TRNSYS*lite*

User interface for an easy, quick and reliable simulation of a single building zone

1. What is TRNSYS*lite* for?

In the planning process and evaluation of innovative energy concepts simulation of buildings and systems gets more and more important. With the internationally well-known software package TRNSYS 16 dynamic building and system simulations with very high complexity can be accomplished. However due to the modular structure and the high flexibility of TRNSYS 16 simple building simulations with only one zone, like e.g. in the competition consultation or in the concept design phase of buildings, were so far relatively complex.
I
n order to speed up the performance of such simple building simulations significantly, the new TRNSYS*lite* for TRNSYS 16 was developed. TRNSYS*lite* is a very useful tool for both experts and beginners. The main characteristics of TRNSYS*lite* are:

- Reduction of the required input using standard values entered in a single interface data
- Clear input documentation
- Automatic creation of output files and diagrams for temperatures and heat flows
- Simple creation and management of concept variations
- Project files can be imported to TRNSYS 16 for further simulations

TRNSYS*lite* is also an effective tool for teaching. With TRNSYS*lite*, engineering and architecture students can study the thermal behaviour of building designs at an early stage. At the same time, they can experience integral planning processes firsthand.

Note:
TRNSYS*lite* is an add-on to the TRNSYS package for TRNSYS users. It isn't a stand-alone tool.

2. Features

The current version of TRNSYSlite is a 32-bit application for TRNSYS 16. The following features are included:

- Definition of a thermal zone with any amount of walls/windows
- construction catalogue with common pre-defined components
- library of common glazing systems
- a thermally-active building element (TAB), such as concrete core heating/cooling or slab heating/cooling
- outdoor or indoor shading devices
- integral shading (overhang, wing wall)
- thermal loads
- air heating
- various strategies for air cooling
- Intelligent control strategies
- Movable shading and artificial lighting control depending on solar radiation
- Demand based control of the air heating period and the heating / cooling period of the thermo-activate element
- Natural stack ventilation
- Comfort evaluation acc. to EN ISO 7730
- Clear input documentation
- Meteorological data library of cooling load zones defined by VDI 2078 for the calculation of a two-week extreme period
- simulation with userdefined meteorological data
- Management of concept variations
- Automatic graphic output of temperature and heat flow diagrams
- Temperature, loads and comfort statistics
- Student version (for universities only)
- English and German version

Note:
TRNSYS*lite* is a user interface for a licensed TRNSYS 16 package. The simulation engine TRNSYS 16 is **not included** with TRNSYS*lite*

3. Input of a building simulation with TRNSYS*lite*

With TRNSYS*lite* a user friendly input interface is available, which gives assistance by appropriate references, default values and value ranges. Depending upon type of use of the object (living or office building) default value schedules for the internal heat loads are suggested automatically. Those schedules of course can be changed if the user has more exact information about heat loads. For the building management data can be defined for heating, ventilation, cooling and shading (see fig. 1). The variable sun protection device can controlled the ambient temperature or the radiation on the facade.

