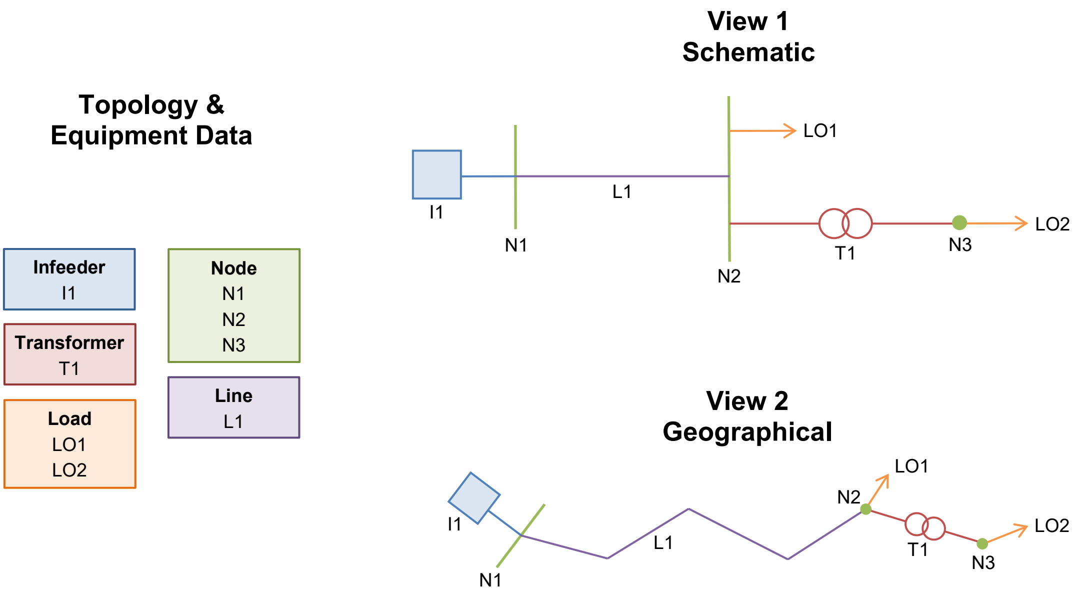
Network Graphic

New View Dialog for Configuration of Network Views

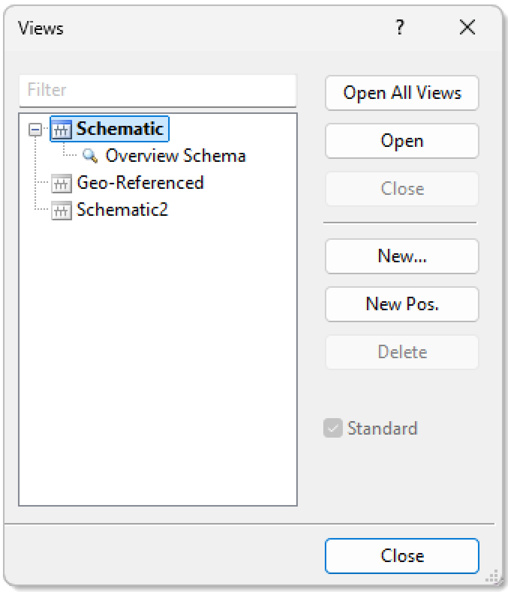
In PSS SINCAL, any number of graphical network views (single line diagrams) can be created and managed in a network model. The various views can be used to display technical details in higher resolution or the spatial or structural arrangement of the network / grid. The flexible configuration capabilities of the network views allow the adaption with respect to the respective analysis and visualization requirements depending on the view. A view can be either schematic or geographical.



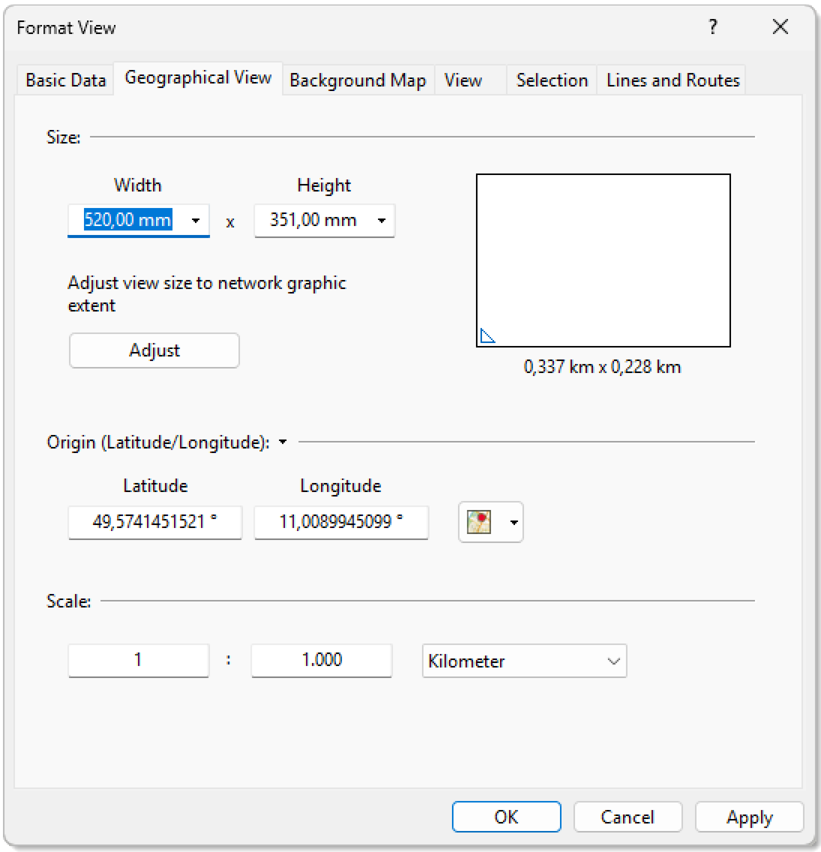
The following image illustrates the concept using two different views. The topology and equipment data of the network model are only stored once. However, in each individual view, the respective network elements are visualized with their own independent graphical representation.



The **View** dialog box is available for creating and managing network graphic views. This allows you to open existing views, create new views, or delete existing views.



In this product version, the configuration of views has been simplified. All settings are now available centrally in the **Format View** dialog box, which offers all display and editing settings for a view.



New to this dialog box are the tabs **Basic Data**, **Schematic View | Geographical View**, and **Background Map**.

- **Basic Data**
  The basic configuration of the view is carried out in this tab. Here you specify whether it is a schematic or geographical view. The projection system is also managed for geographical views.
- **Schematic View**
  This tab is used to set the size and orientation of a schematic view ("virtual page").
- **Geographical View**
  This tab is used to set the size of a geographical view and the scale for displaying the geographical data.
- **Background Map**
  This tab is used to configure the background map in geographical views.

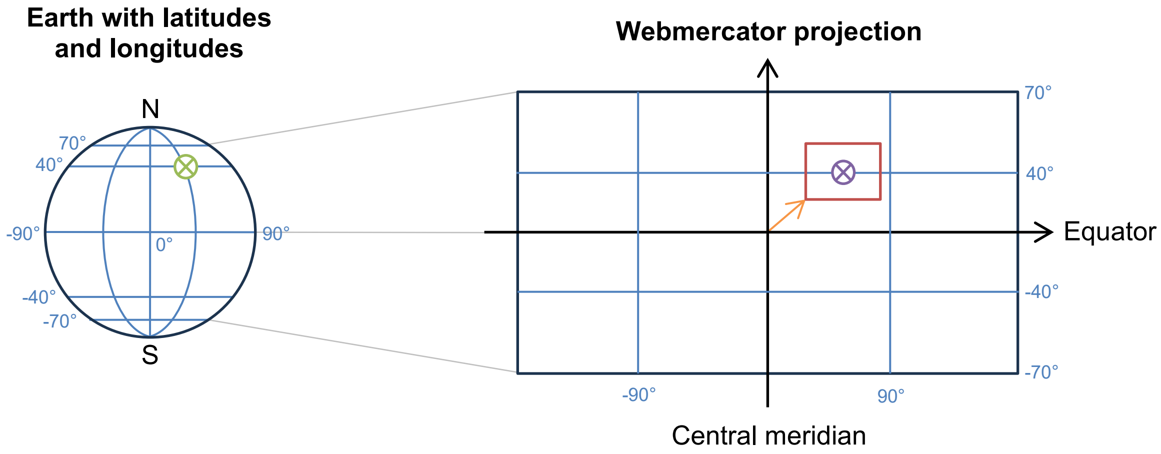
New Projection System for Geographical Views

PSS SINCAL always uses a Cartesian coordinate system to store and display geographic positions. The positions on the Earth's surface, which are uniquely defined by latitude and longitude, must be projected into this coordinate system for geographical network views.

Various methods are available for projecting geographical data.

A frequently used projection method is the **Transverse Mercator Projection**. This allows limited areas of the Earth's surface (usually a maximum of 12° of geographical longitude) to be converted into Cartesian coordinates. Well-known systems such as Gauss-Krüger and UTM are based on this approach. Numerous parameters are required for a clear transformation of latitude and longitude into Cartesian coordinates.

Another projection method that has become established with a wide variety of map services on the Internet is the **Webmercator Projection** (EPSG:3857). This projection is often used to display geographical data in web applications. It allows map content to be visualized efficiently in tiles. Compared to other projections, the Webmercator projection focuses on fast and scalable visualization of geographical data. This is the new preferred projection method for PSS SINCAL, as it enables direct conversion of geographical positions into degrees of latitude and longitude without additional parameters and is also ideal for use with background maps. The following image illustrates the principle using the Webmercator projection:



… Lat/Lon position

… x/y Position mercator

… Geographical view
Defined by origin position, page format and scale

… Origin of the geographical view
x/y origin position

Webmercator coordinates in meter:
90° = Earth's circumference/4 =
40,075,017/4 = 10,018,754.25 m

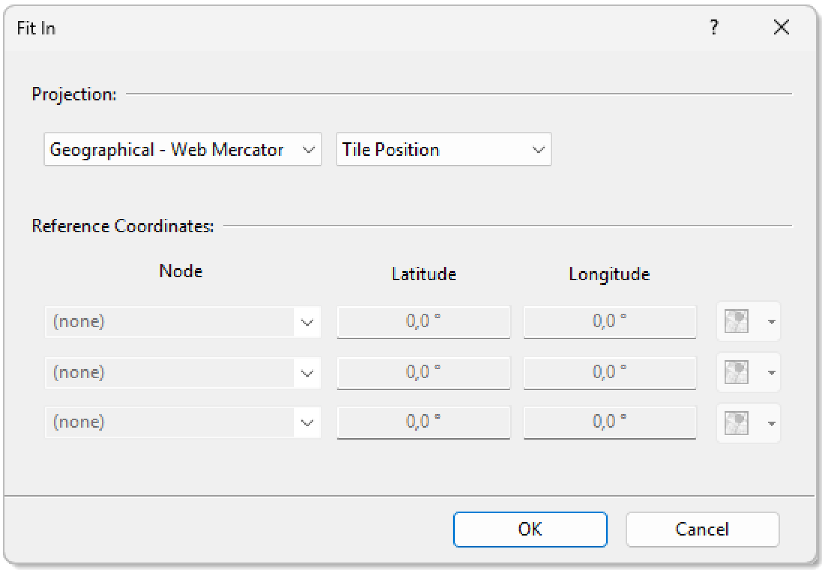
A geographical point on the earth is uniquely described by its latitude and longitude. Using the selected projection method, this is mapped in a Cartesian coordinate system. To store and visualize the network graphic in PSS SINCAL, a geographical view with its size and scale is used. This defines the area to be displayed. The origin defines the left lower corner of the area displayed in PSS SINCAL.

With the Webmercator projection, positions in the network graphic can be transformed directly into latitude and longitude coordinates and vice versa without any additional parameters.

Since the projection system itself is "non-equidistant", PSS SINCAL uses bidirectionally the transformation for all length calculations (e.g., when inserting a new line) in a geographical view with this projection in order to calculate the length from position A to position B in the Cartesian projection using the latitude and longitude coordinates for position A and position B.

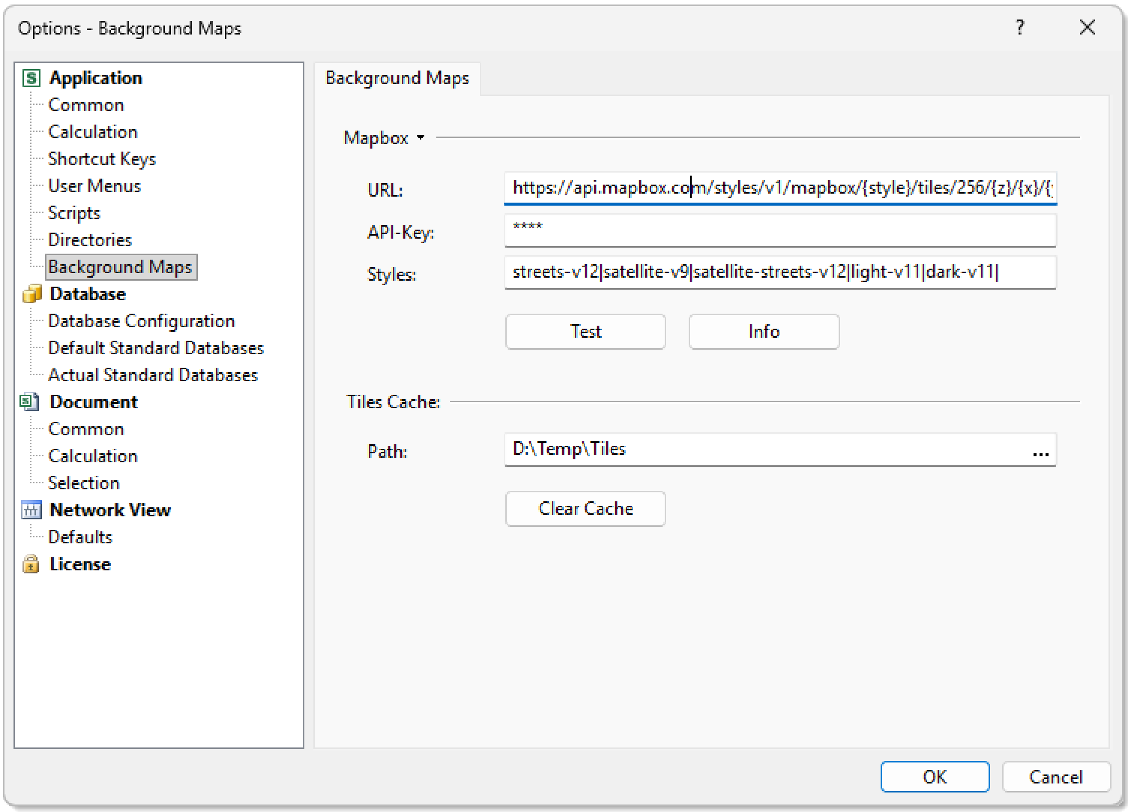
This projection feature is now also used extensively in PSS SINCAL for importing and exporting geographical positions: for the Excel import and for all advanced import/export features from standard data formats such as CIM, PSS E, HUB, DINIS, and CYMDIST.

A conversion function is available in the PSS SINCAL user interface so that the advantages of the Webmercator projection can also be leveraged for existing geographical views of older network models. This function allows existing network graphic views that were originally based on other projection methods to be converted to a view based on the Webmercator projection. The function can be started via the function **Format** – **Position and Size** – **Fit In**.



Simplified Integration of Background Maps

The use of background maps in geographical views has been simplified. These background maps are based on standardized web services from various providers, which provide the maps online either free of charge or for a fee. The background map providers are configured as before in the **Options** dialog box in the **Background Maps** tab.

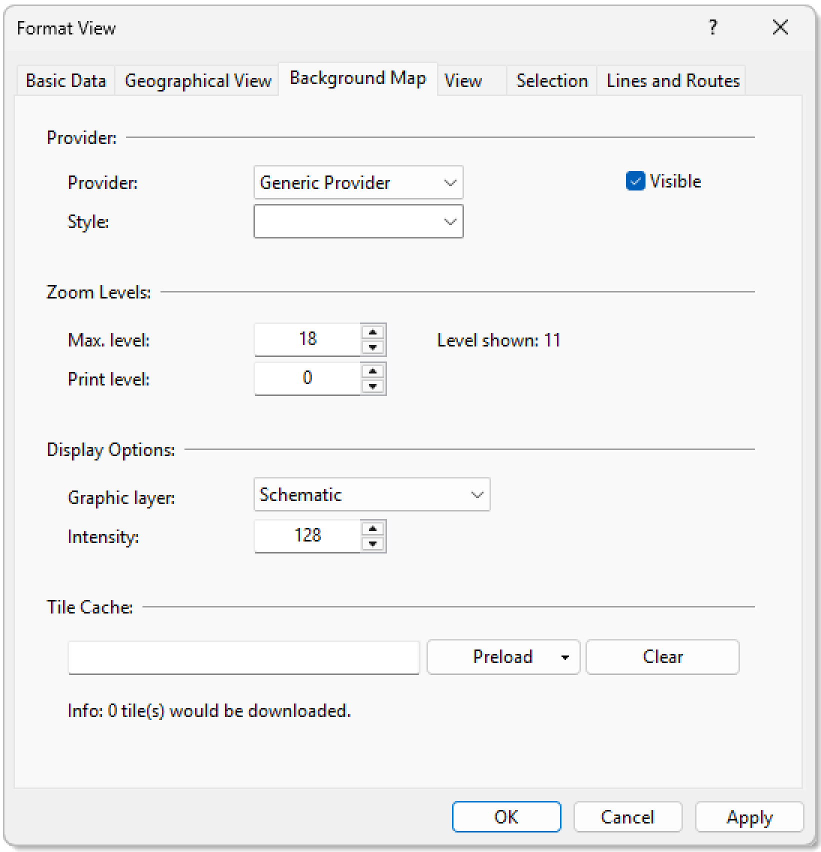


The range of supported providers has been revised according current availability of the services. Now the following background map providers are available:

- **Generic Provider:**
  This is a placeholder for a generic WMTS map provider. It can be completely configured using the offered, for example, to use your own tile server.
- **Mapbox:**
  This commercial provider offers background maps in preconfigured and customizable formats. An individual API key is required to use the service. The provider offers both free and paid usage options.
- **MapTiler:**
  This commercial provider offers background maps in preconfigured and customizable formats. An individual API key is required to use this service.
- **Azure Maps:**
  This commercial provider offers background maps in preconfigured formats. An individual API key is required to use this service.

