THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 1

4.9.3

Applicable User Manual: v4.9

Modifications:

➢ It is now possible to export any real or integer user entities and Thermisol variables in h5 file. This can be done by adding the name of the user entity in the H5_RES0 or H5_RES1 Thermisol control variable. Adding 'VAR' in H5_RES0 or H5_RES1 variable allows to store all the real and integer user variables (defined in the $VARIABLES block) at the initialization (for H5_RES0) or during the whole simulation at the time frequency given by H5_FREQ (for H5_RES1). See the Thermisol User Manual for more details and example.

➢ Fixed an incorrect output in the temp.out file. The NRLXCC (node at which the maximum temperature change has been obtained) was wrong when it was an EDGE node.

```
MODULE SOLVFM
LOOPCT =          14  (NLOOP  =       100)
ENBALA = 0.00090413  (INBALA =       0.1)
ENBALR =  0.0038813  (INBALR =       0.1)
RELXCC = -5.1447e-05  (RELXCA =    0.0001)  at node -1717986918 in model
```

The node number is now output correctly.

```
MODULE SOLVFM
LOOPCT =          14  (NLOOP  =       100)
ENBALA = 0.00090413  (INBALA =       0.1)
ENBALR =  0.0038813  (INBALR =       0.1)
RELXCC = -5.1447e-005  (RELXCA =    0.0001)  at node 704 in $EDGES
```

➢ It is now possible to perform a complete Thermisol calculation (without error) from file (dck or sysprc) containing a space character in its name. However, it is always advisable to avoid spaces.

➢ Fixed a bug that generated NaN values when using RCN method with parametric couplings and materials with zero conductivity.

➢ Increased number of maximum user entities defined in the DCK file from 10 to 100.

➢ Fixed a bug that split an if loop into two subroutines when generating fortran code with Thermisol.

➢ Fixed a bug that made it impossible to modify labels using macros.

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 2

4.9.2P1

Applicable User Manual: v4.9

Modifications:

➢ It is now possible to export any real or integer user entities and Thermisol variables in h5 file. This can be done by adding the name of the user entity in the H5_RES0 or H5_RES1 Thermisol control variable. Adding 'VAR' in H5_RES0 or H5_RES1 variable allows to store all the real and integer user variables (defined in the $VARIABLES block) at the initialization (for H5_RES0) or during the whole simulation at the time frequency given by H5_FREQ (for H5_RES1).

See the Thermisol User Manual for more details and example.

4.9.2

Applicable User Manual: v4.9

Modifications:

➢ The libsolver is now built in 64bits on Linux and Windows.

➢ Create a new Thermisol subroutine GETCSG(Node) to get the CSG value of any node in the dck file (see Thermisol User Manual for more details).

Corrections:

➢ Fixed a crash of Thermisol when running SOLCYC solver with SPLIT option.

➢ Fixed a bug concerning interpretation of lines starting with C in the .dck file. Some capacitance assignments were interpreted by Thermisol as comments whereas it should not.

➢ Fixed a bug on the SCYCLE routine (the convergence criteria were not applied on all the specified nodes if the Znode includes submodels).

➢ Fixed a crash of Thermisol when calling SOLVFM on a thermal model including GF between two diffusive nodes.

➢ Fixed a crash of Skeleton module when using several user files.

4.9.1

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 3

Applicable User Manual: v4.9

Modifications:

➤ Improvement of Thermisol calculation performances on Linux for TMM with a large number of GL and/or GR

➤ New heater routine STEADYQR provided for steady-state cases (see User Manual for more details)

➤ Fix of SCRANK solver so that when there are two events of different types at the same time $OUTPUTS is correctly executed

➤ Fix of SCRANKAUTO so that time values are correctly stored in H5 file (there was one time step difference) and time step cannot drop below DTMIN.

4.9.0

Applicable User Manual: v4.9

No modifications.