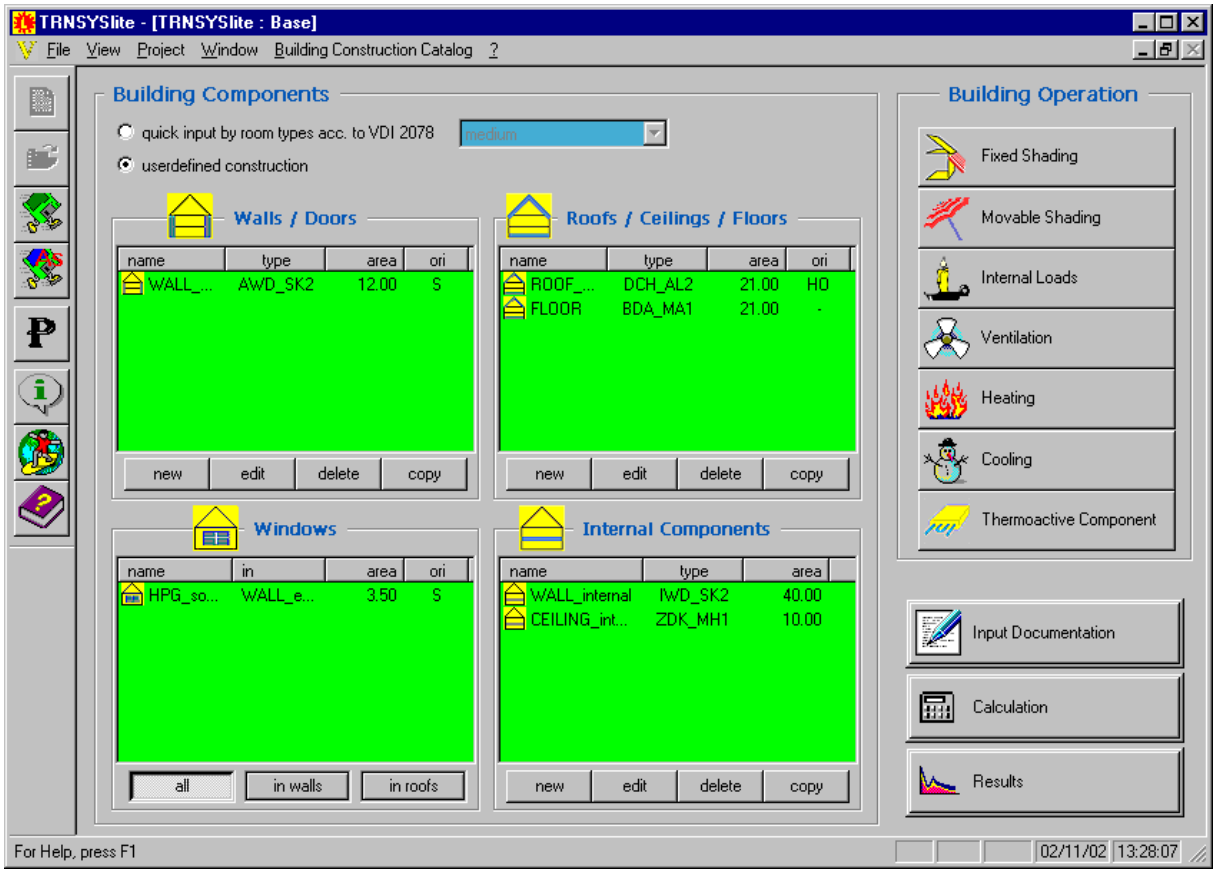


Fig. 1 - Main input mask of TRNSYS*lite*

A integrated building construction catalog of approximately sixty selected wall constructions makes it easy to define a new building. The complex input of a wall with different layers is reduced to the selection of a suitable type of construction and the input of the desired insulation thickness. The construction catalog is documented in detail in the manual.

Beside normal constructions also a so-called Thermal Active Building element (short TAB) can be selected in TRNSYS*lite* (see fig. 2). For ceiling, roof and internal slab a thermoactive layer can be defined (the pipe system is situated in the middle of the concrete layer). For floors the setting of a floor heating is possible. (the pipe system is bedded on a insulation layer). The definition of the TAB parameters is kept simple.