Each provider uses specific parameters that are required to configure its map tile server. These include, for example, the URL for tile queries, the access key (API key), and provider-specific styles that enable individual map styles.

The background map in a geographic view is now activated and configured directly in the **Format View** dialog box.



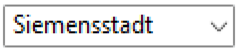
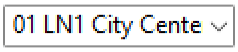
Here, you can select from the preconfigured providers and styles (e.g., road map or orthophoto) and activate visibility. The other setting options remain unchanged.

Note: A "fitting" of background maps into a view is no longer necessary and is also no longer recommended. Each geographical view in PSS SINCAL is assigned a projection system and a reference point with Cartesian coordinates and the corresponding latitude and longitude. When creating the view, this must be selected so that the desired background map material (especially if integrated from your own source via a background image) fits. This allows the background map to be used directly in a geographical view.

Substation Toolbar in the Graphics View

The toolbar integrated into the graphic view has been expanded. It is now possible to manage substations and bays within the graphic view and assign them specifically to the selected network elements (#1).

New buttons and selection fields in the integrated toolbar:

	Browser for adding and managing substations, bays, and equipment
	Display of assigned substation or assignment of available substation
	Display of the assigned bay or assignment of an available bay
	Selecting a substation function (generating substation graphics, resetting node types, creating network level assignments)

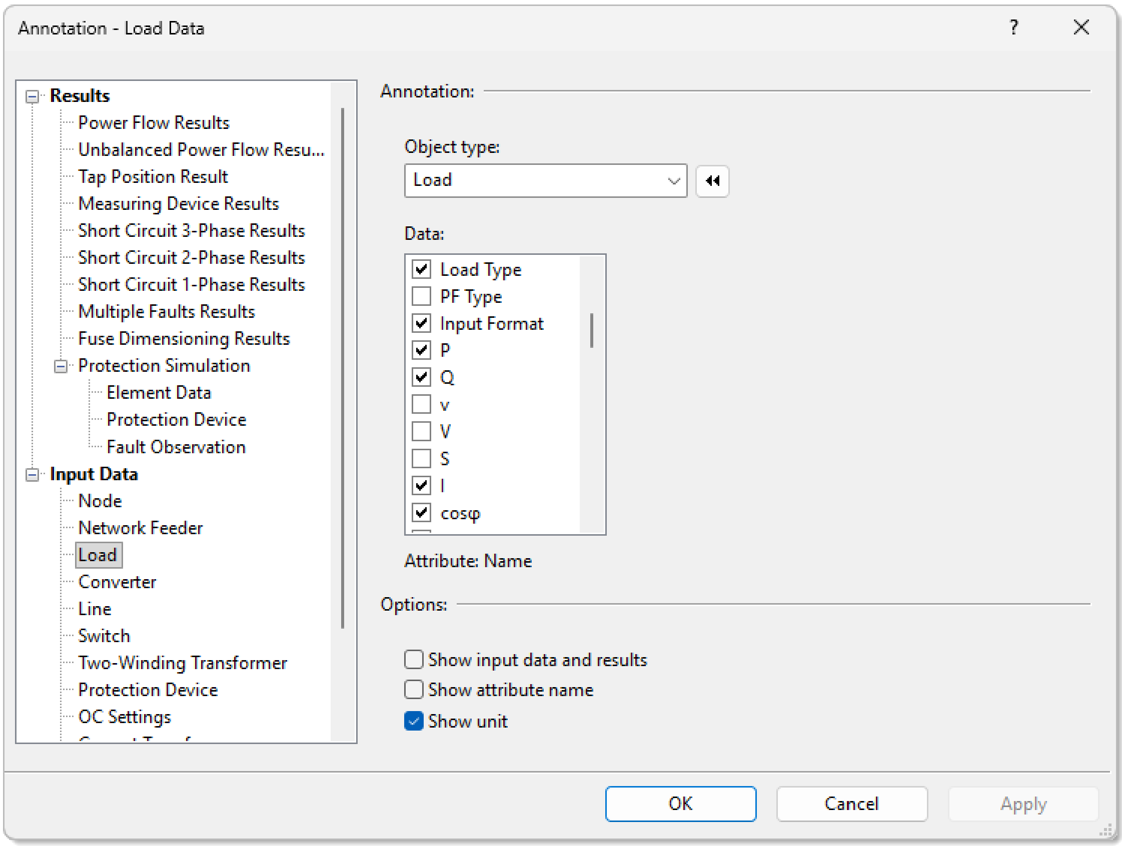
Improved Switch Insertion Mode

The function to insert switches in geographical views has been revised to improve usability. Unlike the previous approach to insert the switch exactly at the point where the branch element was clicked by the user, it is now placed either at the beginning or at the end of the corresponding network element. This ensures consistent placement of the switch and simplifies the assignment and traceability of switch positions within the network model.

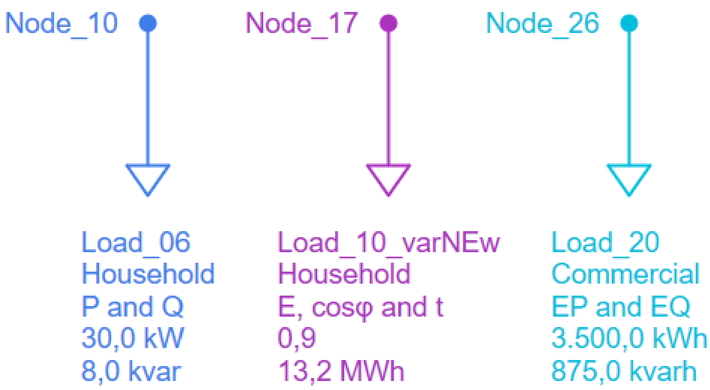
Another new feature is the automatic synchronization of changes across the network graphic views. This function ensures that all views are always kept synchronized, regardless if they are opened or closed in the user interface. When a switch is added, it is automatically integrated into the designated position in the network graphic of all views. This ensures that the graphical representation of the network model remains consistent and complete at all times without the need for manual updates.

Improved Visibility Control of Network Element Annotation

The visibility control for the annotation texts of network elements has been expanded. Now, only those annotations that match the input format set for the network element are displayed in the graphic. The following image illustrates this principle. In the object type **Load**, the annotations for power, current, and energy are activated.

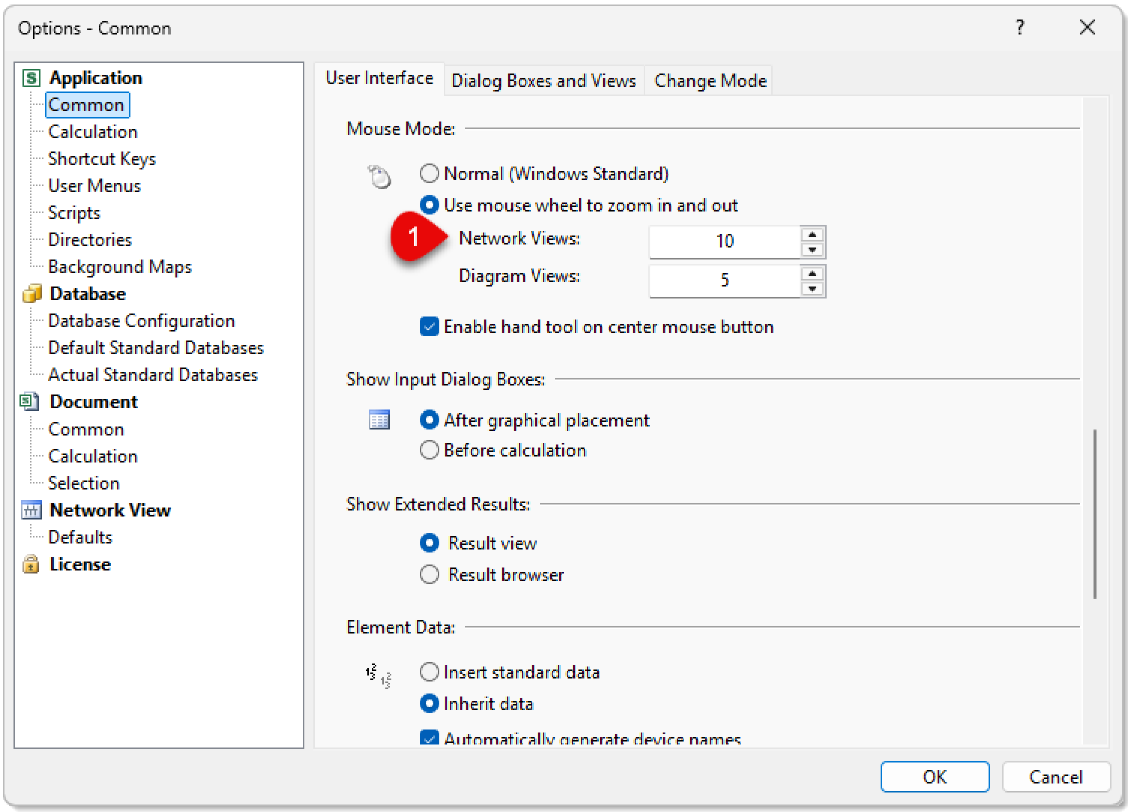


This object type is assigned to the loads in the network model. The three loads each use their own input formats: "P and Q," "E, cosφ, and t," and "EP and EQ". Only the attributes that match the selected format are displayed in the network graphic.



Advanced Control for Zooming with Mouse Wheel

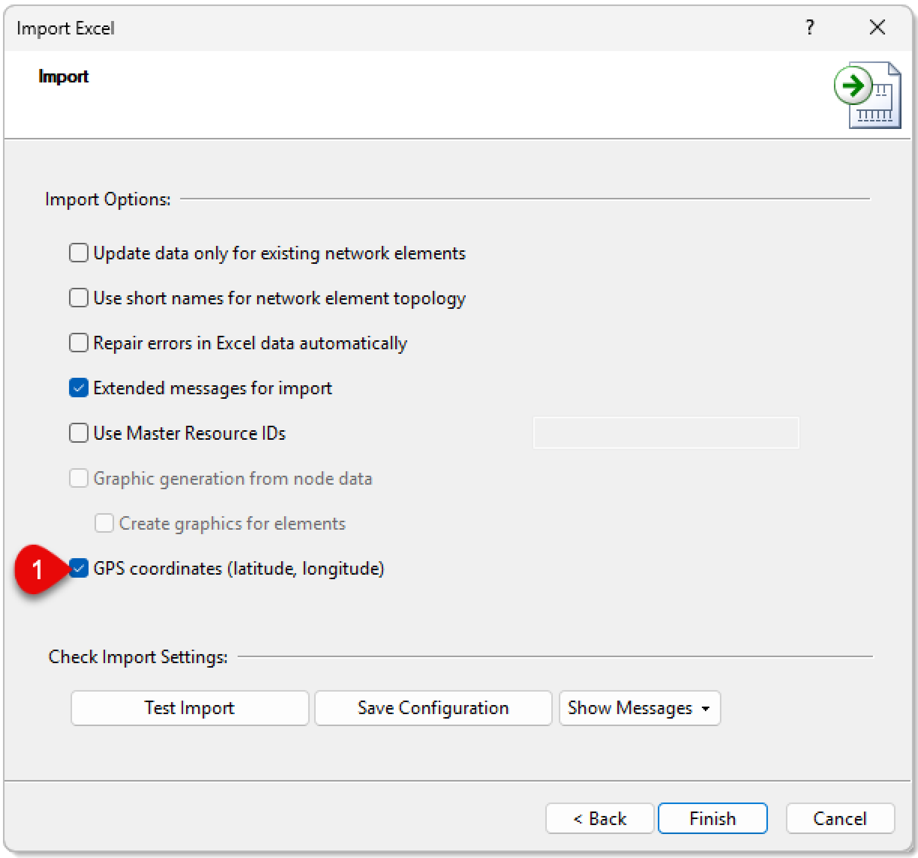
When using the mouse wheel or trackpad to zoom, the sensitivity can now be set in the **Options** dialog box in the **User Interface** tab (#1). The settings can be customized for the network view and the diagram view. A lower value causes zooming to be slower and the zoom level to be modified in smaller increments. A higher value, on the other hand, causes the zoom factor to change significantly more with each position change of the mouse wheel or trackpad.



Excel Import – Enhancement

The functionality for importing graphic data with the Excel import has been expanded. When importing network models with geographical positions, it is now possible to specify the graphic positions of the elements in coordinates in the form of latitude and longitude (GPS coordinates) instead of having to convert them manually into a Cartesian coordinate system first. This supports the transfer and visualization of graphical network data from external data sources.

The use of GPS coordinates is optional, and the existing import function for graphic data with Cartesian coordinates (e.g., for schematic views) remains available. The use of latitude and longitude coordinates during import can be activated in the Excel Import Wizard by selecting the corresponding option (#1).



Importing graphic data (GraphicElement) has been simplified. To import graphic elements for node and branch elements, it is no longer necessary to specify the symbol point (SymCenter, blue marker). If this point is not provided in the data to be imported, it is determined automatically during import.

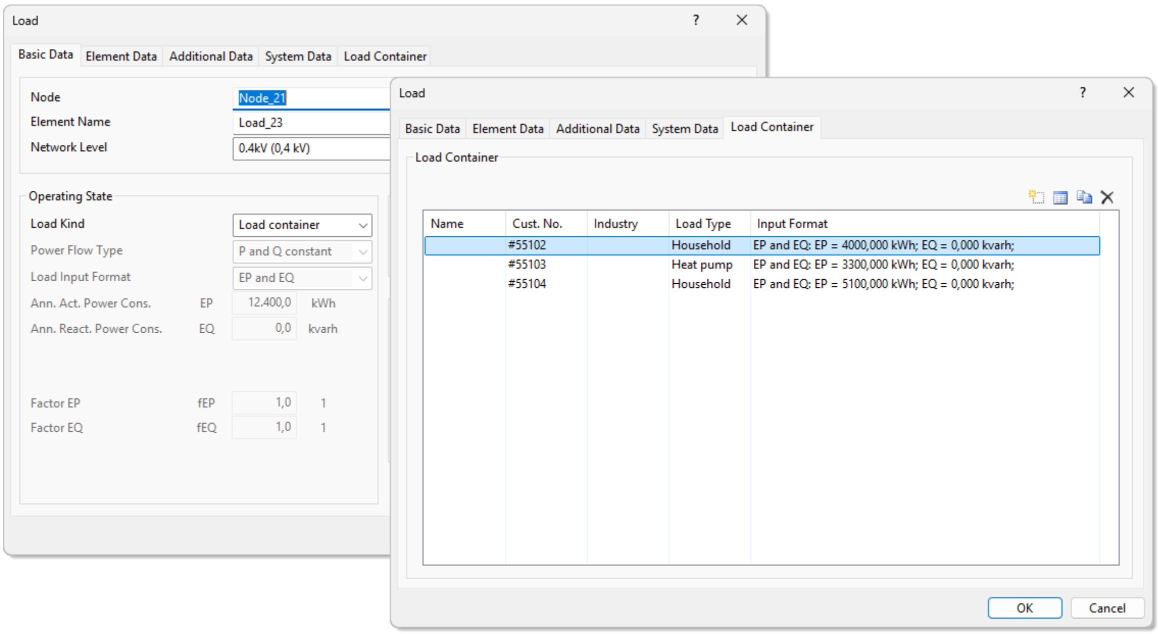
The "Example Imp Excel" is available to illustrate the use of the comprehensive Excel import functions. It demonstrates in a practical way how the import workflows can be implemented for various tasks. The new functions of the extended import of graphic data are already integrated in the example as recommended to be used.

Electrical Networks

Enhancements for Network Elements

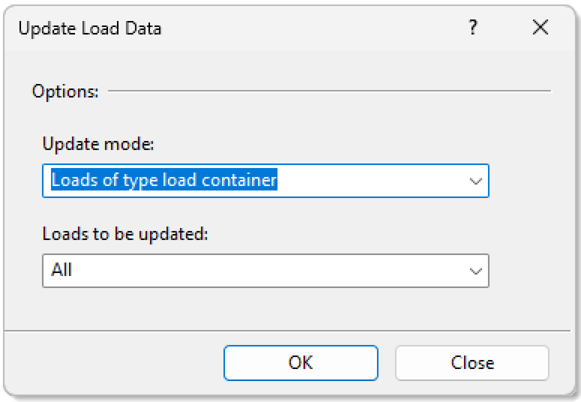
Load

The handling of the general load has been further improved with regard to the use of **Load Containers**.

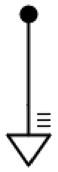


The basic data is now automatically synchronized with the customer data in the load container. This means that the basic data always contains the aggregated values of the data stored in the load container.

However, if it is necessary to update the basic data manually – for example, if external applications write the load container data directly to the network database – this can be done via the function **Edit – Set Data – Update Load Data**.