4.8.3P3

Applicable User Manual: v4.8

Corrections:

➤ Bug fix on the SOLCYC routine (the Znode selection could be wrong of other functions using a Znode as argument were called during the simulation). **Note that this bug fix is available in 4.8.3P3 version and in 4.9.1 and later but it is not included in 4.9.0 version.**

4.8.3P2

Applicable User Manual: v4.8

Corrections:

➤ Bug fix on the SCRANKAUTO resolution routine (correction of the auto time step computation).

4.8.3P1

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 4

Applicable User Manual: v4.8

Corrections:

➢ The node surface values are now written with %.6E format in the nod.nwk file to avoid that the TSINK routine of Thermisol generates NAN values because of a lack of precision.

➢ Creation of a new entry icon "GF" for the Skeleton module box (in the processing tab of the GUI). This entry icon allows connecting directly the Convection module to the Skeleton module. **Because of this new entry icon, Systema does not ensure down compatibility on processing files (capacity to open files from previous versions). It is mandatory to rebuild the old processing files.**

➢ The skeleton module now generates the correct command in the .dck file to export the user variables in the h5 file (VAR in H5_RES0 and H5_RES1).

➢ Bug fix in the SDS/HDF5 library (h5 close on Windows)

4.8.3

Applicable User Manual: v4.8

Corrections:

➢ Correction of the INTCYC routine. The interpolation was wrong when using order 2 (quadratic interpolation).

➢ Correction of the FLUXMR routine. The calculation of radiative exchanges with this routine was wrong.

➢ Correction of the FBAND routine (used in the EPSWLBEF routine). Parentheses were missing.

➢ Correction of a bug when using the –i option (include expansion) in command line. No .dck file was created.

4.8.2

Applicable User Manual: v4.8

Corrections:

➢ Cyclic interpolation routines now calculate an average value of the tables when performing a steady-state analysis (bug fixed for INTRP1 and INTERP routines which no longer calculate an average value).

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 5

➢ Model names containing numerical characters are now well interpreted and compatible with the library.

➢ Correction of GF management: GF reading and reversal index issues.

4.8.1

Minor features:

➢ Power solver memory leak solved

➢ GRPMIN/GRPMAX functions corrected

➢ Variable capacitance: more accurate numerical integration

4.8.0

Major features:

➢ Variables h5 export option: It is now possible to store the variable values in the h5 output

➢ Export of all Power Add-On data in the h5 output (voltages, component parameters and currents)

Minor features:

➢ Management of Power Add-On options from the skeleton generator module

➢ Language: Addition of recursive subroutine and function definitions

➢ Solver: Update of label data-structure after the $INITIAL block only. Previously the node label C data-structure was updated at each call of an output routine. Due to a performance decrease, this update is done only once after the $INITIAL block. As a consequence, node label changes will have no effect if done after the $INITIAL block.

➢ Solver: The PRNCSV function manages also the following entities: NS,L,A,C,EPS,ALP

➢ Solver: Addition of a warning in the log and standard output files in case the maximum number of loops have been reached in a solution routine

Corrections:

➢ Correction of SCYCLE specifications exported to TMM by the skeleton generator module

➢ Solver: Call to GENMOR added before getting into the $INITIAL block so to get updated variable values

➢ Pre-processing: Correction of syntax error when comments are used within an array definition

➢ Pre-processing: Correction of temperature unit management

➢ Solver: PRNDBL function exports all couplings relative to a node (instead of the only the one with nodes higher than the current one)

AIRBUS

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 6

➢ Solver: Correction of GRPMAX and GRPSUM routines

➢ Solver: Correction of a crash with isolated edges

4.7.1

Skeleton:

➢ When generating a new skeleton file, the TIMEND parameter setting is moved from $CONTROLS to $EXECUTION to avoid the generation of GENMOR code

Language:

➢ Node labels expended to 64 characters

Solver Library:

➢ Output format of QRATES modified

4.7.0

Skeleton:

➢ Recursive expansion of #USE references

➢ Re-use of an already existing Skeleton from the GUI

➢ Temperature initializations by groups or from a result file (h5) proposed by the GUI

➢ Interface of new stabilized cycling convergence routine (SCYCLE) from the GUI

Language:

➢ **New $GLOBAL block:**

Context: Thermica exports parametric data to Thermisol so to ease the parametric analysis at TMM level (for instance material properties such as the conductivity). When using sub-models, material properties or any parametric data shall be locally declared into each model (as locals, variables or arrays…) so these declarations are duplicated several times and modifying a parameter may become complex.