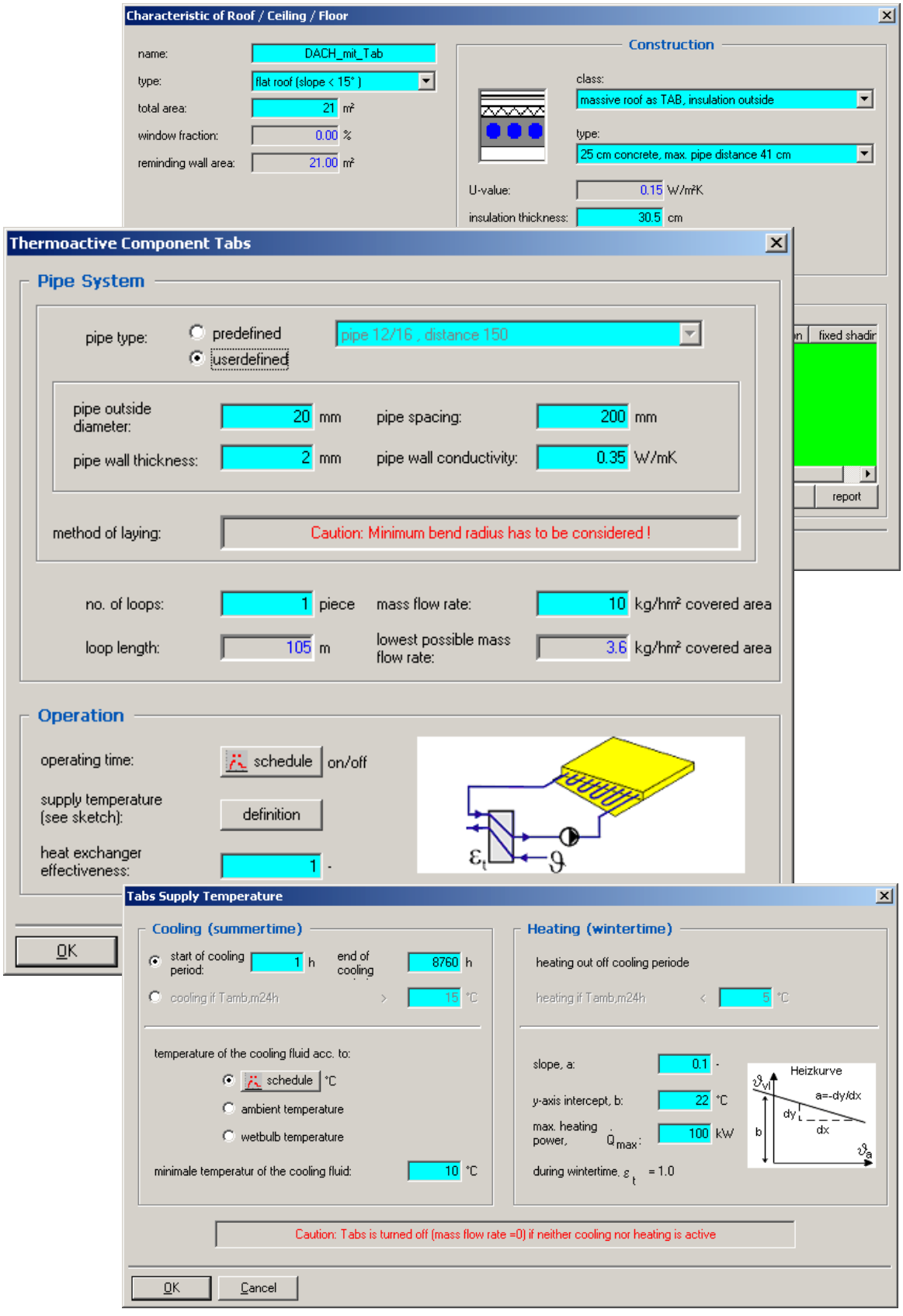


Fig. 2 - Input of a thermal active building element in TRNSYS*lite*

The building operation like heating, cooling, ventilation, infiltration and shading is defined by user-friendly interfaces. Depending on the object (office or housing) standard values for internal loads are proposed. Of course, these standard values can be modified by the user.