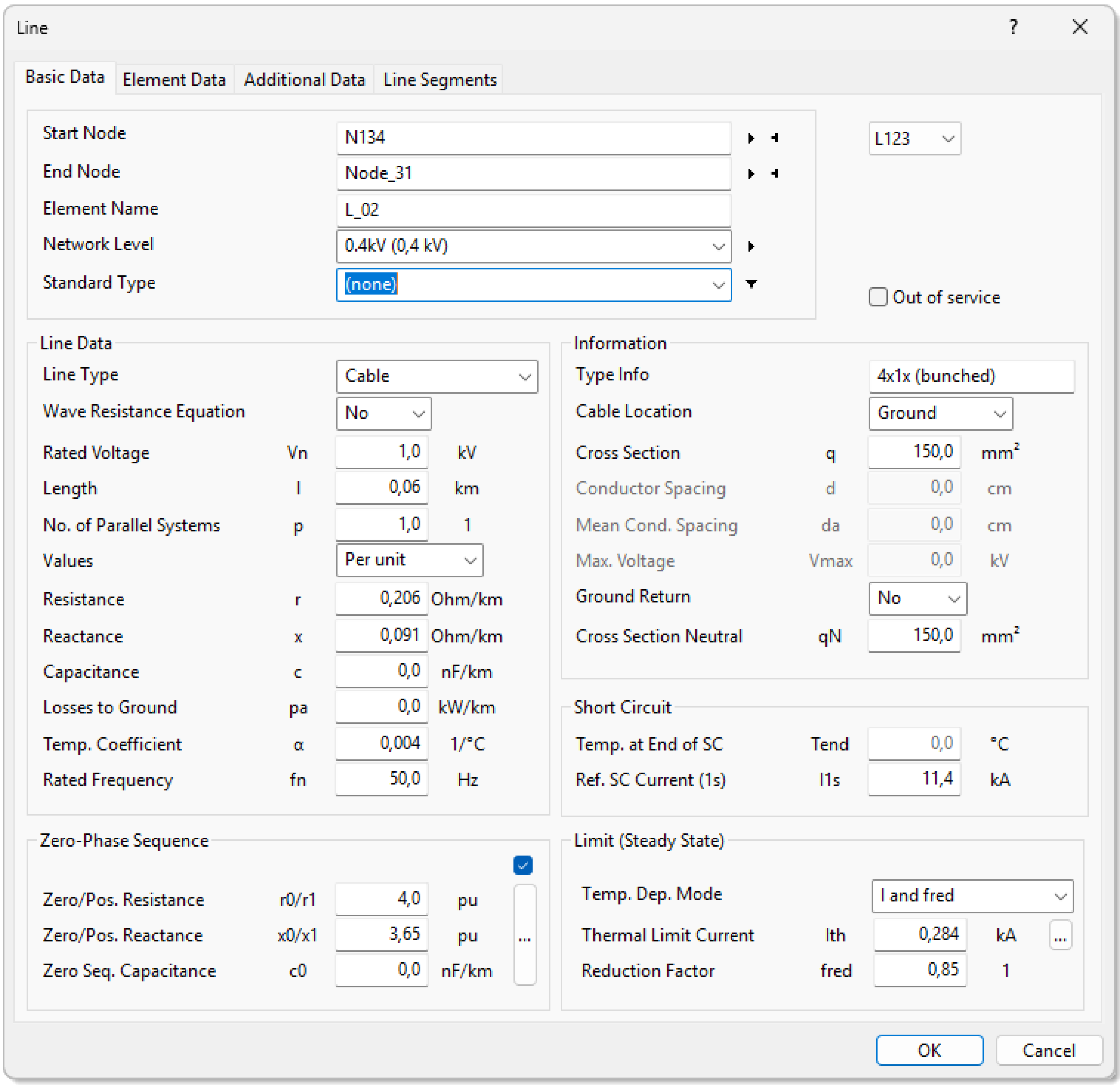


The symbol for the general load in the network graphic now indicates that it is a load container.



Line

The data dialog for the line has been revised. The attributes of the equipment are now displayed in adapted sections in the input dialog box.



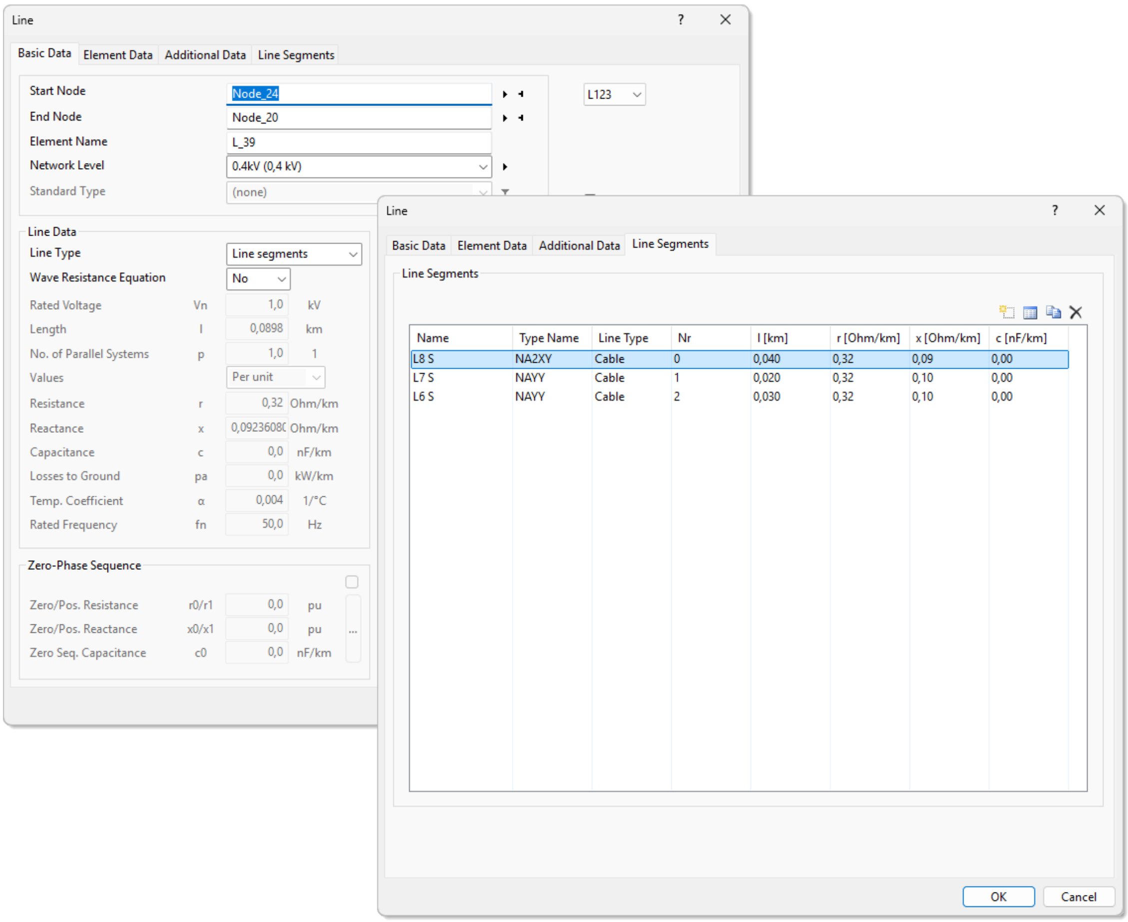
Data input is now carried out in the following areas:

- Line Data:
  This section contains the technical parameters for the line that are required to map it to the PI equivalent circuit (of the positive and negative sequence) for the calculation modules.

- Zero-Phase Sequence:
  This section contains the technical parameters for the line that are required to map it to the PI equivalent circuit (of the zero sequence) for the calculation modules
- Short Circuit:
  Extended data for short-circuit calculation and evaluation.
- Limit (Steady State):
  Input of limit values or characteristic curves for determining the relative utilization in steady-state power flow calculations.
- Information:
  These data are not used by calculation methods but for documentation purposes only.

The handling of **Line Segments** has been expanded. Line segments make it possible to map individual sections of a line in such a way that each segment remains identifiable and parametrized. This means that technical parameters of the individual segments of a line can be kept in the network model but automatically mapped to one representative ("equivalent") line element for calculations. This way the network model remains reduced in terms of the number of nodes and branches for the calculation modules, ensuring efficient processing and evaluation.

Similar to the load, the data for the lines and its segments is now automatically synchronized. The basic data for the line always contains the aggregated data of the individual assigned segments.

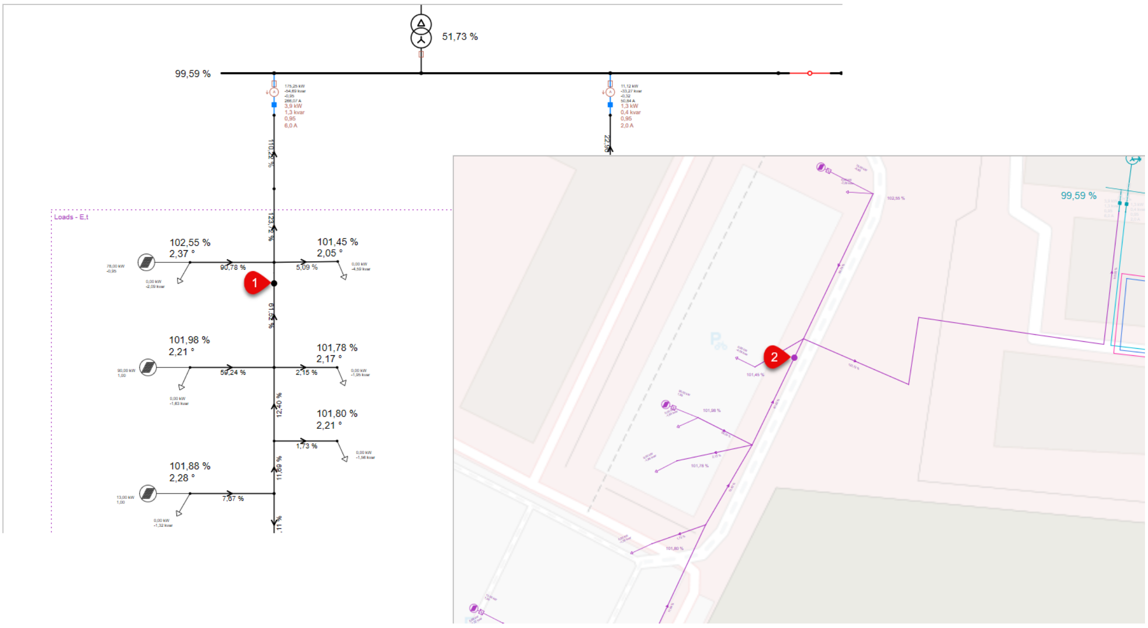


However, if manual updating of the basic data is necessary – for example, if external applications write the line segments directly to the network database – this process can be carried out via the function **Edit** – **Set Data** – **Update Line Data**.

The **insertion of netpoints** along lines has been improved as well. This function creates a new node at the selected position and divides the line into two sections, distributing the line data proportionally between the two sections. Assigned line segments are now also considered and distributed proportionally between the sections.

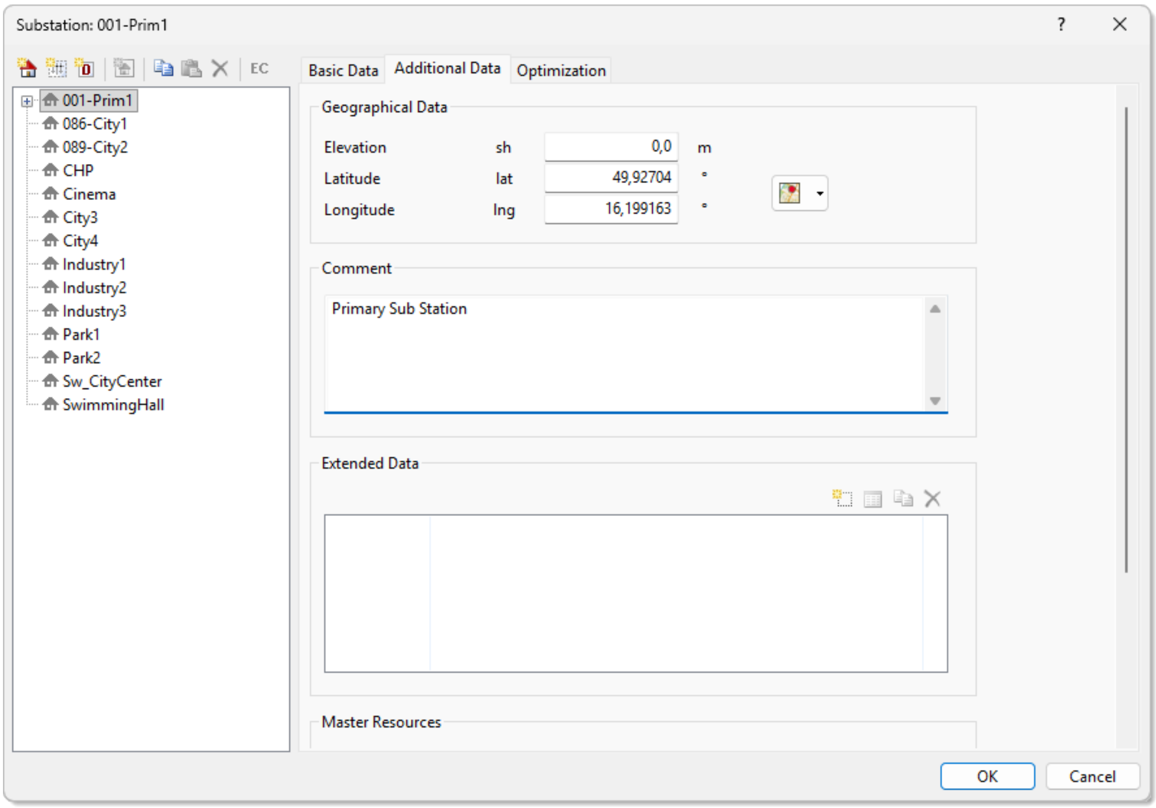
Another new feature is the automatic synchronization of changes across the network graphic views. This function ensures that all views are always kept synchronized, regardless if they are opened or closed in the user interface. When a switch is added, it is automatically integrated into the designated position in the network graphic of all views. This ensures that the graphical representation of the network model remains consistent and complete at all times without the need for manual updates.

The following images illustrate the function in the "Example LV" network. Along the "L_26" line, a network point is inserted in the schematic view (#1). In the geographical view, the network graphic is updated automatically so that the new node and the new additional line are displayed (#2).



Substation

Additional input data is available for a substation. This information is not required for the calculation methods, but to store additional information in the network model, thereby capability of the model to be referenced to other data sources.



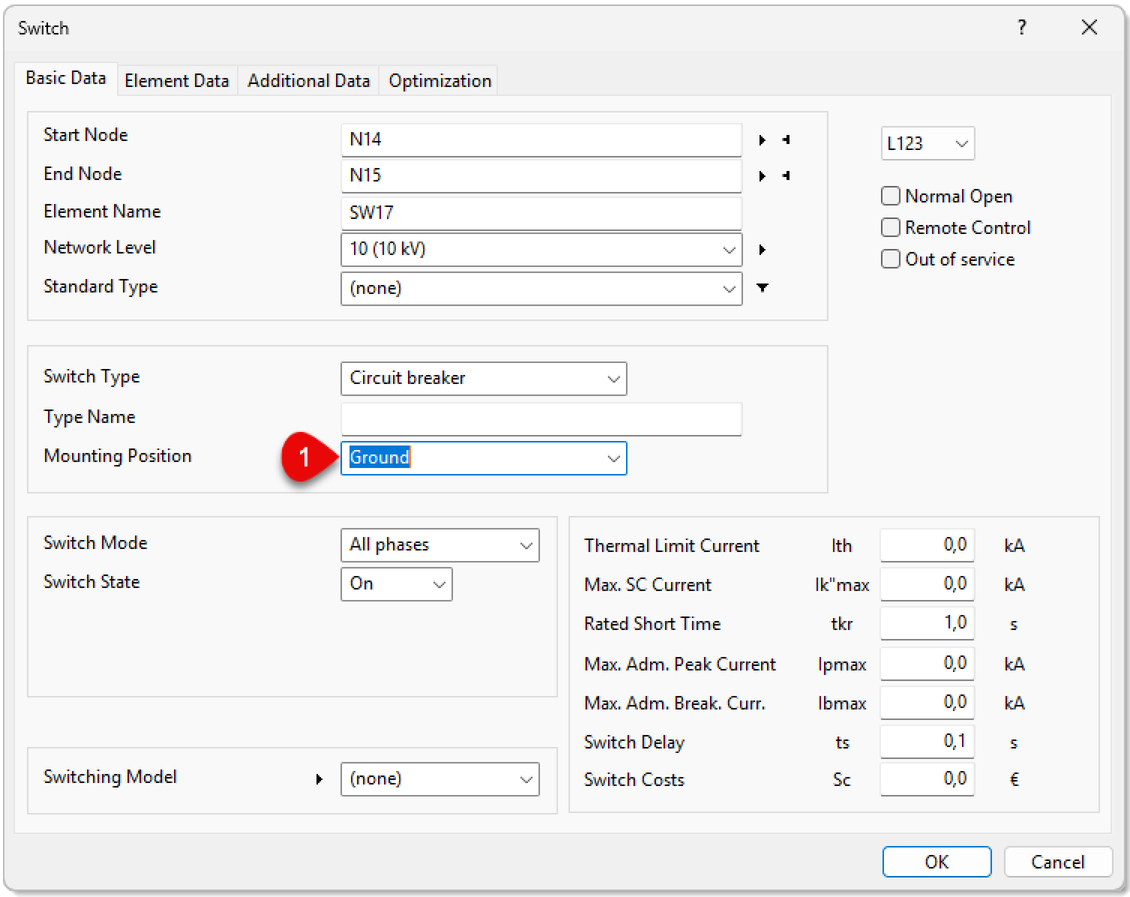
Geographical Data can be used to document the substation's elevation and geographical location.