Why this new block: The new $GLOBAL block, which shall be written outside of any model, allows to declare $LOCALS, $VARIABLES and $ARRAYS visible from any model level. It then solves the difficulties of managing material parametric properties when using sub-models.

➢ **New $GLOBAL-CASE *N* block:**

For managing TMM cases, the newly created $GLOBAL block may be duplicated and assigned to a case number. A variable can then have a different value assigned depending on the executed case.

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 7

In batch command, the call of a specific case may be done using the argument *–case N*. The pre-processor will then skip the reading of $GLOBAL-CASE blocks not corresponding to the one specified in the execution command.

Standard output files will automatically include the case number in their names so all cases may be ran into the same directory.

(*This feature has be implemented especially for the needs of the Outgassing solver, now also embedded into Thermisol, where hundreds of different material properties shall be used for a single model*)

➢ New FATHER syntax allowing to access a data defined into a father model (ex: *FATHER:MyVar*)

Pre-processor:

➢ Correction: suppression of unnecessary GENMOR code generated when a local constant of a submodel was used

➢ Extension of $ELEMENT submodel usage:

    o Declaration of submodels into an $ELEMENT submodel

    o Use of a substitution parameter to declare a node label

    o A substitution variable may be a symbol to be resolved latter in its usage context

➢ Correction: Use of a function (*subroutines not concerned*) of a pre-compiled user library from a definition block ($NODES or $CONDUCTORS) was leading to an error message

➢ Correction of ZNODE interpretations when using node labels

➢ Correction of CASE usage associated to a negative number

Solver Library:

➢ New cyclic convergence routine SCYCLE which can handle up to 32 different convergence criteria on nodal groups. This routine manages automatically the outputs (no $OUTPUTS call during the convergence cycles and convergence results stored into a different h5 file, plus the execution of a final cycle with the re-activation of standard outputs). A reporting is also written into the convergence control file (csv) and into the ascii output file (out).

➢ New GRPAVE2 function to computes quadratic average

➢ New GRPAVE_W and GRPAVE2_W functions to compute arithmetic and quadratic average weighted by a nodal entity (typically the node areas or capacitances)

➢ New thermostat function (THSTAT) suitable for both steady-state and transient computations

➢ New initialization routine TINIT5 to recover temperatures from a h5 file

➢ Correction: PRNDTB was not writing data in case a model had no node

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 8

Solver:

➢ New overload function from the GUI and in batch command (with the argument *-overload file*) to assign a new value to any local constant or variable declared in the input file

➢ User nodal entities can now be stored in the h5 output file

➢ Couplings storage into the h5 file modified so Systema can open large sets of results more efficiently

Power add-on:

➢ The Power resolution routines have been modified so to solve efficiently industrial cases

Outgassing add-on:

➢ A new definition of outgassing nodes, view factors and solver is also available

4.6.1

Linux Compiler:

➢ gfortran changed from version 4.1.1 to version 4.3.6 (32/64 bits). *g77still maintained for 32bits.*

4.5.3a

Corrected Issues:

➢ Initial time-step for SCRANKAUTO

➢ B-Plot default Y scale changed to a subdivision by 10 (rather than 9)

➢ B-Plot: Correction of input files management (F1,F2…)

➢ Posther: ASCII output extension changed from *txt* to *csv*

4.5.3

Language:

➢ New feature: loop on user nodes thanks to group creation and parsing

4.6.0

Pre-processor:

➢ Generation of GENMOR code from $CONTROL resolved

4.5.2

Skeleton:

➢ Dump of expension summary at the end of the expended file as coments for checking

AIRBUS

THERMISOL

Release Note

Réf   :   RN.000040344.AIRB
Edition :   10
Date   :   29/09/2023
Page   :   9

➢ Possibility to expand a file using a different modelname into the current main model using the new syntax #READ-AS_MAIN and #USE-AS_MAIN

Pre-processor:

➢ Syntax USRPRP(I) now supported (where USRPRP is a user nodal property)

➢ Extension of Mortran macro syntax to node labels

➢ Extension of array declaration with the use of a formulae in the dimension declaration

➢ Periodic event declaration failure corrected (bug introduced in 4.5.1 by the Power add-on)

➢ CNDFNC function now implemented for type options 2 and 3 (types 4 and 5 not implemented)

Solver Library:

➢ Filter of low capacitances has been set with a new control variable **CAPAFLT** so all nodes with a capacitance so that $CSG_i \leq \Delta t.CAPAFLT$ will be considered as arithmetic nodes (i.e. with a zero capacitance). The default value of CAFAFLT is 1.0e-9 (very low filter preventing from numerical instabilities only)

➢ Node label changes are now taken into account in output routines

4.5.1b

Skeleton:

➢ Availability of SLFWBK from the graphical Skeleton parameters

Solver Library:

➢ Interpolation in oversized arrays

➢ Retro-compatibility of for DKL*n* node declaration

➢ Use of a substitution parameter value as initialization of another default parameter

➢ Correction of unrealistic temperature pick at first time iteration of SCRANK

4.5.1a

General:

➢ Correction of "include expansion" stand alone function

Pre-processor:

➢ Recognition of SNGL keyword

➢ Implicit model path for couplings

➢ Use of a string as argument in function at call to coupling creation

➢ Extension f ESATAN compatibility

Solver Library:

➢ New PRATES routine

➢ New SOLCYC routine

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 10

➤ QRATES prints out fluxes through edges rather than to edges

4.5.1

Pre-processor:

➤ Improving sub-model management

➤ The pre-processor now outputs unused symbols

4.5.0

General:

➤ New EDGE definition and management

➤ Wavelength dependent emissivities and radiative couplings

Pre-processor:

➤ New SET command to instantiate arrays in the $ARRAY block

➤ Undeclared variable reporting: condensed report

➤ FX, FY, FZ, QSI, QAI, QEI removed as native nodal properties (may be recalled with $ENTITIES options)

➤ Variables declared outside $LOCALS, $VARIABLES or $CONSTANTS return an error

➤ List of dependencies output by pre-processor (specific option)

Solver Library:

➤ H5_FREQ management corrected

➤ Unexpected time-shift in SLFWBK corrected

➤ Cryogenic temperatures being frozen to their values corrected

➤ Correction of routine DMPTHM not summing all couplings between two nodes

➤ ENBALT: New definition: maximum node imbalance in Transient analysis

Skeleton:

➤ Extension of parametric #READ and #USE to 256 files

Posther:

➤ Correction of flux budget

SYSTEMA Interface:

➤ Correction of processing diagram containing spaces not executed

THERMISOL Working Station (Windows):

➤ Node list corrected

4.4.2

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 11

Pre-processor:

➢ Correction of comments management in MIXE format

➢ Correction of the manual call to VARIABLES1

Solver Library:

➢ Convergence management of transient cases with strongly unbalances node powers at initialization

➢ Correction of the STATST call on a coupling

Skeleton:

➢ Possibility to add comments after #READ instructions

➢ Expansion of #READ and #USE delimited in expended file

B-PLOT:

➢ Upgrade of CPU performances

4.4.1

Pre-processor:

➢ Suppression of "undeclared symbol warning" on FORTRAN symbols written in minor case