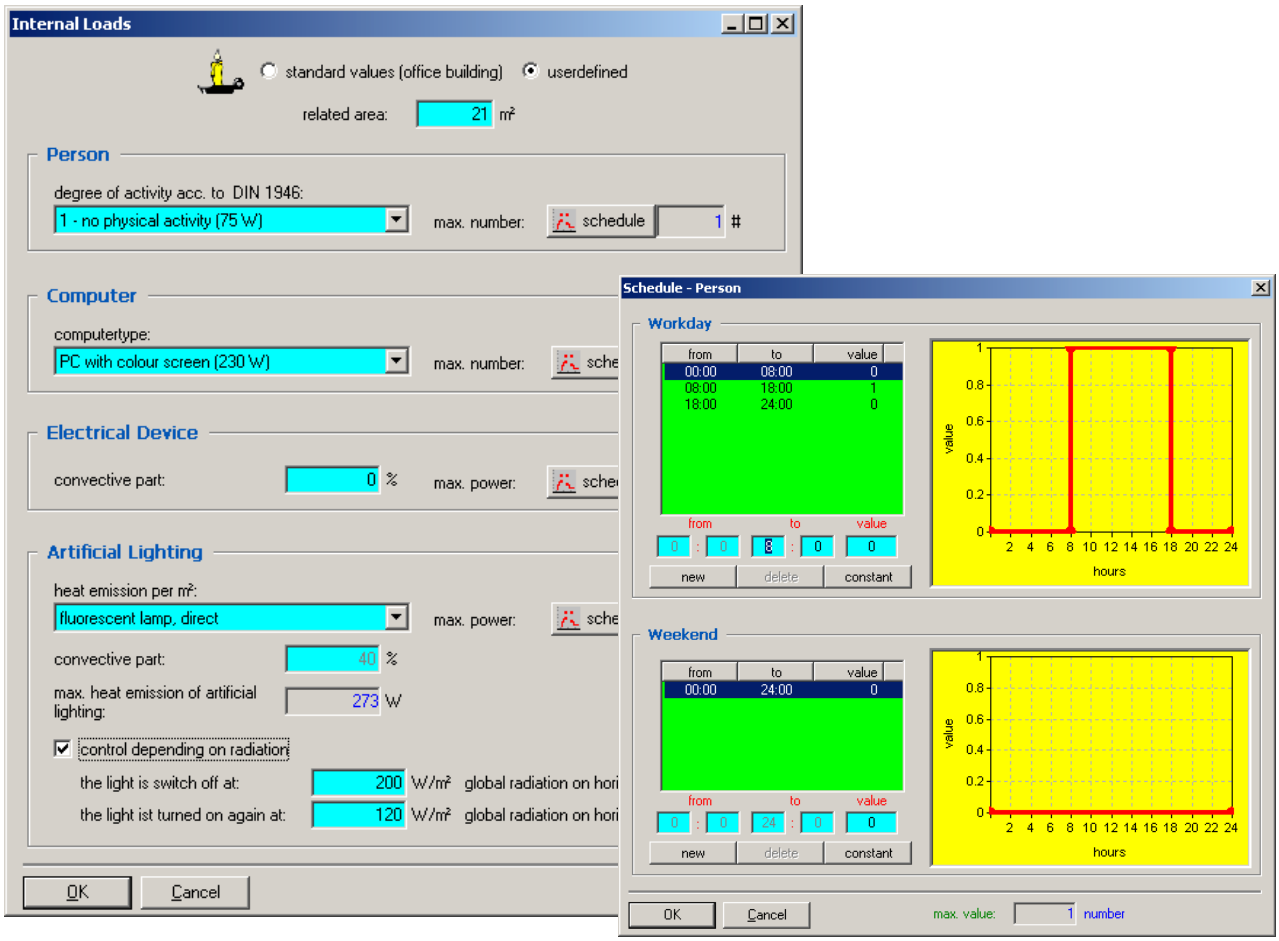


Fig. 3 – user defined input for internal loads

For movable shading different control strategies depending on radiation or temperature can be applied for each facade orientation.

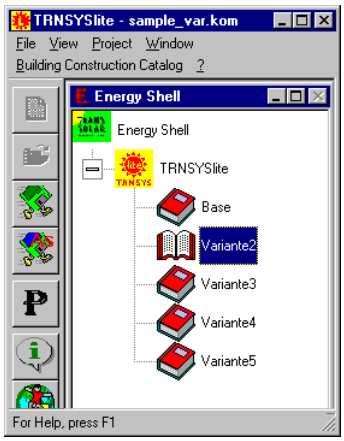
In addition, TRNSYS*lite* performs a comfort evaluation according to EN ISO 7730.

For checking the input and getting an overview over the input data a printable input documentation is available.

The behaviour of a building during a hot summer period simulations can be simulated according to the German VDI 2078. A yearly simulation can be accomplished for an arbitrary location. Used meteorological data files require a special header. A description of the data format of the header is given in the manual.

Automatically, TRNSYS*lite* generates all files required for the simulation and starts the simulation with TRNSYS.

4. Variants with TRNSYS*lite*



Building simulation mostly is used to optimise thermal comfort and energy demand of a buildings. Therefor variants have to be computed, whose pro and cons in all aspects must be taken into account. In TRNSYSlite a variant administration is contained, which makes it very easy to examine several variants within a project. Variant can be made very fast and simply by copying an existing variant. For checking and documenting all entered data a clear printable input documentation is available.