The **Comment** feature allows you to enter any kind of plain text. This allows you to store individual notes, comments, or additional information directly in the network model.

In the **Extended Data** section, you can define and fill individual additional data fields for a substation. The functionality is the same as for nodes and network elements. The additional data is stored in the network database and can be used for evaluations with external applications. The additional data can be displayed in the substation annotation text in the network graphic as well.

Switch

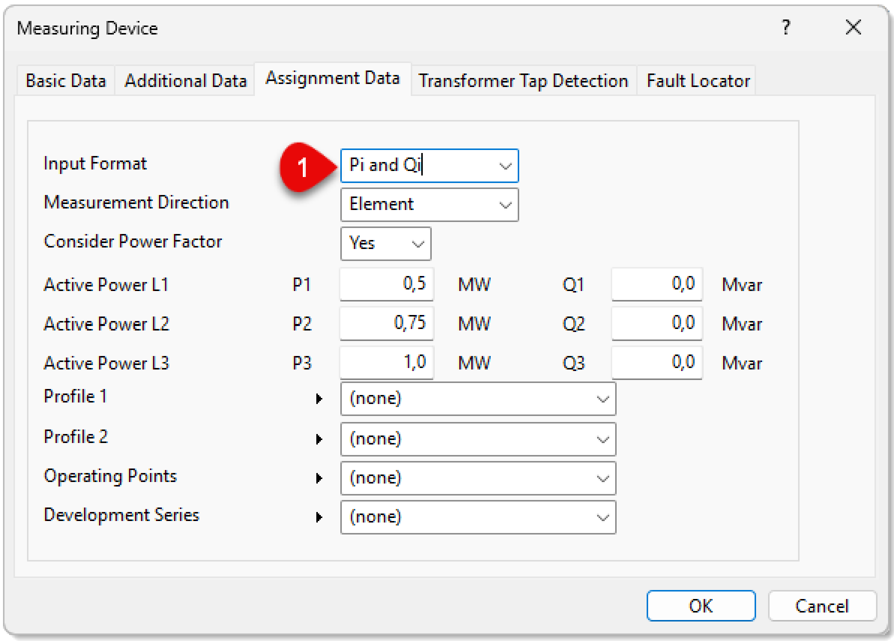
An additional attribute is available for the switch to document the mounting position (#1).



Depending on the mounting position, different permits or equipment may be required for the installation of a switch and its operation. Managing the mounting position in the network model supports network planning and network operation.

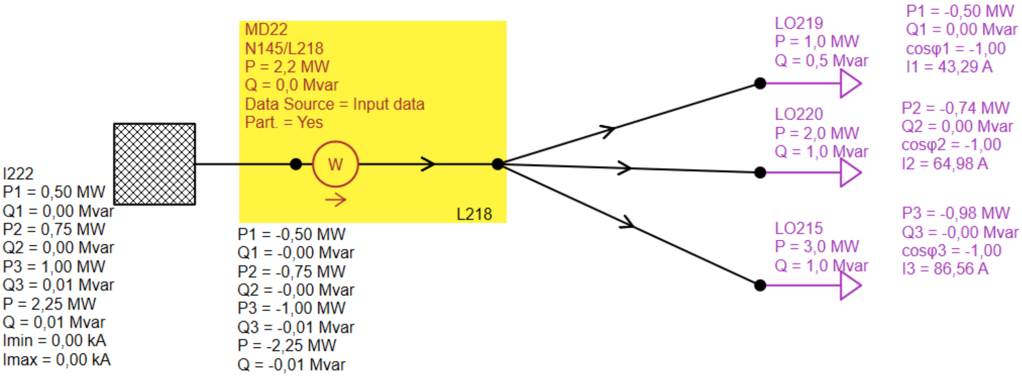
Measuring Device

The modeling of measuring devices in PSS SINCAL has been expanded and revised. The data entry dialog box has been revised, and the assignment data (measured values) can now also be entered individually for each phase in the measuring device. To do this, select the "Pi and Qi" option as the **Input Format** (#1):

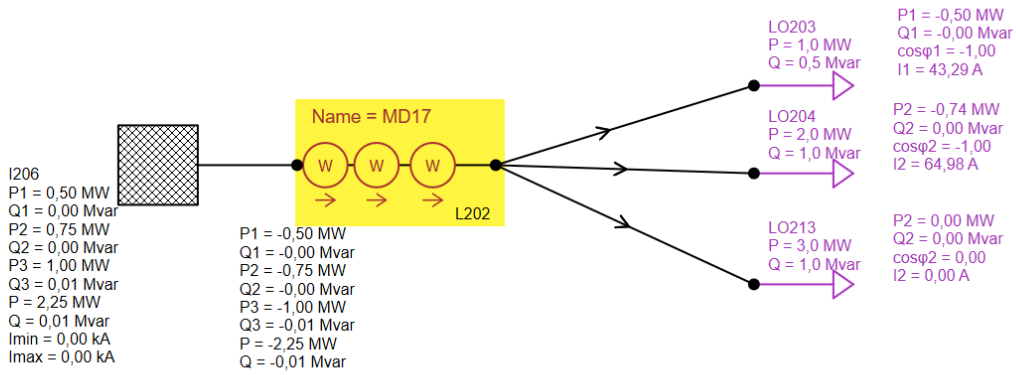


This simplifies the modelling in unbalanced networks. The following images show a network model with the results of load assignment in the new and old input formats using three necessary measuring devices.

New input format:



Old input format:



The other **Input Formats** for power or current values have also been revised. The following options are now available:

- I and cosφ (current and power factor)
- S and cosφ (apparent power and power factor)
- P and Q (active power and reactive power)
- P and cosφ (active power and power factor)

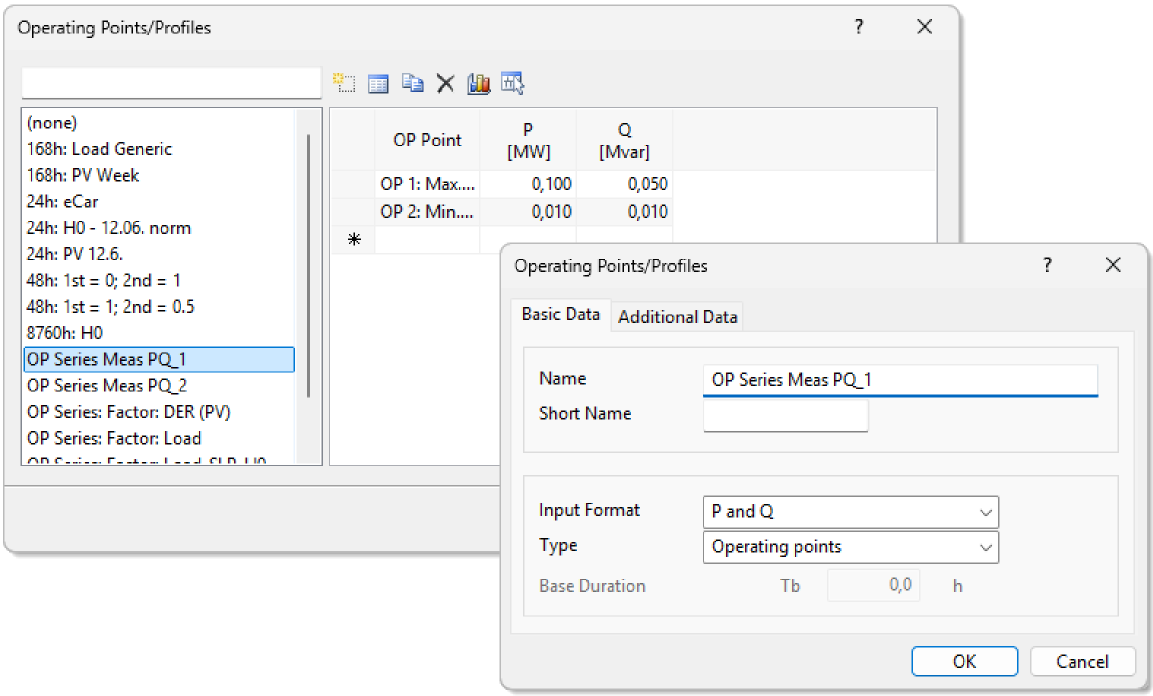
If only one measured value is available for the absolute value of current, active or apparent power, without a corresponding or time-synchronized value for the angle or power factor, the power factor can be set to be not considered.

The measuring device is modeled at the terminal of a network element. For branch elements, such as lines or transformers, it is possible to put the measuring device either at the beginning (terminal 1) or at the end (terminal 2). For this reason, it is necessary to specify the measuring direction. This can be either in the direction of the network element or in the direction of the node.

To make the selected measurement direction recognizable to the user, a **direction arrow** is now displayed on the **graphical symbol of the measuring device**. This arrow visualizes the configured measurement direction, thus facilitating the interpretation of the measurement data in the network model.

Operating Points/Profiles

The operating points/profiles can be used to model line or step position values for each operating point or time step.



The new input format **Pi and Qi** is available for measuring devices and loads. This allows the connected active and reactive power to be entered per conductor, which greatly simplifies modeling in unbalanced network models (see above).

In addition, the other input formats have been consolidated and the distinction between values for network elements and measuring devices has been removed. The following input formats are now available for using power values in operating points and profiles:

- Factor (f):
  Multiply apparent power by factor f.
- P and Q (active power and reactive power):
  Absolute power values P and Q.
- fP and fQ (factor active power and factor reactive power):
  Multiplication of active power and reactive power by fP and fQ, respectively.
- P and cosφ (active power and power factor):
  Absolute values for active power P and power factor cosφ.
- I and cosφ (current and power factor):
  [only assignable to measuring device or load]
  Absolute values for current I and power factor cosφ.
- S and cosφ (apparent power and power factor):
  [only assignable to measuring device or load]
  Absolute values for apparent power S and power factor cosφ.
- f and cosφ (factor and power factor):
  [only assignable to measuring device or load]
  Multiplication of the respective absolute values in the basic data by factor f. Absolute value for power factor cosφ.

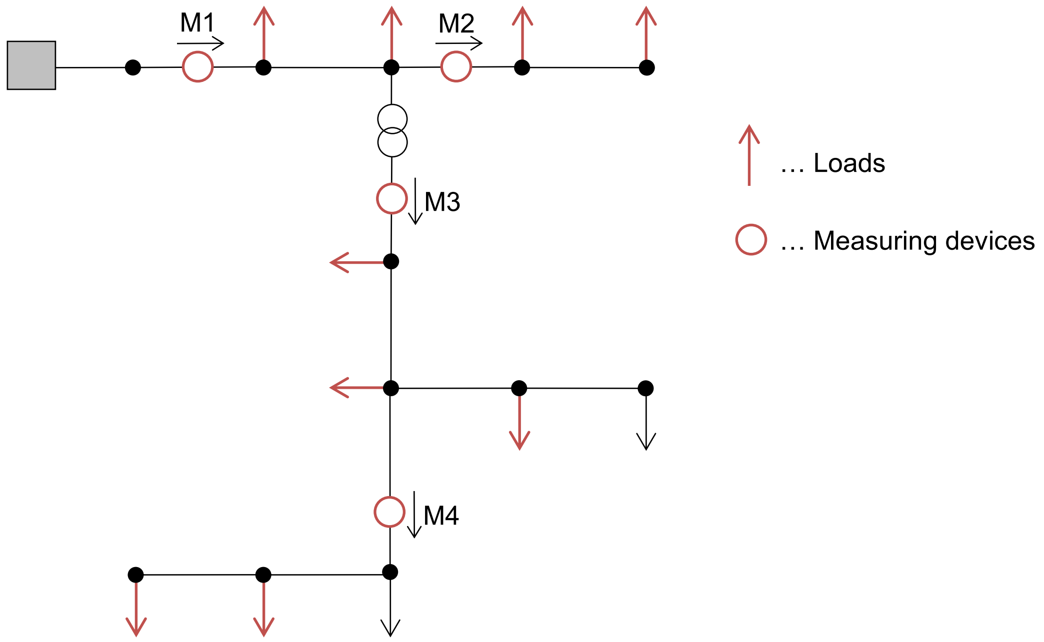
- P and V (active power and voltage):
  [recommended only for network feeder or synchronous machine]
  Absolute values for active power P and voltage V.
- fP and fV (active power factor and voltage factor)
  [recommended only for network feeder or synchronous machine]
  Multiply active power by factor fP and voltage by factor fV.
- Pi and Qi (active power and reactive power per conductor):
  [only assignable to measuring device or load]
  Absolute power values P and Q per conductor i.

Load Assignment (LA)

Revised Functionality in the Calculation Module

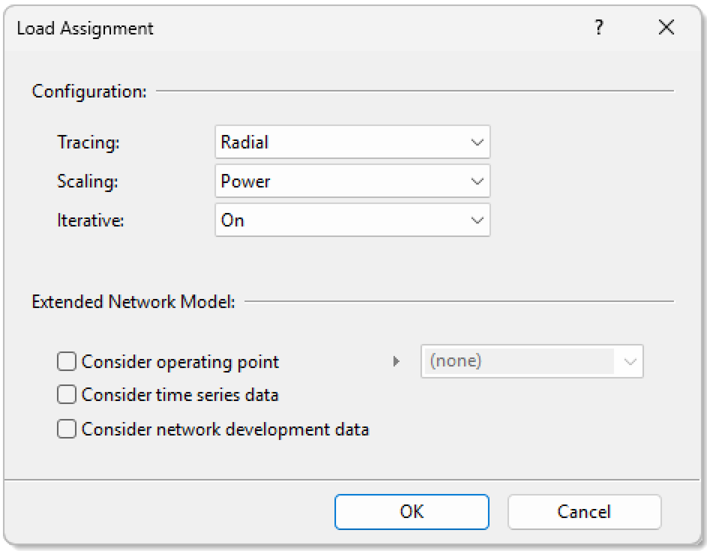
The calculation module has been revised in this product version. It offers more functions and uses the new input formats from measuring devices for more precise results and more flexible usability.

The aim of load assignment is to determine the power demand by loads fulfilling the boundary conditions of the specified measured values at the measuring devices. The result of load assignment is a network state that meets the sufficient condition (with respect to the convergence criteria) and matches the calculated values at the respective terminals with the measured values of the modeled measuring device. The following image illustrates the operating principle. It shows a network model with measuring devices and loads.



In the image shown, the loads marked in red are those that are considered in the load allocation (participation in the allocation of adapted power values). For these loads, a suitable power is determined based on the configuration of the calculation module so that the entered measured values of measuring device are met. The remaining, unmarked loads (not participating in the allocation), which are not changed in the load allocation, keep their respectively set power values.

The dialog box that appears when starting the load assignment module has been revised and offers new options to configure the calculation module.



The **Scaling** selection field is used to configure how the calculation module determines the proportional power of the participating loads. The options **Power** and **Energy (per phase)** are offered.

Scaling Mode Power

In this load allocation mode, the power values of the participating loads are used as weighted base values for the subsequent adjustment of the power values.

The calculated power S_{act} is determined at the terminal of the measuring device. If there are subordinate measuring devices, the sum of their powers is formed in S_{sub}.

$$S_{act} = S_{lf} - S_{sub}$$

The sum of the non-participating element apparent power values is subtracted:

$$S_{to} = S_{act} - S_{nopart}$$

The apparent power S_{to} then can be split in P_{to} and Q_{to}.

The ratio between the target and current power results in factors fP and fQ for the multiplication with P and Q of the loads.

$$P_{\Delta} = P_{meas} - P_{to}$$

$$Q_{\Delta} = Q_{meas} - Q_{to}$$

$$fP = 1 + \frac{P_{\Delta}}{P_{to}}$$

$$fQ = 1 + \frac{Q_{\Delta}}{Q_{to}}$$

In unbalanced network models, these equations are applied separately per phase.

If **Consider Power Factor** is deactivated for the measuring device, the power factor of the loads is kept constant, and factor Q is set equal to factor P so that the power factor of the loads is not changed.

If **Consider Power Factor** is activated for the measuring device, the power factors of the loads are adjusted iteratively in order to meet the power factor at the measuring device.

The respective setting must be made depending on the availability of the measured values.

The factors are calculated as follows:

$$I_{\Delta} = I_{meas} - I_{lf}$$

$$S_{act} = S_{lf} - S_{sub}$$

The power flow voltage V_{lf} and the rated voltage of the node V_r are used to calculate the current power:

$$V_{LE} = V_{lf} \times \frac{V_r}{\sqrt{3}}$$

$$I_{act} = \frac{S_{act}}{V_{LE}}$$

$$\mathrm{fPQ} = 1 + \frac{I_{\Delta}}{I_{act}}$$

Load Assignment Considering Operating Points (OP) and Load Development (LD)

Load assignment can now also be used by considering operating points and load development data in a combined mode. This enhancement enables a more precise and flexible analysis of network models with regard to various operating scenarios and future network development.

The operating point and load development characteristics can be assigned to both a network element and a measuring device. The consideration of operating points and load development characteristics is configured via the start dialog box of the load development module.

