What's New in PSS®SINCAL 12.0

With V12.0 of the PSS SINCAL Platform several improvements have been implemented. The most important enhancements are:

New XML Symbol Files
Since the beginning of PSS SINCAL, the symbols of network elements, additional elements and protection devices are saved in external files so that they can be adapted easily. The symbol files have been converted to a new flexible XML format which can be processed well both manually and automatically. The new XML format is based on the format used by the Model Editor in PSS NETOMAC.

Additional Information for Network Elements
PSS SINCAL makes it possible to store additional information for network elements and nodes, in order to maintain information for which there are no attributes in the data model. The additional information was previously limited to short names (50 characters) or numerical values. The new product version now converts the additional information to variable text fields and now enables longer items of information to be stored easily. The field is available both in the Node table as well as the Element table. It can therefore be accessed quite easily for evaluations because no other lookups/joins are required with queries.

Enhanced Feeder Determination
The new option Consider only Primary Substations is now provided for determining feeders. This makes it possible to set whether all substation containers are to be considered in the network or only those that are marked as "primary substations".

The second new Consider establishment/shutdown date option allows feeders to be determined by date.

The functions for the Allocation of feeders to substations were likewise enhanced. If a feeder is connected to several substations, preference is given in the allocation to transformer substations. When substations have equal status, the substation with the higher rated voltage is allocated.
Checking for Radial Network Structure
A new function is provided in the user interface that makes it possible to check whether the network is radial. The function can be started via the menu item **Tools – Check – Check Radial Network**.

Enhanced Voltage Curve Diagrams for Substations
The voltage curve diagrams in PSS SINCAL are generated if required for a manually predefined route or for a node marked as a "transformer substation". The algorithm was also enhanced so that all feeders of the substation can be viewed in a voltage curve diagram. If required, the generation of individual diagrams can be activated for each feeder with a special registry switch.

New Calculation Procedure for Transfer Capacity According to ENTSO-E
The new calculation procedure is used to determine the transfer capacity between different network areas. The calculation algorithm is based on the ENTSO-E method: "Definitions of Transfer Capacities in Liberalized Electricity Markets".

The calculation of the transfer capacity consists of a series of load flow calculations. In each individual load flow calculation the active power of the incoming supplies varies in order to ensure a transfer between two network areas.

The results include all the relevant data (TTC, NTC, TRM etc.) for the transfer. The illustration on the left shows the most important ENTSO-E parameters for the different phases.

The **Consider malfunctions in transfer areas** option activates the contingency analysis. This enables the transfer to be possible even if an element fails.

The results of the transfer capacity are provided in the result view, the tabular view and the data screen forms in order to enable a wide range of different analyses and evaluations. The illustration on the right shows the result view with the calculated transfer capacity.
Enhanced Functionality for Verifying Connection Conditions

The most important innovation here is the Check According to NER Australia (IEC 61000-3-6/-7).
New Network Planning Tool for Line and Transformer Sizing

PSS SINCAL now offers a new network planning tool for line and transformer sizing. Some types are selected from a preselection of standard types that best meet the requirements in the network.

In order to start the equipment sizing, a line or a two-winding transformer must be selected. The menu item Tools – Determining Data – Equipment Sizing is then activated. The wizard for line sizing or transformer sizing then appears, depending on the element selected.

The standard types to be considered for the sizing of the equipment are selected at the beginning. It is also possible to enter a configuration file in which all settings are saved.

These defined control parameters are used to determine from the standard types those meeting the requirements. The standard types are arranged so that preference is given to the ones with the closest fit (which are normally the most economical ones).

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A standard type can now be selected from the selection list and assigned to the selected network element.

![Figure 6 - Menu for Equipment Sizing](image-url)
Enhanced Control in the Load Flow

If a network structure has many variably controlled elements, these elements often interact with each other very much. One solution to this problem is to combine controllable elements into groups. The control group is already provided in the data model of PSS SINCAL. This function is fully retained but the control group is now also used to define the association and dependency of controllable elements.

Generic Element

The new generic element is designed to ensure that network elements with a variable number of connections and a special internal behavior can also be simulated in PSS SINCAL.