Fig. 4 - Variant administration in TRNSYS*lite*

5. Results of TRNSYS*lite*

During the simulation all outputs can be looked at in a online window. Additionally the results are printed into a ASCII-file.
An additional graphic program called TRNGRAPH is included in the TRNSYSlite package. This program is very useful for visualisation of the results and for the comparison of variants and. It allows to create all kind of statistics. Beside others, the following results are available:

- Outside temperature
- air temperature of the room
- Operative room temperature
- Inlet temperature of TAB
- Return temperature of TAB
- Core temperature of TAB
- Surface temperature of TAB·
- Specific radiation data for different orientations
- Losses / gain due to ventilation
- Heating energy demand
- Convective cooling power (latent/sensible)
- Energy demand TAB system (cooling/heating)
- Internal convective gains
- Internal radiative gains·
- Transmitted solar radiation by all windows
- Comfort evaluation (PMV,PPD)

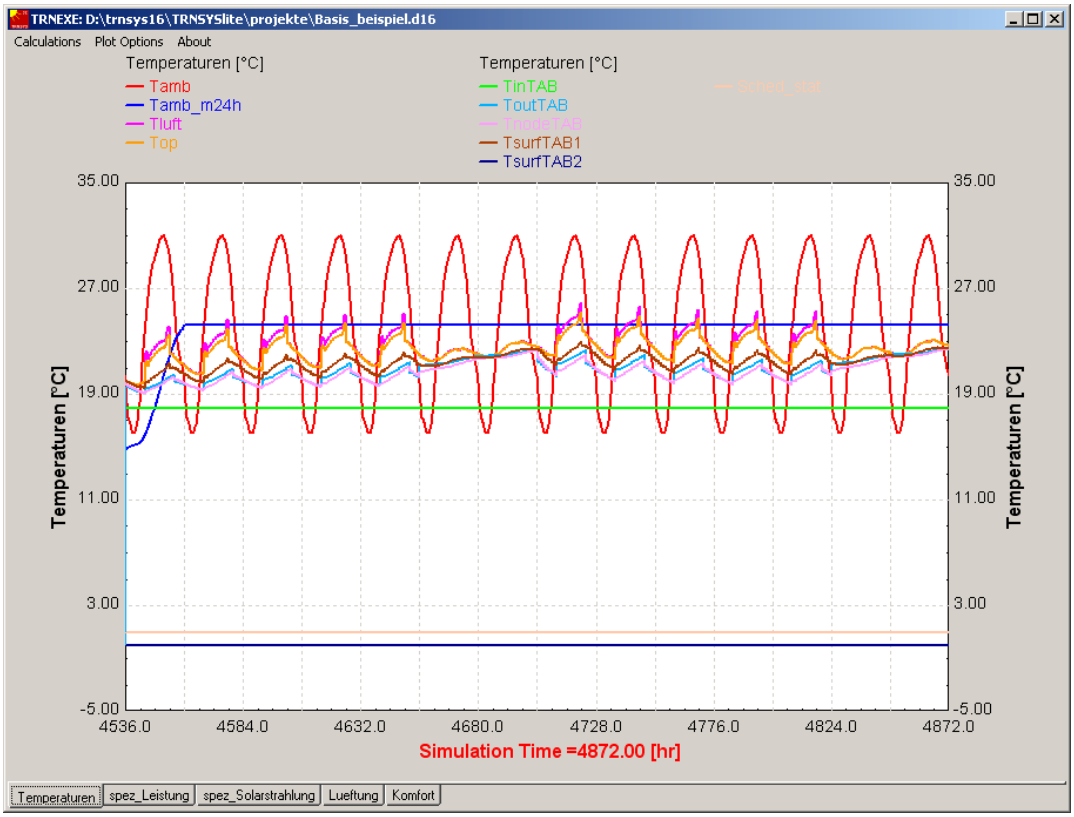


Fig 5 – Temperature plot online during the simulation

6. Link between TRNSYS*lite* and TRNSYS 16

TRNSYS*lite* generates the project files Bui and DCK needed for TRNSYS simulations. Therefore, it is easily possible to carry out a simple simulation with TRNSYS*lite* and then continue with TRNSYS as things get more complex.

7. Summary

TRNSYS*lite* is an interface for TRNSYS 16 which allows the user to make fast and easy dynamic simulations of a thermal zone. TRNSYS*lite* is not only a great enhancement for beginners in building simulations, but represents also an enormous assistance for experts during the variant formation and concept design phase. TRNSYS*lite* is developed by TRANSSOLAR. Further information about how to order TRNSYS*lite* as well as a demo version are available under **http://www.trnsys.de**. Please, do not hesitate to contact us

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