Extended Labeling of Results

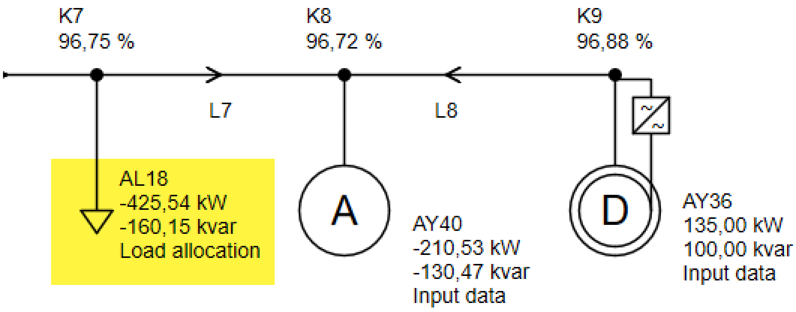
The power flow results include an identification of the data source. The power flow branch results (LFBranchResult/ULFBranchResult) and measuring device results (MeasureDataResult) therefore store information about the source of the power data used in the power flow.

Now, additional information is stored here indicating with the value **Load allocation** whether the power has been adjusted by the load assignment feature.

Result_ID	Node 1	Node 2	Element ...	Element ...	Network...	ɔp [%]	Ibs [kA]	I/Ibs [%]	SOC [%]	State	Data Sou...	Terminal...
35	K2		AL14	Load	Mittel	0,000	0,000	0,000	0,000	Ok	Load allocation	On
43	K13		AL25	Load	Mittel	0,000	0,000	0,000	0,000	Ok	Load allocation	On
38	K6		AL17	Load	Mittel	0,000	0,000	0,000	0,000	Ok	Load allocation	On
36	K3		AL15	Load	Mittel	0,000	0,000	0,000	0,000	Ok	Load allocation	On
47	K20		AL35	Load	Mittel	0,000	0,000	0,000	0,000	Ok	Load allocation	On
42	K12		AL23	Load	Mittel	0,000	0,000	0,000	0,000	Ok	Load allocation	On
41	K11		AL22	Load	Mittel	0,000	0,000	0,000	0,000	Ok	Load allocation	On
40	K10		AL21	Load	Mittel	0,000	0,000	0,000	0,000	Ok	Load allocation	On
39	K7		AL18	Load	Mittel	0,000	0,000	0,000	0,000	Ok	Load allocation	On
37	K4		AL16	Load	Mittel	0,000	0,000	0,000	0,000	Ok	Load allocation	On
49	K8		AY40	Asynchronou...	Mittel	97,313	0,000	0,000	0,000	Ok	Input data	On
50	K13		VSH37	Variable Shun...	Mittel	0,000	0,000	0,000	0,000	Ok	Input data	On
48	K9		AY36	Asynchronou...	Mittel	65,896	0,000	0,000	0,000	Ok	Input data	On

During **Load Assignment**, the power value at the load was adjusted internally using the load assignment function according to the scaling procedure. For a load in the input format P and Q, this results in a deviation from the set input power or energy values of the load, which were used for the scaling as weighting only (as described above).

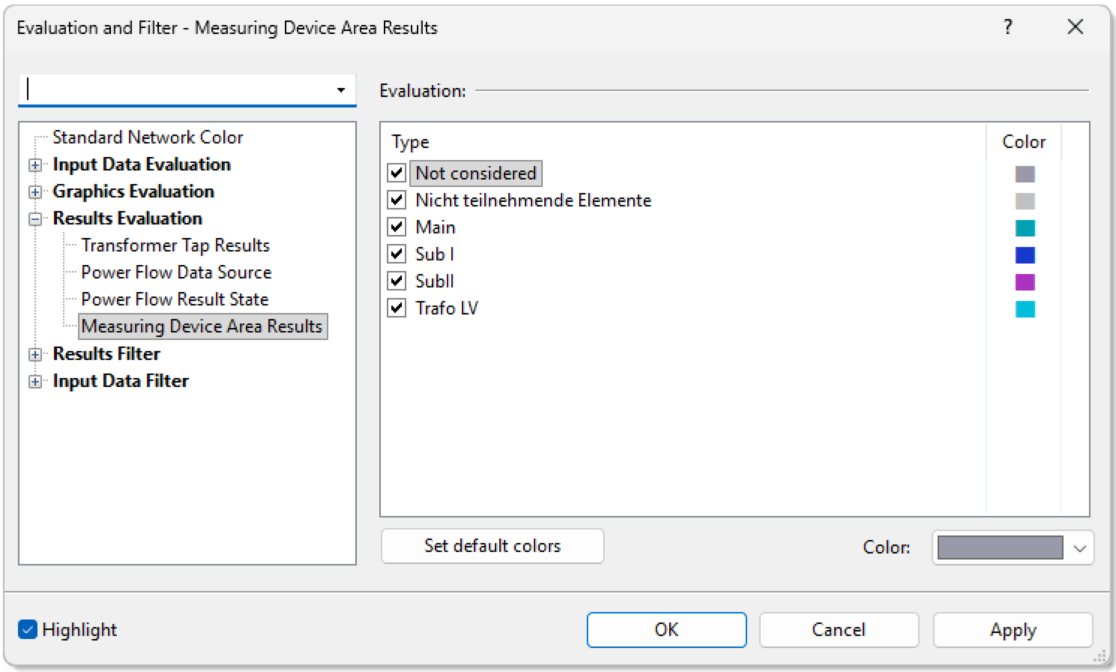
This data source can also be displayed in the network graphic.



Evaluation of Results from the Measuring Device Areas

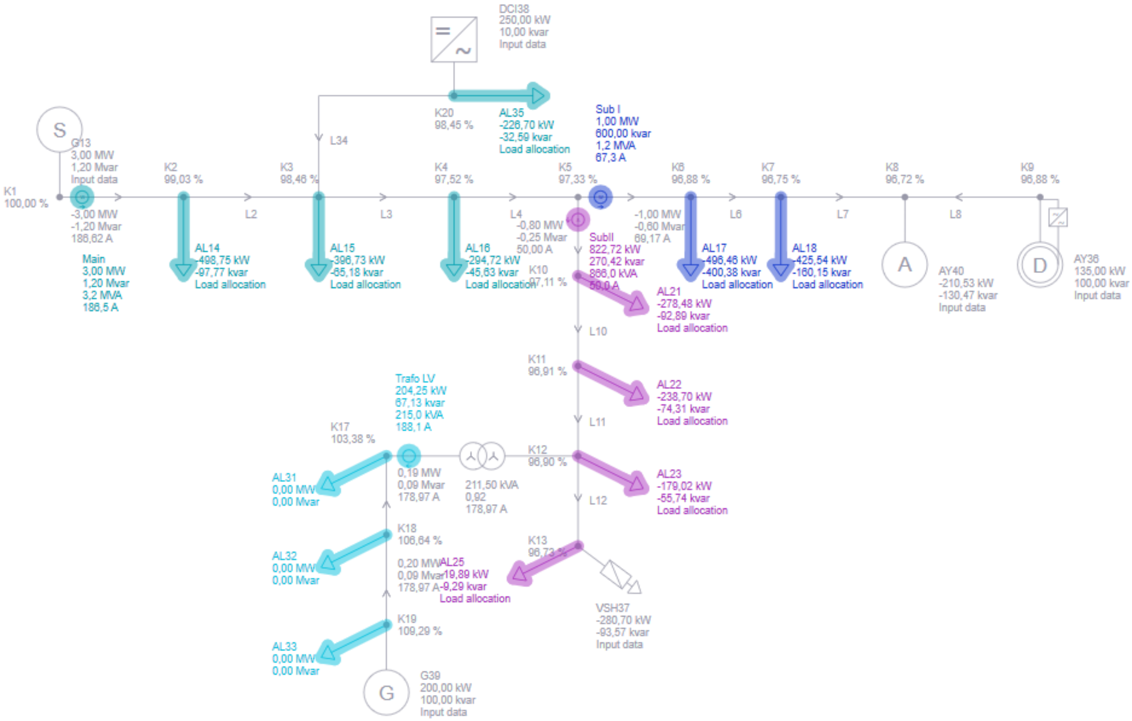
New **Measure Data Area Results** are available for load assignment to document the relation of the participating loads to their related measuring devices. This supports the identification which loads were assigned to which measuring device in the process and adjusted accordingly.

The new results are stored in the network database in the "MeasureDataAreaResults" table. The results are also available in the tabular view, but the primary purpose is to enable graphical evaluation of the relation between loads and measuring devices. These can be activated in the **Evaluation and Filter** dialog box.



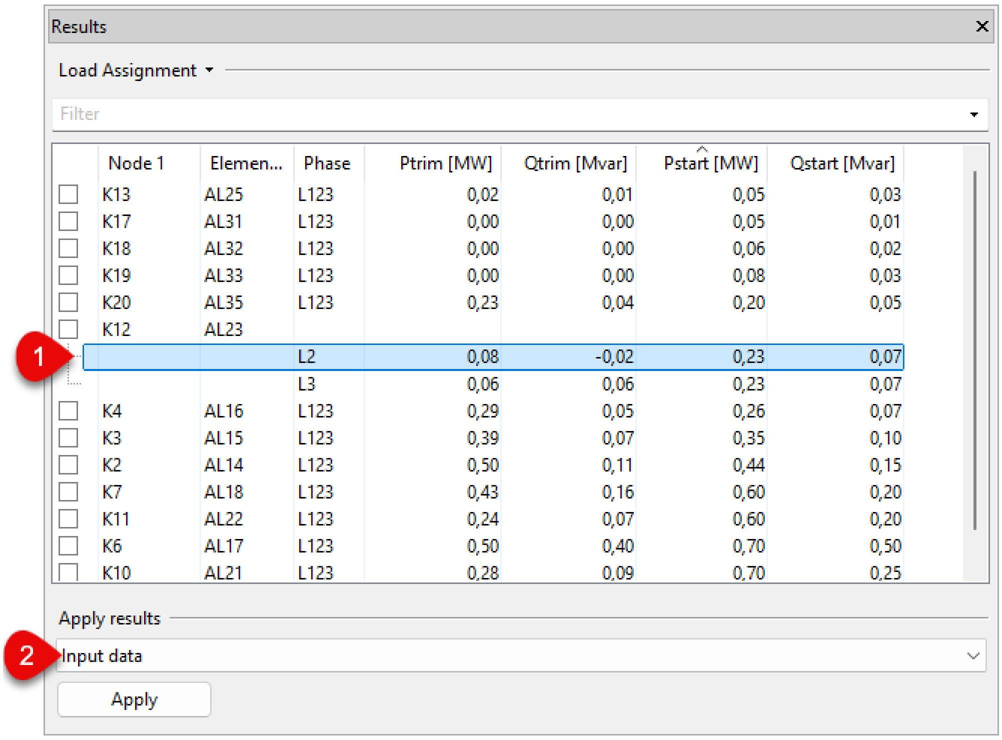
The following image shows the example network "Example LA" with the new evaluation **Measuring Device Area Results**.

The **Highlight** of results is activated.



Extended Display and Input Data Update with Results

The result browser displays the results of the load assignment module. All loads that were included in the load assignment are listed there. For each load, the adapted power values as well as the start values are listed.



	Node 1	Elemen...	Phase	Ptrim [MW]	Qtrim [Mvar]	Pstart [MW]	Qstart [Mvar]
☐	K13	AL25	L123	0,02	0,01	0,05	0,03
☐	K17	AL31	L123	0,00	0,00	0,05	0,01
☐	K18	AL32	L123	0,00	0,00	0,06	0,02
☐	K19	AL33	L123	0,00	0,00	0,08	0,03
☐	K20	AL35	L123	0,23	0,04	0,20	0,05
☐	K12	AL23					
			L2	0,08	-0,02	0,23	0,07
			L3	0,06	0,06	0,23	0,07
☐	K4	AL16	L123	0,29	0,05	0,26	0,07
☐	K3	AL15	L123	0,39	0,07	0,35	0,10
☐	K2	AL14	L123	0,50	0,11	0,44	0,15
☐	K7	AL18	L123	0,43	0,16	0,60	0,20
☐	K11	AL22	L123	0,24	0,07	0,60	0,20
☐	K6	AL17	L123	0,50	0,40	0,70	0,50
☐	K10	AL21	L123	0,28	0,09	0,70	0,25

Additionally, the adapted power values for unbalanced loads are now displayed per conductor (#1).

In the **Apply results** section (#2), the calculated power values can be used to update the input data of the loads. This functionality has been revisited with respect to the following options:

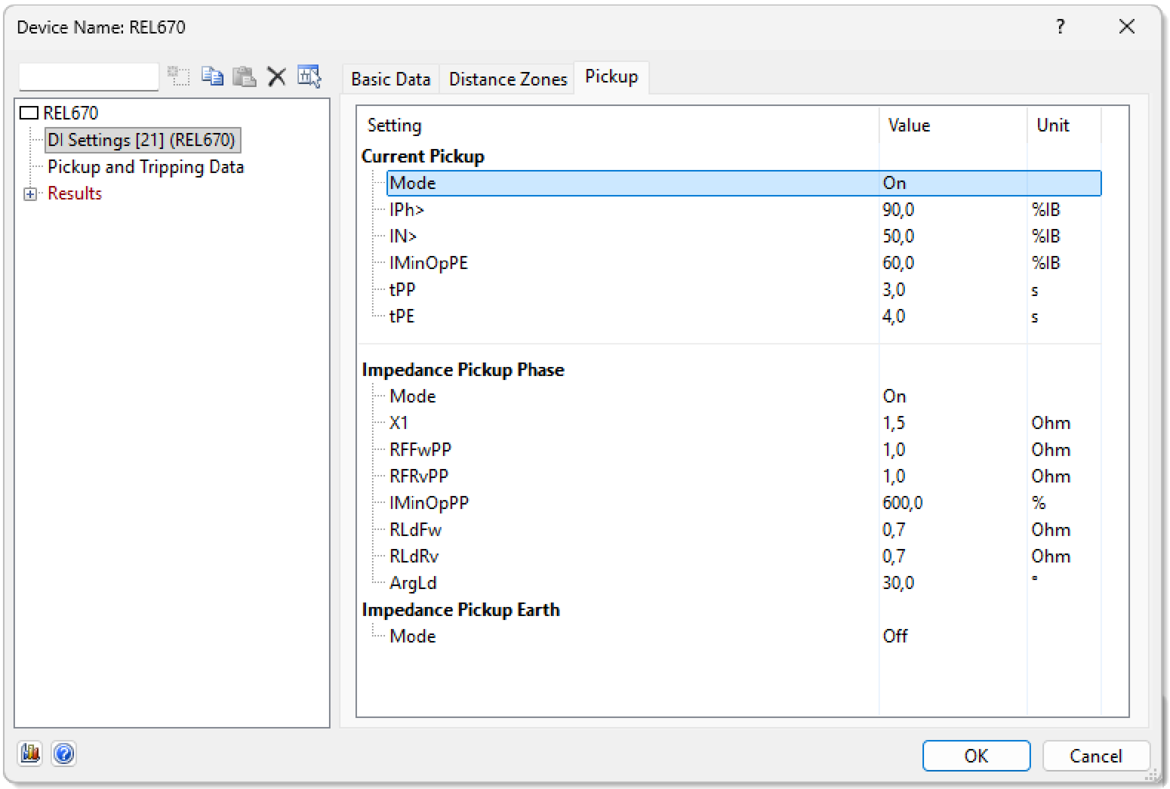
- **Input data:**
  The result of the power values from the load assignment is transferred to the loads and the input data is overwritten. The load input formats **P and Q**, **S and cosφ**, **P and cosφ**, **Pij and Qij – delta**, and **Pi and Qi – star** can be adopted from the results. For unsupported types, the load input format is set to **P and Q** or, in the case of unbalanced results, to **Pi and Qi – star**.
- **Input data – factors:**
  The result of the power values from the load assignment is converted to factors for the load input format **P and Q**. P and Q remain unchanged and only fP and fQ are overwritten. The other load input formats behave as described in the **Input Data** option.

Protection Coordination (OC, SZ, DI)

Device-specific Pickup for Distance Protection Devices

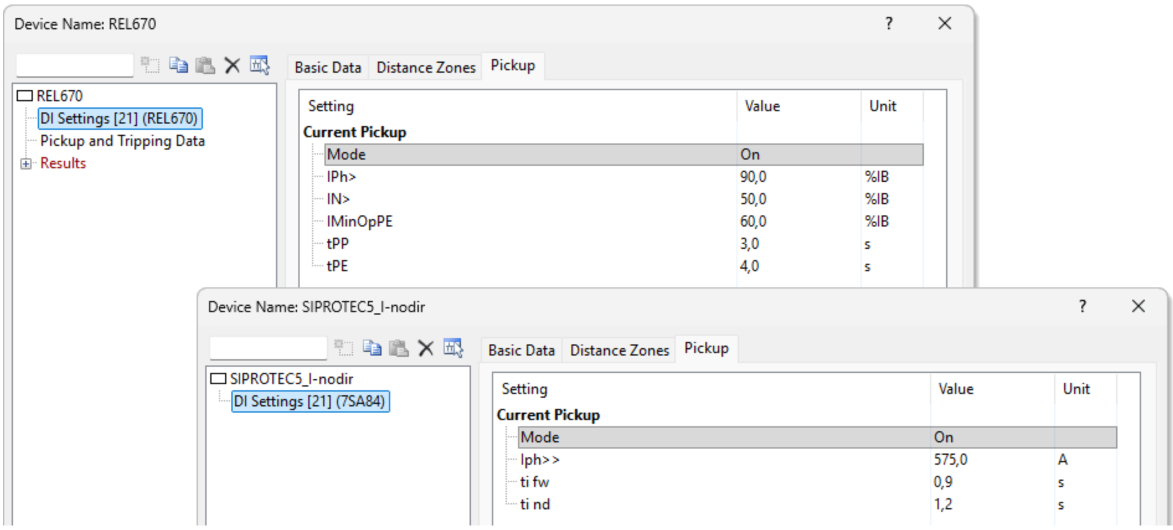
The dialog box for entering pickup data for distance protection devices has been completely redesigned. The management of pickup data has been made significantly more transparent and efficient. From now on, all pickup settings are clearly summarized in a single, clearly structured tab. This adjustment makes it easier to quickly and directly capture and edit all relevant information for parameterization.