The diakoptics implementation already available in PSS SINCAL was extensively enhanced for this purpose. Previously, the diakoptics implementation enabled any models containing subnetworks as well as control structures to be allocated to branch and node elements. The diakoptics model is processed here by the dynamic simulation and the rest of the network in the PSS SINCAL load flow. However, the two subnetworks are not solved separately but together within the load flow iteration.

Any complex diakoptics model can be created which simulates the behavior of a complete subnetwork with any number of terminals. For example, this can be an HVDC+ to the control power transfer, a complete MicroGrid system or any other system.

PSS SINCAL calculates the existing terminals on the basis of the model used and generates the appropriate boundary nodes. As with a substation, these are assigned to the generic element. The network elements can then be assigned at the boundary nodes. This creates the connection between generic element and PSS SINCAL network model.

The diakoptics models can only be used in the load flow calculation and in the dynamic simulation. A substitute simulation can therefore be defined at each boundary node for the short circuit and harmonics calculation. With these calculation procedures, the network model ends at the boundary nodes and the substitute simulation is used. For the short circuit calculation these are the feed power in the event of a fault as well as the decay behavior, as for the generator. A current and voltage source is provided for the harmonics calculation.
Min/Max Results for Load Profile Calculation

With load profile calculations over a long period it is often useful to find out when the maximum loads of elements and largest voltage drops on nodes take place. To simplify this and also make it possible for large networks, PSS SINCAL has integrated the new Load Profile (Maximum) calculation method. This performs a fully normal load profile calculation in which, however, the results are evaluated in a special way:

- For network elements the result of each calculation time is provided at which the load of the element is highest.
- For nodes the result of each calculation time is provided at which the voltage at the node is the lowest.

Enhanced Simulation for Autotransformers with Compensation Winding

The autotransformer with a compensation winding is modeled in PSS SINCAL with a three-winding transformer. With an autotransformer with a free neutral point the star equivalent circuit fails in the zero-phase sequence.

As each phase has the same properties in the symmetrical zero-phase sequence and can be considered as four phase, the modeling problem can be eliminated with an equivalent circuit using a "resonance triangle".

Parallel Calculation for Contingency Analysis and Reliability

The Contingency Analysis and Reliability calculation methods were enhanced so that they support parallel calculation. The calculation is divided here into several processes that solve the problem simultaneously.

Depending on the calculation method and network, PSS SINCAL decides whether parallel processing is viable and then uses the preset maximum number of processes.

The possible increase in speed depends on many factors, starting with the capacity of the computer used right through to the structure of the network. However, the resources provided are generally better used with parallel processing. For example, because of optimization in the calculation methods and parallel processing, the calculation time for contingency analysis in a typical medium voltage network with 25,000 nodes and 32,000 network elements is reduced from 560 seconds in version 11.0 to 90 seconds in version 12.0 when using 4 parallel processes.

Enhanced DINIS Import

In response to feedback from users, the DINIS import function was enhanced. Substations with network elements can be modelled in DINIS. The substations, however, create an additional structuring in the network which offers many possibilities: Feeder analysis, enhanced voltage curve diagrams, evaluations,
structuring in the network browser, enhanced updating etc. The substation data is therefore now also imported from the DINIS data structures and the nodes and network elements are allocated to these substations.

A new function is provided for importing the graphic data, which imports the substations in the form of "tiles" in their own schematic views.

**PSS E 34 Import and Export**

The PSS E import and export functions in PSS SINCAL have been enhanced. PSS E networks can now be imported and exported in format 34.

The majority of changes result from the new node/breaker model of PSS E 34. This allows substation-based network modeling. The node/breaker model is designed so that it can be used as required but does not have to be used in all cases. An option is therefore provided in the PSS E import wizard which can be used to define whether the data is to be imported with or without the node/breaker model.

The system wide data is also a new feature in the RAW file. PSS E calculation settings are stored here which were previously only available in the binary SAV file. The import transfers this data to the Global Settings (GlobalSetting).

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**Enhanced CIM Import and Export**

Siemens has received an attestation by the ENSO-E which documents that PSS SINCAL can handle data conformly to the standard prescribed by ENTSO-E (see official website).