

PSS[®]SINCAL

Basic Modules

Basic Modules for Planning and Managing Operations in Electrical Networks

These calculation methods are used for planning, designing and managing operations in electricity transmission and distribution networks as well as industrial networks. Networks examined in this way can be as complex as you want.

The following basic modules are available:

- Load Flow Balanced
- Load Flow Unbalanced
- Short Circuit 3-Phase
- Short Circuit 2-Phase and Ground Circuit 2-Phase
- Ground Circuit 1-Phase

Load Flow Balanced

The balanced load flow is an effective tool for calculating operating conditions in electrical networks. This calculation method determines the power flow from the generators – through lines and transformers – to the power consumers.

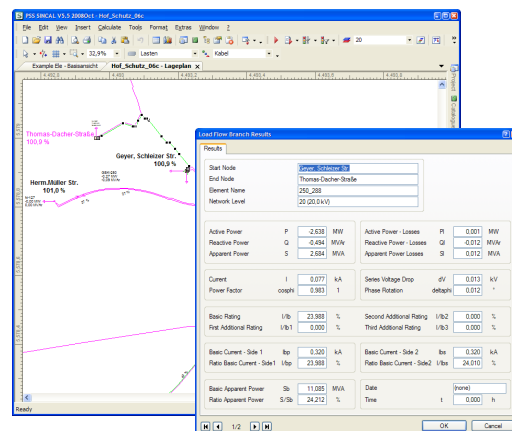


Figure 1: Branch results after load flow calculations

In PSS[®]SINCAL, different kinds of algorithms are available to solve the load flow problem (Current Iteration, Newton Raphson and Admittance Matrix).

Particular emphasis has been placed on their robustness of the load flow procedure when it is implemented. Load flow problems can be solved under the most difficult conditions such as multiple feeders, generators and transformer controllers, poor supply voltage, etc.

Functional characteristics of the load flow calculations

- Load flow calculations are appropriate for all electrical networks. PSS[®]SINCAL can simulate transmission and distribution networks as well as industrial networks.
- Load flow calculations can handle more than one isolated network at the same time.
- Any number of infeeders and generators are supported.
- Voltage controllers can calculate the optimal tap position while automatically taking into account voltage ranges.
- Load flow can handle phase shifting transformers.
- Permissible operating ranges (P/Q) can be defined for generators and infeeders. PSS[®]SINCAL can also use a prescribed zone exchange power to calculate power transfer between different network areas.
- Establishment and shutdown dates can be defined for any equipment considered by the load flow calculations.
- PSS[®]SINCAL load flow supports different load types.

Siemens PTI – Software Solutions

Answers for energy.

SIEMENS

Load Flow Unbalanced

Unbalanced load flow calculations are enhanced symmetrical load flow calculations. Just as in balanced load flow calculations, the unbalanced load flow calculates the flow of power from the generators – over lines and transformers – to the power consumers. In this case, however, the calculations are done for individual phases.

The network is still created and displayed as a one-phase network. Only the connection type is defined to create an unbalanced network.

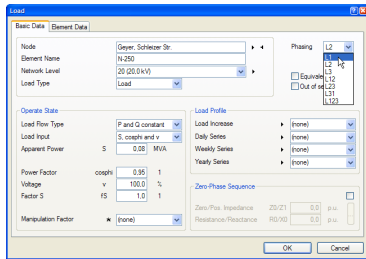


Figure 2: Selecting a phase for a load

For enhanced unbalanced network element modeling, you can enter negative- and zero-phase sequence data in addition to the positive-phase-sequence data.

PSS®SINCAL prepares the results of the unbalanced load calculations (currents, voltages) for individual phases. The results for nodes and terminals also show the symmetry factor.

Short Circuit

Short circuit calculations are required for assessing the correct ratings for the network (maximum fault currents) and also for protection coordination (minimum fault currents).

PSS®SINCAL can calculate one-phase ground faults, two-phase short circuit and ground faults, as well as three-phase short circuits for individual nodes or entire subnetworks. This means the current distribution in the network can be determined for any fault condition.

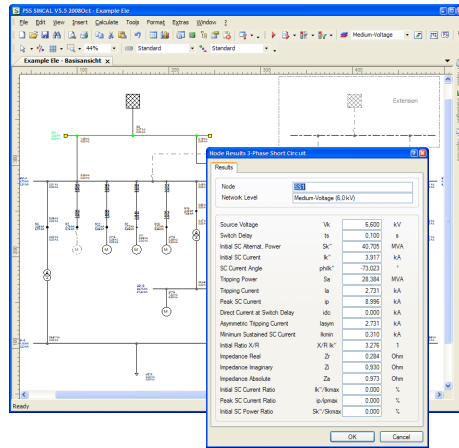


Figure 3: Node results for a three-phase short circuit

PSS®SINCAL calculates electricity values for current, voltage and power for one-, two- and three-phase short circuits according to the following standards:

- VDE 0102/1.90 – IEC 909
- VDE 0102/2002 – IEC 909/2001
- IEC 61363-1/1998
- ANSI
- G74
- With preload

Even though the method of calculation based on relevant standards is the most popular way to ascertain the correct ratings for networks, the load flow superposition method is actually a better way to determine minimum fault currents. This is especially the case when the fault current is in the same order of magnitude as the load current.

Key features of short circuit simulation:

- Calculations with symmetrical components
- Arc impedances can be considered
- Key values are I_k , i_p , I_a , S_k , U_0 , Z_0/Z_1

- I_p can be calculated either according to radial or meshed networks or the equivalent frequency method
- Block generators are implemented according to the standards in two different ways (two simple elements with additional data or only one combined element "generator unit")
- Neutral grounding
- Phase shifts in transformers
- Calculations through out all network levels at the same time
- Calculations of all currents and voltages in the whole network for a single fault location
- Calculations of faults at every node in specified network levels simultaneously
- Various reports for all nodes, all fault locations and all network levels
- Network graphics colored according to calculation limits e.g. 1-sec current for lines or short circuit currents at the busbars

Calculation Results

The results of all the calculation methods are stored directly in the PSS®SINCAL network database. If you want, these results can be displayed in the network diagram. For enhanced evaluations, data screen forms and Tabular View are also available. PSS®SINCAL can even provide some special results as diagrams (e.g. for voltage curves).

All the calculation methods have predefined reports to let you document input data and calculation results in detail.

You can even use your own programs to write and evaluate the results in the database at any time.

Published by and copyright © 2009:
Siemens AG
Energy Sector
E D SE PTI
Freylebenstrasse 1
91058 Erlangen, Germany

www.siemens.com/energy/power-technologies

Siemens Energy, Inc.,
Power Distribution, T&D Service Solutions
Siemens Power Technologies International
400 State Street
PO Box 1058
Schenectady, NY 12301-1058

Siemens Transmission and Distribution Ltd
PTI
Sir William Siemens House, Princess Road
Manchester, M20 2UR
United Kingdom

For more information, please contact
our Customer Support Center.
Phone: +49 180 524 70 00
Fax: +49 180 524 24 71
(Charges depending on provider)
E-mail: support.energy@siemens.com

Power Distribution Division
Printed in Germany
Printed on elementary chlorine-free
bleached paper.

All rights reserved.
Trademarks mentioned in this document
are the property of Siemens AG, its affiliates,
or their respective owners.
Subject to change without prior notice.
The information in this document contains general
descriptions of the technical options available,
which may not apply in all cases.
The required technical options should therefore be
specified in the contract.

SWSC04-EN-200905