The following image shows the parameterization of the pickup of a REL670 (ABB) distance protection device.



All pickup data is shown in a list. The list is divided into sections containing the setting values for current pickup, VI pickup, and impedance pickup. The list only shows those pickups that are supported by the selected protection device type. Active pickups appear in expanded view, while inactive pickups are collapsed.

All pickup types, current pickup, VI pickup, and impedance pickup, are now stored device-specific for the most common distance protection device series. Only the setting values supported by the respective device type are displayed in the dialog box. The following image illustrates this using the example of current pickup for a REL670 and a 7SA84 distance protection device. It should be noted here that the direction settings for the pickup and the final times for impedance pickup are no longer available, as these settings do not occur in the real devices. If the impedance pickup with final times should be used, the final times must be specified via the zones.

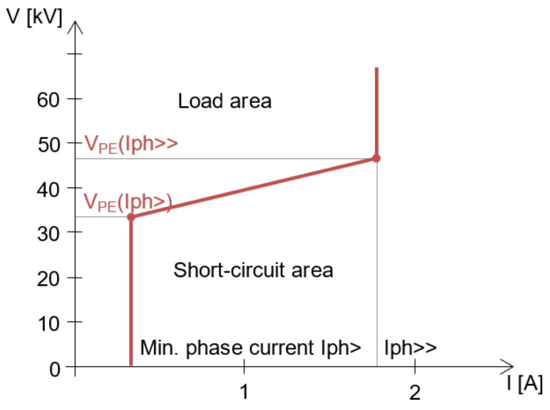


Parameter names and units are provided device specific.

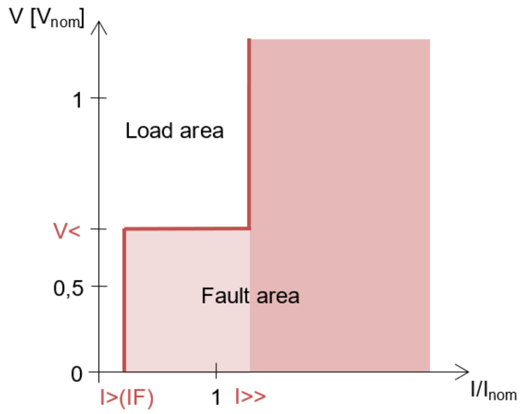
The pickup has also been completely redesigned and made device-specific in the protection simulation algorithms. This revision ensures that the behavior of the pickup within the PSS SINCAL protection simulation corresponds to that of the real protection device. This achieves a higher degree of consistency between the simulation environment and practice, enabling users to reliably test and understand the parameterization/configuration and behavior of the protection devices.

The following two images show examples of the implementation of the voltage-dependent current pickup (VI pickup) for two different types of protection devices.

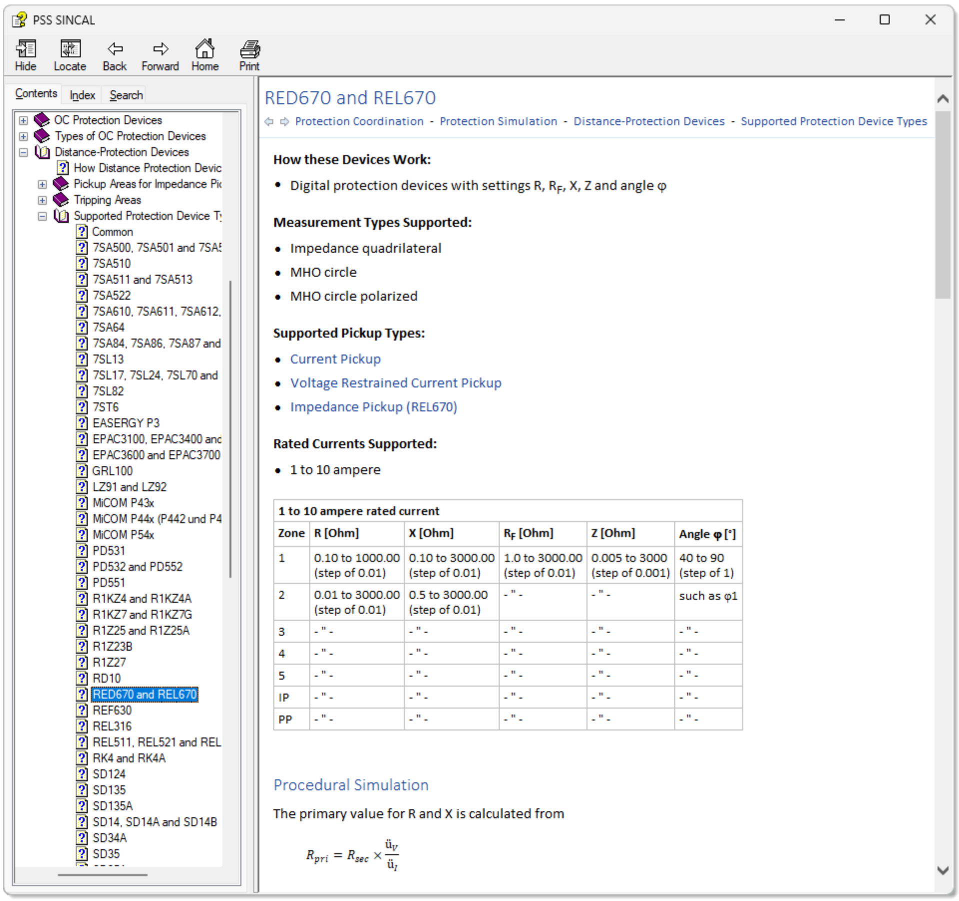
SIPROTEC 5 VI Pickup



MiCOM P43x VI Pickup



The device-specific pickup is described in detail in the protection manual. The corresponding documentation for the currently viewed device type can be accessed via the **Show device-specific help** button in the lower left area of the protection device dialog. The description explains how the protection device works, supported measurement types and pickup, and implementation in the protection simulation.



RED670 and REL670

Protection Coordination - Protection Simulation - Distance-Protection Devices - Supported Protection Device Types

How these Devices Work:

- Digital protection devices with settings R, R_F, X, Z and angle φ

Measurement Types Supported:

- Impedance quadrilateral
- MHO circle
- MHO circle polarized

Supported Pickup Types:

- Current Pickup
- Voltage Restrained Current Pickup
- Impedance Pickup (REL670)

Rated Currents Supported:

- 1 to 10 ampere

1 to 10 ampere rated current

Zone	R [Ohm]	X [Ohm]	R_F [Ohm]	Z [Ohm]	Angle φ [°]
1	0.10 to 1000.00 (step of 0.01)	0.10 to 3000.00 (step of 0.01)	1.0 to 3000.00 (step of 0.01)	0.005 to 3000 (step of 0.001)	40 to 90 (step of 1)
2	0.01 to 3000.00 (step of 0.01)	0.5 to 3000.00 (step of 0.01)	- " -	- " -	such as φ1
3	- " -	- " -	- " -	- " -	- " -
4	- " -	- " -	- " -	- " -	- " -
5	- " -	- " -	- " -	- " -	- " -
IP	- " -	- " -	- " -	- " -	- " -
PP	- " -	- " -	- " -	- " -	- " -

Procedural Simulation

The primary value for R and X is calculated from

$$R_{pri} = R_{sec} \times \frac{\ddot{u}_v}{\ddot{u}_i}$$

Protection Analysis (PSA)

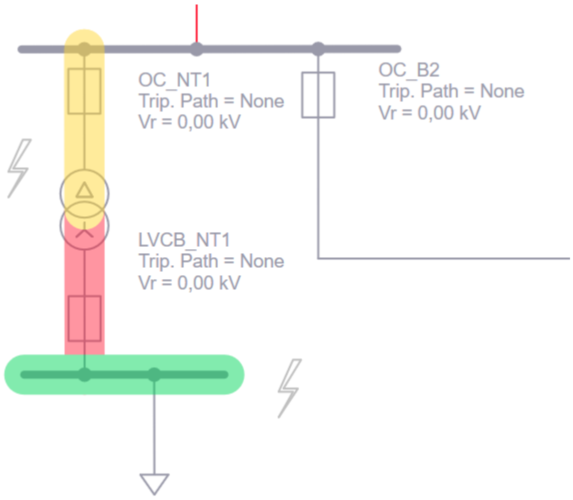
Extended Protection Zone Detection with Switches

The definition of protection zones has been expanded in context with the use of switches. Protection routes that have a switch at their end and are adjacent to another line/zone are no longer considered as a separate protection route. This results in significantly fewer protection routes for a protection zone, for example, when circuit breakers are modeled in addition to MV/LV transformer protection.

Advanced Result Visualization

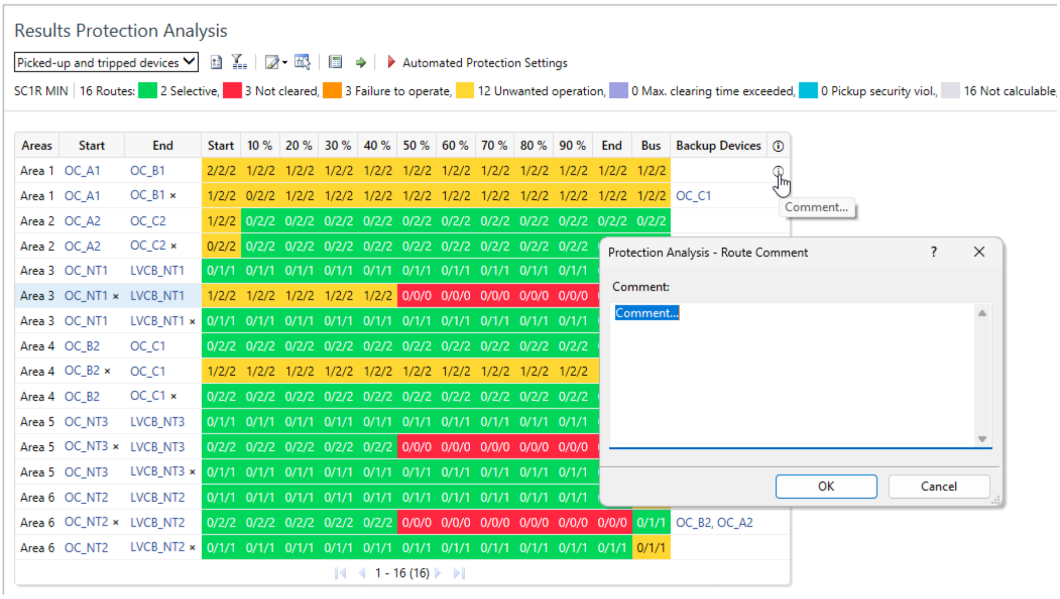
The functions for displaying the results of the protection analysis by highlighting them in the network graphic have been extended. If faults on busbars are activated during the calculation, the entire busbar is now marked when coloring in the network graphic.

Extended coloring is also available for transformers. If different protection behavior occurs on the high-voltage and low-voltage side, the transformer is colored accordingly in the network graphic.



New Comment Function in the Result View

The new comment function allows you to add specific notes for detected weakpoints in the protection analysis results. This is helpful if analyzed weakpoints cannot be fixed immediately or, in general, to explain why certain weakpoints are accepted. In the case of back-up protection, for example, non-selectivity is often accepted. The added comments are also included in the protection analysis report and can therefore be used for documentation purposes.

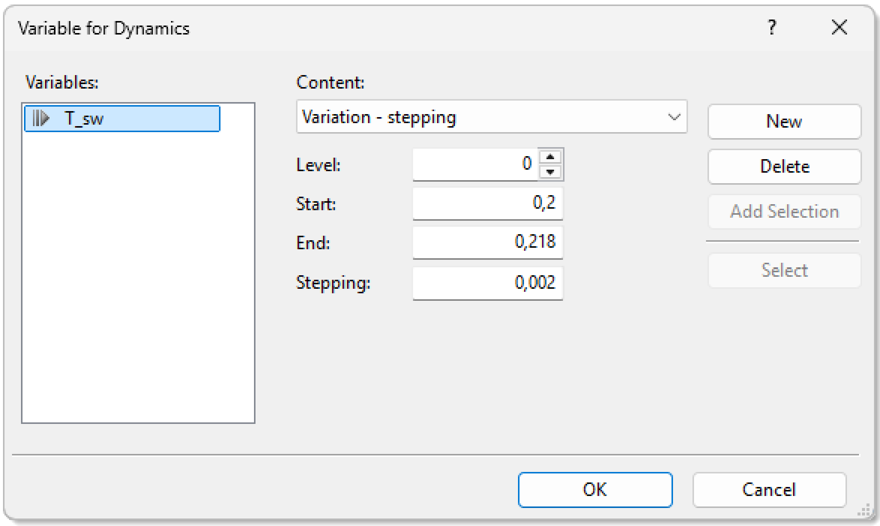


Dynamics (ST, EMT)

Dynamic Parameter Variation

With the new dynamic parameter variation functionality, simulation parameters can be varied automatically. A dynamic simulation of the network model is carried out for each individual parameter value. This way, different settings or scenarios can be analyzed efficiently and their effects on the overall system can be examined. The process runs automatically, so that a systematic study for a range of values can be performed and the behavior of the system can be comprehensively evaluated.

The parameters to be varied are defined in the **Variable for Dynamics** dialog box.



The variations of the parameter can be specified as follows:

- Variation – stepping: Start, end value, and steps
- Variation – discrete (numeric): Specification of discrete numerical values and text values
- Variation – discrete (text): Specification of discrete text values

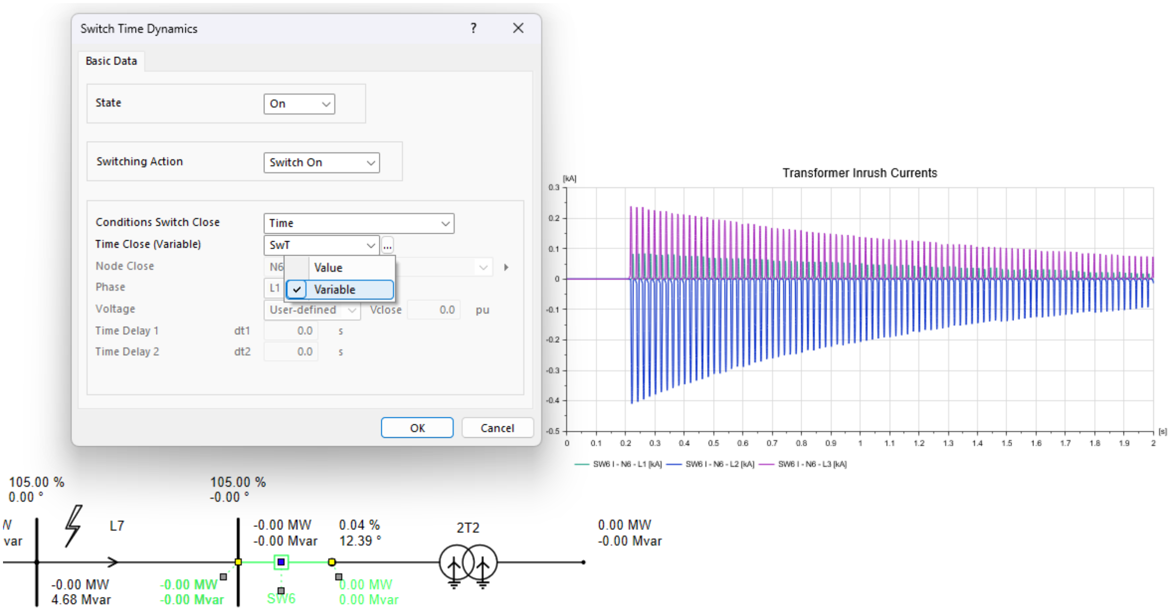
It is also possible to define a level for the parameter. If parameters are varied across multiple levels, the parameter variation with the higher level is performed for each parameter value at lower levels. In this way, nested parameter variations can be defined.

If several parameters are at the same level, the variation values should be present in equal numbers, or the lowest common number of varied values will be considered.

These variables can be used for any model parameter or time parameter in fault observations and switch time dynamics.

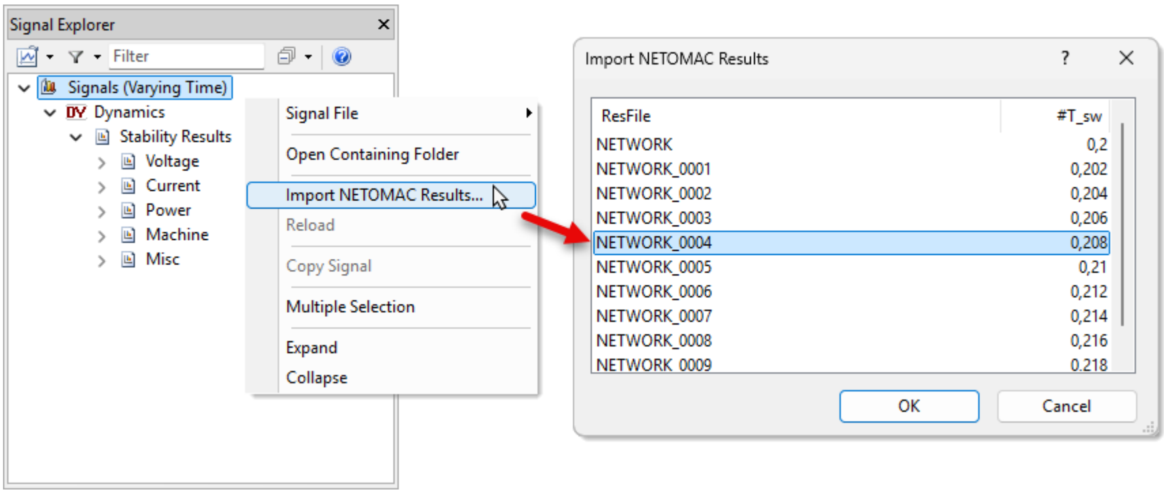
In energization studies often the worst cases are of interest e.g. to check compliance with undervoltage protection. To identify the worst cases it is helpful to vary certain parameters. This is also shown in the application example "Example Energization" in the "Varying Time" variant.