➢ Undeclared symbols from sub-models generate errors rather than warning (no implicit declaration allowed when the symbol is explicitly referenced into a sub-model)

➢ Control variables order reset to the 4.0.34 order (permutation of TABS from RG(16) back to RG(20))

➢ Correction of a crash (Windows only) when using too many variables in declaration loops

➢ Interpretation of logical operator split by a line continuation such as ". // OR.", ".OR // ."…

➢ Suppression of the automatic translation of single to double precision reals in FORTRAN subroutines

➢ New option to deactivate the automatic generation of the h5 output in batch command line (example: ThermisolLNX –s model.dck no_auto_h5)

➢ Interpretation of lines beginning with a 'C' character in column one. Interpreted as a comment when using the context !FORMAT=FIXE, as a standard execution line if !FORMAT=FREE, and left to the pre-processor interpretation when !FORMAT=MIXE (default format)

Solver Library:

➢ Correction of wrong initialization of NRLXCC in Crank-Nicholson

➢ Correction of the $OUTPUTS call at the end of the 1st iteration in Crank-Nicholson (bug introduced in 4.4.0)

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 12

- ➢ Correction of the ZNODE identification, returning wrong warning messages

- ➢ Correction of wrong DAMPT initialization in Crank-Nicholson when not set to 1.0 by the user (bug introduced in 4.4.0)

- ➢ Correction of the h5 output to get a steady-state results without transient

- ➢ Correction of the INTGL function

- ➢ Correction of the TIMEO value at $OUTPUTS call (update to TIMEN required after the $OUTPUTS call and not before)

Skeleton:

- ➢ Correction of the period name when generating a new skeleton from SYSTEMA

- ➢ Correction of expansion possible confusion between the $OUTPUTS executive block and the $OUTPUT context of the $EVENTS block.

- ➢ New option added to expand partial sub-models, specifying which blocks are to be included (example: #READ-SUBMODEL [$NODES,$CONDUCTORS] submodel.dck)

- ➢ Correction of line expansion containing a '%' symbol (bug on HP only)

4.4.0

Pre-processor:

- ➢ Improvement of ESATAN compatibility with new format specifications (fixed, free and mix)

- ➢ Correction of Mortran language extensions such as multi-definition of couplings with a submodel path

Solver Library:

- ➢ Addition of new functions (see User's Manual), increasing the functionalities and the compatibility with ESATAN

- ➢ Updated computation report

- ➢ Correction of memory leaks in GRPMIN like routines

- ➢ Correction of Tsink computation

- ➢ New multi-time step algorithm

- ➢ Update of the ZNODE definition to be compatible with the ESATAN ZLABEL one

Skeleton:

- ➢ Suppression of the #READ-COMMON functionality

- ➢ Addition of the #USE command

POSTHER:

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 13

> ➤ New power budget (BALANCE) function

> ➤ Reviewed power budget between 2 groups function

> ➤ Extended Radiative budget

> ➤ Correction of the text outputs

4.3.3

Pre-processor:

> ➤ New Mortran Macros for Multiple Affectation / Multiplication

> ➤ Addition of general informations and warnings

> ➤ Correction of language interpretation minor bugs

ESATAN Converter:

> ➤ Creation

Solver Library:

> ➤ Addition of convergence parameters based on physical power balance, suitable for transient cases

> ➤ Memory structure re-management for retro-compatibility

Skeleton:

> ➤ Correction of submodel integration

> ➤ Extension of parametric file inclusion capabilities

POSTHER:

> ➤ New Flux Budget presentation and upgrade of conductive budgets

> ➤ Evolutions of the output formats

B-PLOT:

> ➤ New interval management

> ➤ Correction and management of curves outside the graph window

4.3.2

Generality:

> ➤ **Environment variables becomes optional**

> *Default values are set in order to suppress the declaration of the variables.*

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 14

Even on Windows, if MinGW is installed with SYSTEMA, the path to the gcc compiler is not necessary.

