

# UDM Editor™

## User-Defined Model Editor

### Product Features

- Fully graphical interface to build models
- Function block and connectivity based UDM approach
- Supports a wide range of dynamic models
- Comprehensive library of math functions, control functions, input signals, and physical device models as well as capability to use custom functions provided by users
- Models are accepted directly by TSAT and SSAT with no additional compilation

Powertech's DSATools™ is a powerful suite of software programs for power system security assessment. One of the major modeling features in DSATools™ for dynamic analysis (TSAT and SSAT) is its user-defined modeling (UDM) capability. UDM Editor™ is a tool designed exclusively for building user-defined models for use in dynamic analysis.

UDM Editor™ incorporates features and functions to allow the smooth and efficient creation of UDMs in a graphical environment. The resulting models are accepted directly in TSAT and SSAT without the need to go through additional programming and compilation processes.

### Modeling Capabilities

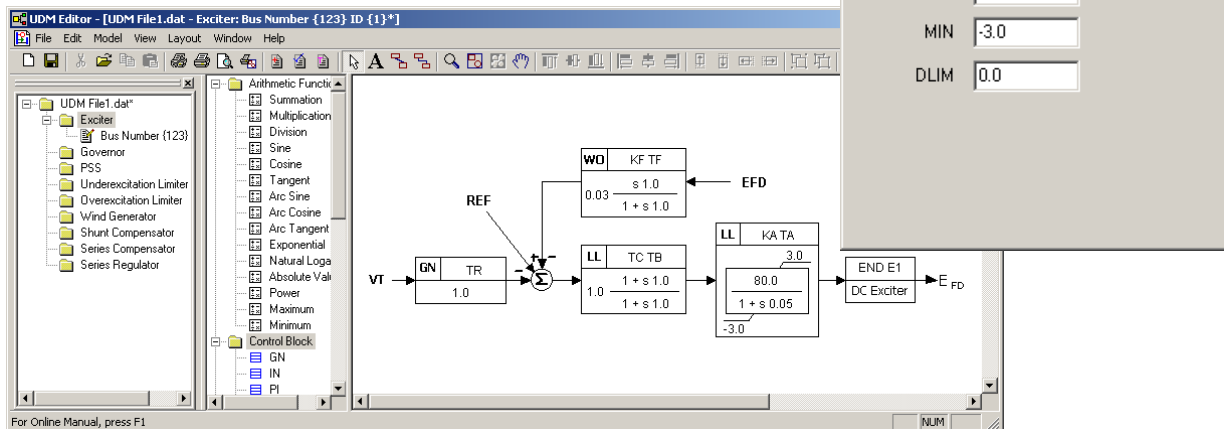
UDM Editor™ can be used to create all types of UDM supported by TSAT and SSAT, including

- Generator controls, such as exciter, governor, PSS, over-excitation limiter, and under-excitation limiter.
- Wind generator model and controls, including conventional and doubly-fed induction generator (DFIG) models.
- FACTS, such as SVC, STATCOM, TCSC, SMES, UPFC, etc.
- HVDC and controls, including converter-based FACTS devices.
- Relay and special protection systems (SPS).

Typical models are available for each model type in the model template library to provide starting point for building a custom model.

A UDM is created using a function block and connectivity based approach. UDM Editor™ provides a comprehensive library of math functions, control functions, input signals, and physical device models for use in building UDMs. The user can also supply custom function blocks written in C/C++ in form of DLL to be included in a UDM as Dynamically Linked Block (DLB).

Once a UDM is created, validation can be performed to ensure that the model meets TSAT and SSAT requirements.



## Main Features

- Full graphical interface with drag-&-drop approach to create UDM.
- Automatically create model block diagram for existing UDM.
- Text, edit, layout, and other graphics arrangement tools.
- Extensive on-line help facility on UDM information.

## Other Powertech Services

- Evaluation of transfer capability and security limits
  - Powerflow analysis
  - Transient Stability analysis
  - Small-Signal Stability analysis
  - Voltage Stability analysis
- Post-mortem analysis of system disturbances
- Frequency control assessment
  - Islanding studies
  - AGC & governor performance
  - Design and evaluation of under-frequency load-shedding schemes
- Increasing transfer capability
  - Control-tuning and design
  - Load shedding schemes
  - Reactive compensation planning
  - Special protection system design and verification
- Assessment of planning alternatives
- Custom modelling & dynamic model reduction
- Reliability Assessment of power systems
- Generator field testing, model development & validation
- Load characteristic measurement and model development

## Partial list of basic building functions/models/signals in UDM library:

- Input signals
  - Local signals (model dependent): quantities from buses, generators, and branches
  - Remote signals: quantities from buses, generators, branches, interfaces, shunts, loads, and converters
  - Connecting signal: PSS, OEL, UEL
  - Other: reference value, time, constant, base MVA and frequency
- Arithmetic functions
  - Summation/multiplication/division
  - Trigonometric functions
  - Exponential/logarithm
  - Absolute value
  - Power
  - Maximum/minimum
  - Logical operations
- Control functions
  - PID
  - Lead/lag with non-windup limit
  - Linear state space model
  - Time switch
  - Logical controlled switch
  - Non-linear function (lookup table)
- Control functions (continued)
  - Transfer function (no limit)
  - Digital controller
  - A/D converter
  - Hysteresis
  - Timer
  - Counter
  - Deadband
  - Rank
  - Group
- Physical device models
  - DC, AC, and static exciter
  - Hydraulic, steam, gas, wind turbine
  - Thyristor-controlled reactor/capacitor
  - Thyristor-controlled braking resistor
  - Thyristor-switched reactor/capacitor
  - Thyristor-controlled series compensator
  - Static series synchronous compensator
- Switching functions for relay/SPS
  - Trip branch, generator, load, motor, SVC, or shunt
  - Reconnect/Add/Modify branch
  - Outage bus
  - Block converter

In addition to extensive power system study capabilities, Powertech has a \$50 million lab and test facility which includes high voltage, high current, and high power labs, as well as capabilities in hydrogen technologies, chemistry, metallurgy, and materials engineering.

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