In the example, the transformer is switched on with a variable time:



The variable **T_sw** of type **Variation – stepping** is used for this purpose. It has 10 values, starting at 0.2 seconds with a step size of 2 milliseconds each.

After starting a dynamic simulation, the network model is calculated ten times – once for each variation of the parameter values. The corresponding results are then generated. In the Signal Explorer, you can then use the pop-up menu under **Import NETOMAC Results** to select the desired result file, which is available for visualization and evaluation in the GUI.

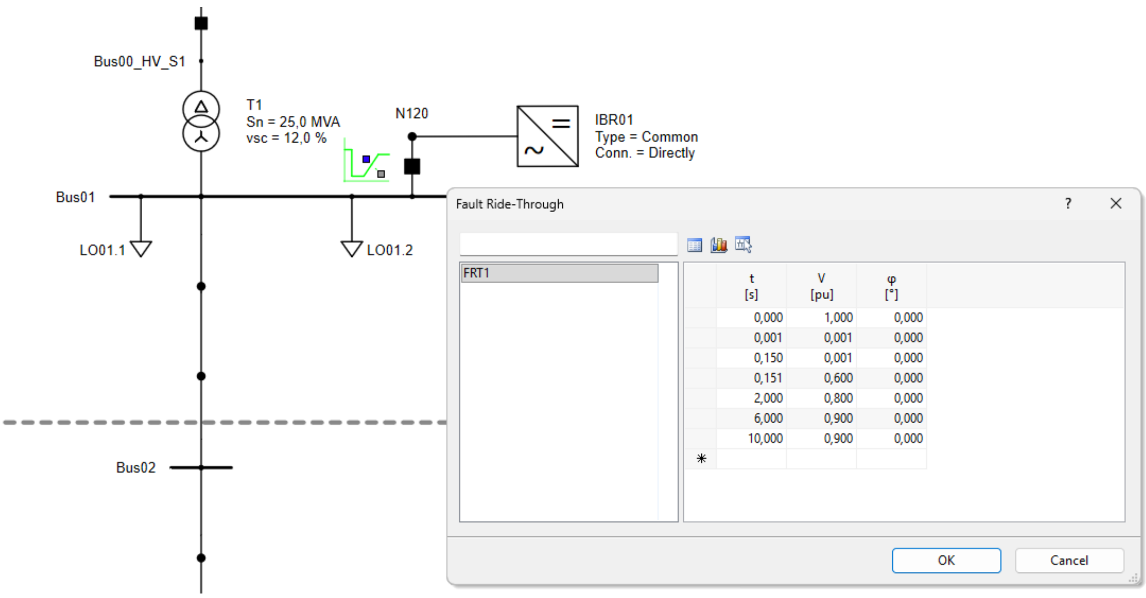


Fault Ride-Through

The Fault Ride-Through (FRT) calculation method can be used to analyze the response of distributed energy resources to changes in voltage or frequency at the point of common coupling. The aim is to check and analyze the following points:

- Compliance with grid codes
- Behavior and stability of the generation plants
- Contribution to voltage support in the event of a fault

The calculation is based on an FRT characteristic curve that describes the voltage or frequency over time. For the voltage curve, it is now possible to additionally define the voltage angle in order to analyze changes in the voltage angle. It is also now possible to define a short-circuit power at the tested node. This is particularly relevant when analyzing inverter-based resources and their operation in weak grids.

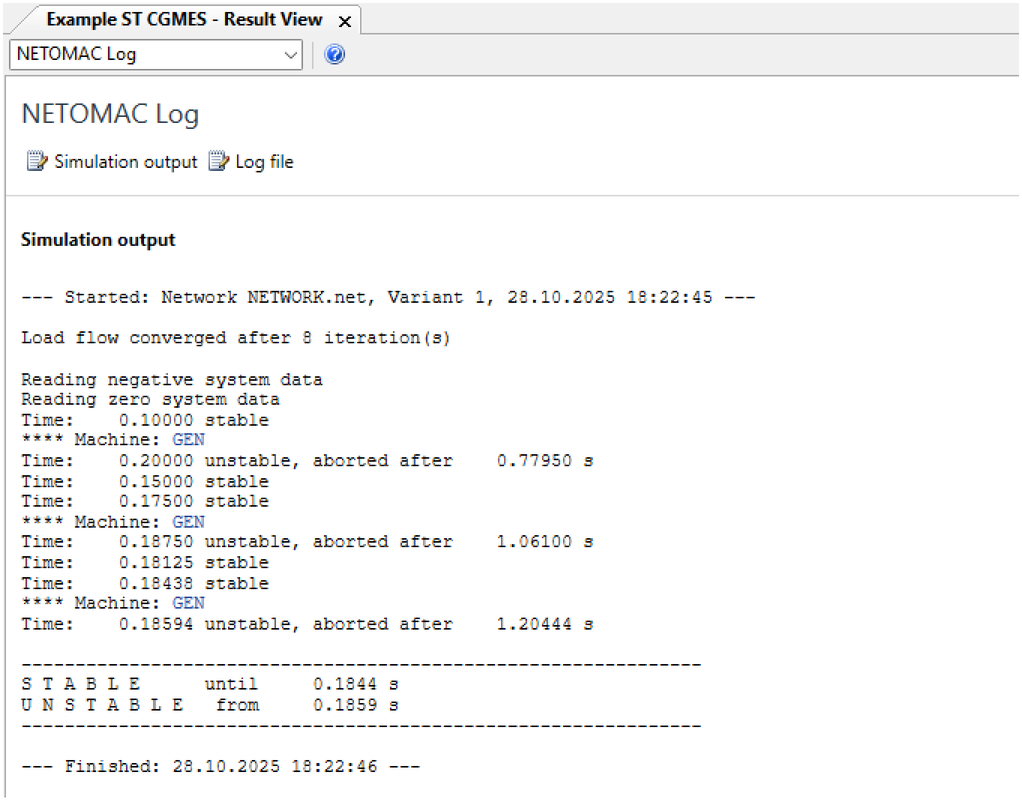


The **"Example Renewables"** application example demonstrates how to use the FRT calculation module.

Transient Stability Limit

This function can be used to determine the critical fault clearing time (CFCT) of a predefined fault in the network model. The duration of the fault is varied iteratively and monitored to ensure that the rotor angles of all machines remain within the specified permissible range (stability condition).

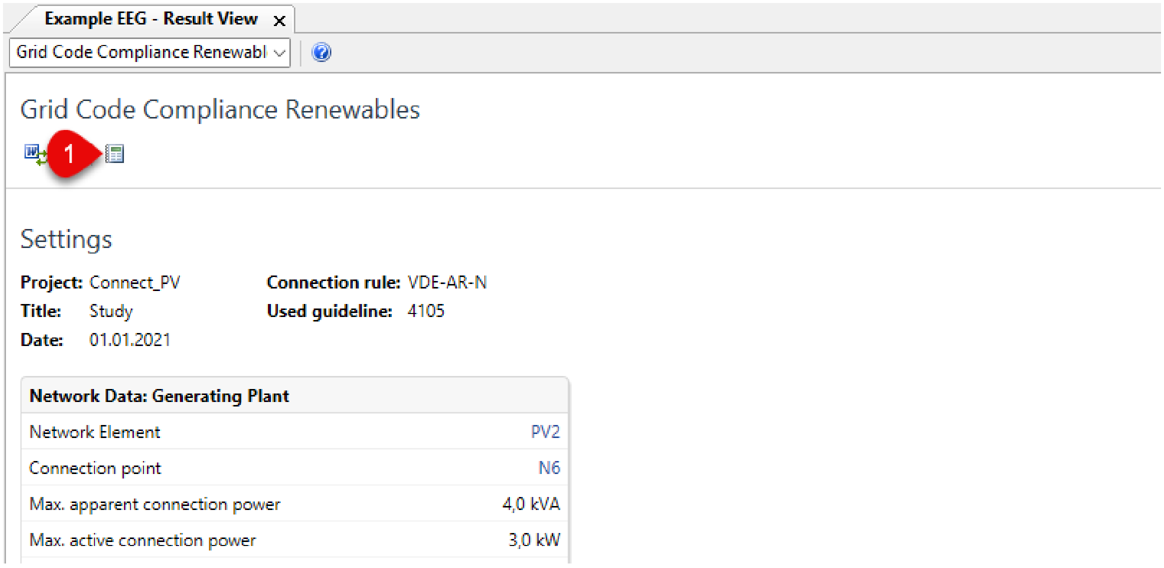
The results for determining the stability limit are available in the result view, which opens automatically after the calculation is complete.



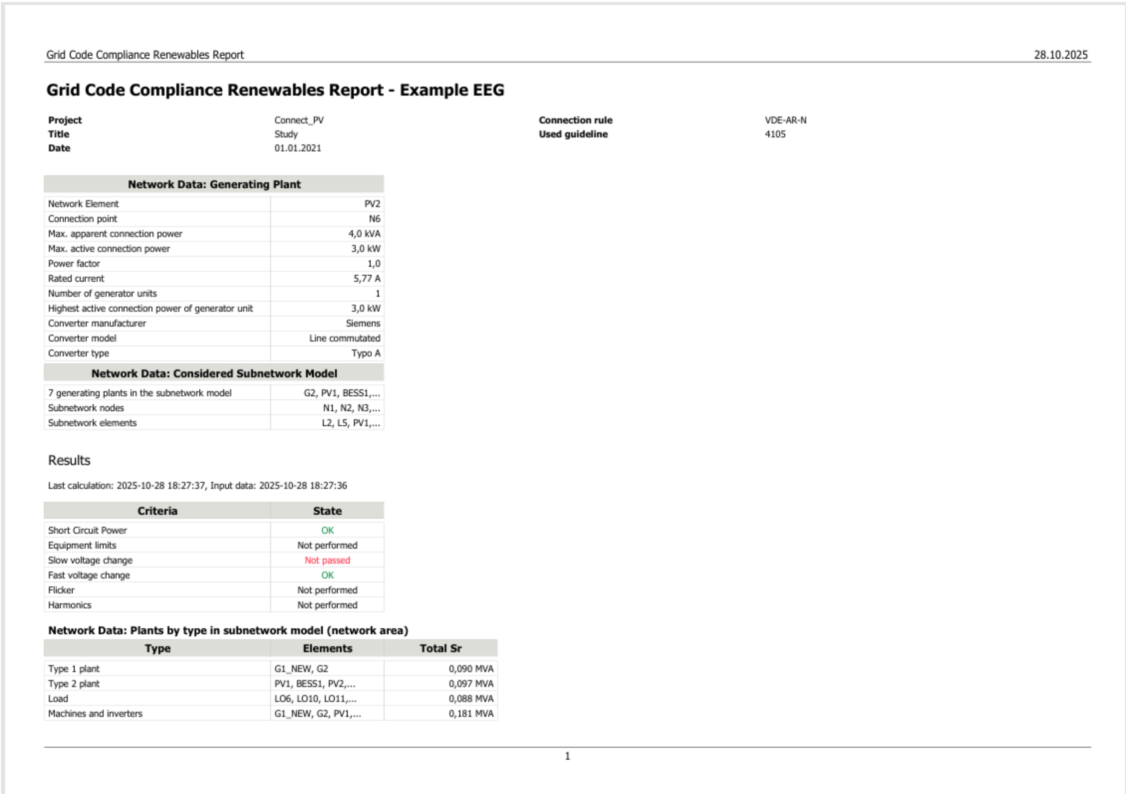
The log contains the individual calculation steps with varying fault times and the individual states of each iteration. At the end of the log, the fault time for the transition from "stable" to "unstable" is displayed.

Grid Code Compliance Renewables (EEG)

A new function is now available in the result view for the module Grid Code Compliance Renewables: The results of the calculation can be exported directly as a PDF report (#1). This enhancement allows the results to be documented independently of Microsoft Word (for example, if the software is not installed on a server).



The results report contains the same information that is displayed in the result view. This includes both the documentation of the input data and the presentation of the results based on the tests performed and the associated diagrams.



Grid Code Compliance Renewables Report 28.10.2025

Grid Code Compliance Renewables Report - Example EEG

Project	Connect_PV	**Connection rule**	VDE-AR-N
Title	Study	**Used guideline**	4105
Date	01.01.2021		

Network Data: Generating Plant	
Network Element	PV2
Connection point	N6
Max. apparent connection power	4,0 kVA
Max. active connection power	3,0 kW
Power factor	1,0
Rated current	5,77 A
Number of generator units	1
Highest active connection power of generator unit	3,0 kW
Converter manufacturer	Siemens
Converter model	Line commutated
Converter type	Typo A
Network Data: Considered Subnetwork Model	
7 generating plants in the subnetwork model	G2, PV1, BESS1,...
Subnetwork nodes	N1, N2, N3,...
Subnetwork elements	L2, L5, PV1,...

Results

Last calculation: 2025-10-28 18:27:37, Input data: 2025-10-28 18:27:36

Criteria	State
Short Circuit Power	OK
Equipment limits	Not performed
Slow voltage change	Not passed
Fast voltage change	OK
Flicker	Not performed
Harmonics	Not performed

Network Data: Plants by type in subnetwork model (network area)

Type	Elements	Total Sr
Type 1 plant	G1_NEW, G2	0,090 MVA
Type 2 plant	PV1, BESS1, PV2,...	0,097 MVA
Load	LO6, LO10, LO11,...	0,088 MVA
Machines and inverters	G1_NEW, G2, PV1,...	0,181 MVA

1

CIM-Import und -Export

CGMES 3.0

PSS SINCAL now supports the CGMES 3.0 standard for CIM import and export.

This standard expands on the capabilities of CGMES 2.4.15 and offers improved modeling functions and a better structured data model. In addition to the enhancements and adjustments to the existing profiles in CGMES 2.4.15, CGMES 3.0 introduces two supplementary profiles. The Operation Profile (OP) allows the definition of operating states and thus a more detailed configuration of various system conditions. The Short Circuit Profile (SC) is designed for short-circuit calculations.

Advanced Functions for Exporting Graphic Data

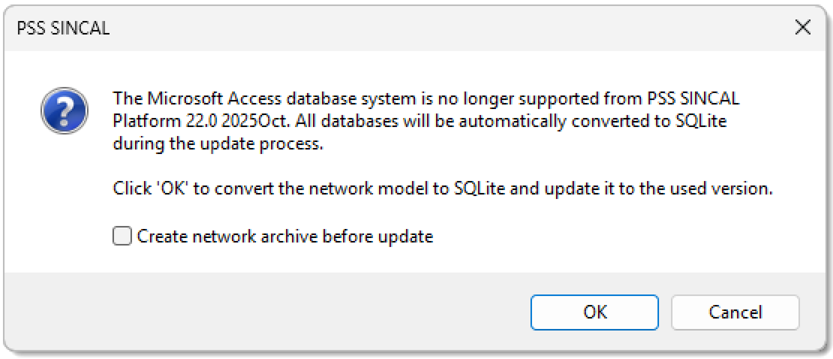
PSS SINCAL now offers extended functionality for handling geographical network graphics data for CGMES 2.4.15 and CGMES 3.0. When importing geographical coordinates in latitude and longitude, the corresponding graphical representations are directly transformed into the network views of the network model using the new WebMercator projection during import.

This approach has the advantage that, in case of a CIM export, the exact coordinates in latitude and longitude can be calculated using the new WebMercator projection and exported accordingly. Moreover, the WebMercator projection in the network views enables optimal integration of the geographical network data in conjunction with background maps within PSS SINCAL (see above). This further improves and facilitates the visualization and analysis of network data in a geographical context.

Network Model (Database)

Phase-Out of Access Databases

Access databases are no longer supported as of this product version. When opening an existing network model that has been using the Microsoft Access database system, the following message will be displayed:



The message dialog offers an option to create a network archive before updating. This completely backs up the previous network model together with the Microsoft Access database in a network archive.

After clicking OK to confirm the message, the network model database will be converted to the SQLite database system.

Note: If the option **Create network archive before update** was not activated, the Microsoft Access database with the file name "database_[timestamp].mdb" remains in the data directory "_files" of the network model. This should be deleted manually by the user after successful conversion and updating of the network model.

If a global or local standard type/protection device database in Microsoft Access database format is assigned to the network model, a check is performed to see whether this has already been converted to SQLite during a previous update process. If this is the case, these are automatically replaced by the corresponding SQLite databases and the assignment is updated.

If a global/local standard type/protection device database has not yet been converted, the **Database Update** dialog box opens. Using this dialog box, the assigned standard type and protection device databases in Microsoft Access database format can be converted to SQLite and updated or reassigned.

Changes to the Network Model Schema (Data Model)

The following changes have been made to the data model of the PSS SINCAL network database. For a detailed description of all tables and fields, refer to the **Database Description** and **Input Data** manuals.

Electrical Networks

Table name	Field	Data type	Unit	Description	Comment
AddFaultData	FktI	Double	1	Reliability Dependent Factor Overcurrent Protection Devices	changed
CalcParameter	EcoTI	Long Integer		Load Assignment Iterative	changed
EcoStation	Un	Double	kV	Nominal Voltage	renamed
EcoStation	TextVal	VarString		Comment	new
EcoStation	sh	Double	m	Elevation	new
EcoStation	lat	Double	°	Latitude	new
EcoStation	lon	Double	°	Longitude	new
EcoStationExt	NodeExt_ID				new
EcoStationExt	EcoStation_ID	Long Integer		Secondary Key – Substation	new
EcoStationExt	Name	Text		Name of Attribute	new
EcoStationExt	Flag_Type	Integer		Type of Value 1: Number 2: Text	new
EcoStationExt	Value1	Double		Numeric Value	new
EcoStationExt	Value2	VarString		Text Value	new
EcoStationExt	Unit	Text		Unit	new
FaultRideThroughVal	VoltageAngle	Double	°	Angle of Voltage	new
GraphicAreaTile	CoordSys	Text		Coordinate System	new
GraphicAreaTile	RefLat	Double	°	Reference Latitude	new
GraphicAreaTile	RefLon	Double	°	Reference Longitude	new
GraphicAreaTile	RefPosX	Double	m	Reference Position X	new
GraphicAreaTile	RefPosY	Double	m	Reference Position Y	new
GraphicAreaTile	Scale1	Integer			not used
GraphicBackgroundMap	Provider	Integer		Provider ID	changed
IncrSer	BaseP	Double	MW	Base Value Active Power	new
IncrSer	BaseQ	Double	Mvar	Base Value Reactive Power	new

IncrSerVal	P	Double	MW	Active Power	new
IncrSerVal	Q	Double	Mvar	Reactive Power	new
IncrSerVal	I	Double	kA	Current	new
IncrSerVal	S	Double	MVA	Appearent Power	new
Line	Flag_Mat	Integer		Values 0: Per Unit 1: Absolute	changed
Line	Flag_Tend	Integer		Temperature Dependent Mode 0: I and fred 1: I and f(Tamb) 2: I(Tamb)	changed
Line	TempChar_ ID	Long Integer		Secondary Key – Temperature Characteristics (Factor)	new
Line	LineInfo	Text		Type Information	changed
Line	Flag_Mat	Integer		Values 0: Per Unit 1: Absolute	changed
Line	Flag_Tend	Integer		Temperature Dependent Mode 0: I and fred 1: I and f(Tamb) 2: I(Tamb)	changed
Line	TempChar_ ID	Long Integer		Secondary Key – Temperature Characteristics (Factor)	new
LineSeg	Flag_Mat	Integer		Values 0: Per Unit 1: Absolute	LineSeg
LineSeg	Flag_Cond	Integer		Zero-Phase Sequence 0: No 1: Yes	LineSeg
LineSeg	LineInfo	Text		Type Information	LineSeg
Load	P_max	Double	MW	Maximum Measured Active Power	unit changed
Load	P_min	Double	MW	Minimum Measured Active Power	unit changed
Load	Imax	Double	kA	Maximum Measured Current	unit changed
Load	I_min	Double	kA	Minimum Measured Current	unit changed
Load	Flag_LA	Integer		Join Load Assignment 0: No 1: Yes 2: signQ 3: Yes and signQ 4: signP 5: Yes and signP 6: signQ and signP 7: Yes, signQ and signP	choice changed
MeasureData	I	Double	kA	Current	unit changed
MeasureData	S	Double	MVA	Apparent Power	unit changed
MeasureData	I_min	Double	kA	Minimum Current	unit changed
MeasureData	S_min	Double	MVA	Minimum Apparent Power	unit changed
MeasureData	P	Double	MW	Active Power	unit changed
MeasureData	Q	Double	Mvar	Reactive Power	unit changed
MeasureData	P_min	Double	MW	Minimum Active Power	unit changed

MeasureData	Q_min	Double	Mvar	Minimum Reactive Power	unit changed
MeasureData	Im	Double	kA	Current	unit changed
MeasureData	DC_P	Double	MW	Active Power Generation	unit changed
MeasureData	DC_Q	Double	Mvar	Reactive Power Generation	unit changed
MeasureData	DC_Pmin	Double	MW	Minimum Active Power Generation	unit changed
MeasureData	DC_Qmin	Double	Mvar	Minimum Reactive Power Generation	unit changed
MeasureData	I_max	Double	kA	Maximum Current	new
MeasureData	S_max	Double	MVA	Maximum Apparent Power	new
MeasureData	cos_phi_max	Double	1	Maximum Power Factor	new
MeasureData	P_max	Double	MW	Maximum Active Power	new
MeasureData	Q_max	Double	Mvar	Maximum Reactive Power	new
MeasureData	P1	Double	MW	Active Power L1	new
MeasureData	Q1	Double	Mvar	Reactive Power L1	new
MeasureData	P2	Double	MW	Active Power L2	new
MeasureData	Q2	Double	Mvar	Reactive Power L2	new
MeasureData	P3	Double	MW	Active Power L3	new
MeasureData	Q3	Double	Mvar	Reactive Power L3	new
MeasureData	Flag_ConsiderPowerFactor	Integer		Consider Power Factor 0: No 1: Yes	new
MeasureData	Flag_Src	Integer		Localization Mode 1: Local balance (terminal) 2: Aggregation	changed
MeasureData	Flag_Val	Integer		Input Format 1: I and cosφ 2: S and cosφ 3: P and Q 4: P and cosφ 5: Pi and Qi	changed
MeasureDataAreaResults	Result_ID	Long Integer		Primary Key – Result	new
MeasureDataAreaResults	MeasData_ID	Long Integer		Secondary Key – Measuring Device	new
MeasureDataAreaResults	Variant_ID	Long Integer		Secondary Key – Variant	new
MeasureDataAreaResults	Flag_Result	Integer		Result Type	new
MeasureDataAreaResults	ResDate	TimeStamp		Date	new
MeasureDataAreaResults	ResTime	Double		Time	new
MeasureDataAreaResults	Element_ID	Long Integer		Secondary Key – Network Element	new

MeasureDataResult	Flag_DataState	Integer		Data Source for Calculation 0: Not considered 1: Input data 2: Profile value 3: Operating point 4: Development value 5: Profile and development value 6: Operating point and development value 10: TSDI value 11: TSDI previous value 12: TSDI zero data 13: TSDI subst. input data 14: TSDI subst. profile value 15: TSDI quality violation 16: TSDI next valid data 17: TSDI and development value 18: Load allocation 19: Load allocation and profile value 20: Load allocation and operating point 21: Load allocation and development value 22: Load allocation, profile and development value 23: Load allocation, operating point and development value 24: Load allocation and TSDI value 25: Load allocation, TSDI and development value	new
NetworkGroup	TempLine	Double	°C	Overhead Line Conductor Temperature	changed
NetworkGroup	TempCable	Double	°C	Cable Conductor Temperature	changed
NetworkGroup	TempTrf	Double	°C	Transformer Temperature	changed
Node	m	Double		Meridian	unused
OpSer	Flag_Typ	Integer		Input Format 1: Factor 2: fP and fQ 3: P and Q 4: P and V 5: fP and fV 6: Position tap/step 7: Position tap/step (ind. phase) 8: I and cosφ 10: S and cosφ 11: Loss costs 12: Temperature 13: Pi and Qi 14: f and cosφ 15: P and cosφ	changed
OpSerVal	P	Double	MW	Active Power	unit changed
OpSerVal	Q	Double	Mvar	Reactive Power	unit changed
OpSerVal	I	Double	kA	Current	unit changed
OpSerVal	S	Double	MVA	Appearent Power	unit changed
OpSerVal	P1	Double	MW	Active Power L1	new
OpSerVal	Q1	Double	Mvar	Reactive Power L1	new
OpSerVal	P2	Double	MW	Active Power L2	new
OpSerVal	Q2	Double	Mvar	Reactive Power L2	new
OpSerVal	P3	Double	MW	Active Power L3	new
OpSerVal	Q3	Double	Mvar	Reactive Power L3	new
ProtChoice	ProtChoice_ID	Long Integer		Primary Key – Protection Choice	new
ProtChoice	Name	Text		Choice Type	new

ProtChoiceVal	ChoiceType	Text		Choice Type	unused
ProtChoiceVal	ProtChoice_ID	Long Integer		Secondary Key – Protection Choice	new
ProtDep	ProtDep_ID	Long Integer		Primary Key – Protection Dependency	new
ProtDep	ProtSet_ID	Long Integer		Secondary Key – Protection Setting	new
ProtDep	ProtChoice_ID	Long Integer		Secondary Key – Protection Setting Choice	new
ProtDep	ProtChoiceVal_ID	Long Integer		Secondary Key – Protection Choice Value	new
ProtDep	Flag_Type	Integer		Dependency Type 0: Hidden 1: Disabled 2: Visible 3: Enabled	new
ProtDev	Flag_Template	Integer		Device is Used as Template 0: No 1: Yes	unused
ProtDev	ProtDevCategory_ID	Long Integer		Secondary Key – Protection Category	unused
ProtLang	ProtLang_ID	Long Integer		Primary Key – Protection Language	new
ProtLang	RowType	Integer		Row Type	new
ProtLang	Row_ID	Long Integer		Secondary Key – Data	new
ProtLang	Flag_Lang	Integer		Language 0: English 1: German	new
ProtLang	Name	Text		Name	new
ProtMethod	Methods	Text		Protection Function Codes	unused
ProtOCFault	Flag_toff	Integer		Flag Time Off 0: Value 1: Variable	new
ProtOCFault	toff_var	Text		Time Off (Variable)	new
ProtOCFault	Flag_ton	Integer		Flag Time On 0: Value 1: Variable	new
ProtOCFault	ton_var	Text		Time On (Variable)	new
ProtSet	ProtChoice_ID	Long Integer		Secondary Key – Protection Choice	new
ProtSetCategory	Pos	Long Integer		Position	unused
RouteNode	m	Double		Meridian	unused
ShuntSwitchTime	Flag_ton	Integer		Flag Switch Time Close 0: Value 1: Variable	new
ShuntSwitchTime	ton_var	Text		Switch Time Close (Variable)	new
ShuntSwitchTime	Flag_toff	Integer		Flag Switch Time Open 0: Value 1: Variable	new
ShuntSwitchTime	toff_var	Text		Switch Time Open (Variable)	new
StabVariable	ValStart	Double		Start Value	new
StabVariable	ValEnd	Double		End Value	new
StabVariable	ValStep	Double		Stepping	new
StabVariable	LevelNo	Integer		Variation Level	new
StabVariableVal	StabVariableVal_ID	Long Integer		Primary Key – Values	new
StabVariableVal	StabVariable_ID	Long Integer		Secondary Key – Variable	new

StabVariableVal	Variant_ID	Long Integer		Secondary Key – Variant	new
StabVariableVal	Flag_Variant	Integer		Element of Current Variant	new
StabVariableVal	Val	Double		Value	new
StabVariableVal	TextVal	Text		Text	new
StdLine	Flag_Mat	Integer		Values 0: Per Unit 1: Absolute	changed
StdLine	LineInfo	Text		Type Information	changed
Switch	Flag_MountPos	Integer		Mounting Position 0: None 1: Ground 2: Pole 3: Tower	new
Variant	VarIndex	Text		Index of Variant (C = Activated for Variant Comparison)	changed
VoltageLevel	Un	Double	kV	Nominal Voltage	changed
VoltageLevel	Temp_Line	Double	°C	Overhead Line Conductor Temperature	changed
VoltageLevel	Temp_Cable	Double	°C	Cable Conductor Temperature	changed
VoltageLevel	AmbTemp_Line	Double	°C	Ambient Temperature of Overhead Line	changed
VoltageLevel	AmbTemp_Cable	Double	°C	Ambient Temperature of Cable	changed
VoltageLevel	TempTrf	Double	°C	Ambient Temperature of Transformer	changed

Pipe Networks

Table name	Field	Data type	Unit	Description	Comment
FlowGraphicAreaTile	CoordSys	Text		Coordinate System	new
FlowGraphicAreaTile	RefLat	Double	°	Reference Latitude	new
FlowGraphicAreaTile	RefLon	Double	°	Reference Longitude	new
FlowGraphicAreaTile	RefPosX	Double	m	Reference Position X	new
FlowGraphicAreaTile	RefPosY	Double	m	Reference Position Y	new
FlowGraphicAreaTile	Scale1	Integer			unused
FlowGraphicBackgroundMap	Provider	Integer		Provider ID	changed
FlowNode	m	Double	m	Meridian	unused
FlowVariant	VarIndex	Text		Index of Variant (C = Activated for Variant Comparison)	changed

API (Programming Interfaces for Automation)

API of the User Interface

Highlight in Graphic View

The function to highlight network elements in the graphic view has been completely revised in the previous product version. In addition, revised and new API functions are now available in this product version so that all highlighting functions can also be used in automation processes.

The following Python snippet is an excerpt from the automation example GuiAutoSincal.py. It shows how the new API functions can be used:

```
# Highlight elements in GUI
def DoHighlight():
    print("\n--- Highlight elements in GUI ---\n")

    NetTools = SincalDoc.GetNetTools()
    if not NetTools:
        print("Error: SincalDoc.GetNetTools failed!")
        CleanupAndQuit()

    Highlight = NetTools.GetHighlight()
    if not Highlight:
        print("Error: NetTools.GetHighlight failed!")
        CleanupAndQuit()

    iHighLight1: int = None
    iHighLight2: int = None

    # Set global highlight parameters
    Highlight.SetParameter("LineWidth", 25)
    Highlight.SetParameter("MinLineWidth", 7)

    # Get current selection and highlight it
    SincalSel = SincalDoc.GetSelection()
    iSelCnt = SincalSel.Count
    if iSelCnt:
        print("Highlight current selection...")
        iHighLight1 = Highlight.CreateEx("Highlight1", sincal.HighlightType.Selection,"", 0, 0, 255)
        if not iHighLight1:
            print("Error: Highlight.CreateEx() failed!")

    # Highlight all network elements in graphic layer "Low-Voltage"
    print("Highlight Network Level...")
    Highlight.SetVisualizationType(sincal.HighlightType.NetwLevel, "Low-Voltage")
    Highlight.SetColor(255, 0, 0)

    iHighLight2 = Highlight.Create("Highlight2")
    if not iHighLight2:
        print("Error: Highlight2 failed!")

    # Hide and show highlight
    print("Hide & show highlights:")
    if iHighLight2:
        time.sleep(1)
        Highlight.Hide(iHighLight2)
        time.sleep(1)
        Highlight.Show(iHighLight2)
        time.sleep(1)

    # Get all active highlights
    print("Current highlights:")
    arHighlights = Highlight.GetHighlights()
    for highlight in arHighlights:
        iHighlightID, strHighlight, strType, strCategory, *_ = highlight
        print(f"Highlight ID: {iHighlightID}, Name: {strHighlight}, Type: {strType}, Category:
{strCategory}")

    # Remove created highlights
    if iHighLight1:
        Highlight.Remove(iHighLight1)
    if iHighLight2:
        Highlight.Remove(iHighLight2)

    # Sync view and all tools windows
    SincalDoc.UpdateData(sincal.UpdateType.View, 0)

    SincalSel = None
    Highlight = None
    NetTools = None
    NetTools = None
```

Database Manager Automation

Extract Network Archive

The new API function ExtractSINX() is available in the Database Manager, and can be used to extract an existing network archive into a usable PSS SINCAL network model.

The function unpacks the network model with all relevant data parallel to the network archive. The network model name is generated based on the network archive name.

The following Python snippet shows how the function can be used:

```
# Extract the PSS SINCAL network archive
DBMgr.ExtractSINX("C:\Temp\Example Ele1.sinx")
```

API of the Calculation Methods

Determine Connection Points

The new API function GetConnectionPoints() enables you to search for possible connection points in the network model within a specified radius (distance) of an already modeled node or any geographical position. This means that even without the intermediate step of first inserting a new node and node element (if not already available), you can still perform a high-performance search for candidates for the connection point.

This function can only be used in geographical network views, as the geographical positions of the network elements are required for distance calculations.

The function returns an array. Each row of the array contains a potential connection point with the corresponding data fields. Depending on the parameterization of the function, only existing network nodes or additional positions along lines where a new node (e.g., a new station) can be inserted are output.

Note: The InsertNetpoint() function can also be parameterized directly with these values.

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 from node [km]
[5]	Percent (Element)	Double	Distance from the node in [%] of the total element length
[6]	ConnectionPos.X	Double	Connection point X [km]
[7]	ConnectionPos.Y	Double	Connection point Y [km]

The following Python snippet shows how the function can be used:

```
# Determine all possible connection points for Node *NEW_PV_PCC*
DS.SetParameter("GraphicArea", "GeographicSLD-GIS")
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, "*NEW_PV_PCC*")
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]

# Determine all possible connection points for a x,y position (no node modelled there yet)
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
```

Insert Netpoint

The API function InsertNetpoint() enables the automated insertion of new network nodes along an existing line element.

The following Python snippet shows how the function can be used:

```
# Insert network node for line L_20
DS.SetParameter("NetworkLevel", "0.4kV")

line = DS.GetCommonObject("Line", "L_20")
node = DS.GetCommonObject("Node", "Node_11")
new_node = DS.InsertNetPoint(line, node, 50.0)
if new_node:
    strName = new_node.GetValue("Name")
    print(f"{new_node.RowId}: {strName}")
```

License Expiration Date

The API function GetLicenseExpiryDate() can be used to determine the expiration date for a calculation module.

The function returns the expiration date for the specified module in ANSI date format "YYYY-MM-DD". If no expiration date is assigned, an empty string is returned.

The following Python snippet shows how the function can be used:

```
# Check license state and expiry date
iState = Simulation.CheckLicense("El", "LF")
if iState == 0 or iState == 5:
    strExpiryDate = Simulation.GetLicenseExpiryDate("El", "LF")
```