➢ **Error redirection on the log file**

All errors including Fortran compilation error are now reported in the log file. This is especially necessary for Windows users for which the background execution is not seen.

Pre-processor:

➢ **Automatic reposition to the 6th column of Fortran code**

To prevent Fortran error when user's code is not correctly placed.

The "continue" character is the "&" one and is automatically set on the 5th column.

Only numbers remain on the 5 first columns for tag declaration.

➢ **Check of syntax Nxxxxx**

The syntax Nxxxx designs the nodal entity xxxx. However in THERMICA v3, this symbol is used to declare solar fluxes arrays. A check is performed in order to remain compatible with v3 build models.

➢ **Management of new nodal entities FX, FY, FZ**

Those new nodal entities are used to store the geometrical localization of the nodes.

➢ **Correction of function references in Fortran translated code**

Calls to functions inside Mortran subroutine could be misunderstood. This has been corrected

➢ **Possibility to use implicit references to nodes and couplings in executive blocks**

It is now possible to use implicit references to set nodal properties or couplings, the nodal references being given with a symbol or an expression corresponding to the user nodal number. It also allows the use of loops combined with nodal or coupling references in the executive blocks.

➢ **Possibility to use $LOCALS constants in the $ARRAYS and $TABLES blocks**

Solver Library:

➢ **Correction of convergence problems**

This release of THERMISOL has been intensively validated and consolidated on many industrial cases. Convergence problems on steady-stae and transient analysis have been solved.

➢ **Change of usual THERMISOL TSINK function**

The usual TSINK function has been renamed TSINKN in order not to conflict with the ESATAN-like TSINK one.

➢ **New ESTAN-like TSINK & NODFNC function**

The functions have been implemented as described in the ESATAN user's manual.

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 15

➢ **Crank-Nicholson scheme**

New 2nd order prediction: Allows a closer guess of the solution before iterating on the implicit resolution.

➢ **New INBALT / ENBALT control variables**

The total balance is the sum of all diffusive nodes balances. In steady-state cases, it is almost equivalent to the INBALA/ENBALA variables except that it takes into account internal unbalances. The advantage of this definition is that it is also suitable for transient analysis which did not have a physical convergence criterion.

➢ **CSV output file**

Gives more information on the current run like time error estimation on transient analysis…

A new control variable has been created to control the frequency of dump **CSV_FREQ**

➢ **H5 output file**

The functions associated with the H5 files are **H5_INIT***(filename) ,* **H5_DUMP***,* **H5_CLOSE**

Only a single frequency of storage has been kept in order to simplify the post-processing analysis tools (and to be sure of their robustness)

Skeleton:

➢ **Advanced management of output control**

For cyclic convergence cases, it is possible to set the storage for the last orbit

➢ **Possibility to re-use a previous skeleton in addition to new files to input**

➢ **Correction of expansion problems**

➢ **"No-contextual" expansion has been added**

If no blocks are specified in the file to expand through a #READ instruction, all the content of the file is copied.

POSTHER:

➢ **Flux budget: correction of edge specification**

The definition of that group of nodes was bugged.

➢ **Radiative budget: problem of the nodal group area computation**

B-PLOT:

➢ **Correction of a bug when the initial date (in julian days) was not zero**

In cases made by SYSTEMA v4, the reference date is set. Those models could not be displayed by B-PLOT in previous THERMISOL versions.

➢ **Graphical definition of B-PLOT input**

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 16

In addition of creating a B-PLOT file by hand, it is also possible to define the graph in the GUI edition box of B-PLOT.

4.3.1

Pre-processor:

➢ **New syntax in declarations: 'U'**

Understood as a zero but allows reading of Esatan files

➢ **Priority of the symbol ':' versus '+'**

T:1000 + 25   means the temperature of node 1000 + 25°C

T:(1000+25)   means the temperature of node 1025

➢ **Undeclared variables checking**

Warnings are output to the log file and to the xterm window to notice all undeclared variables.

It is however possible that some symbols are recognized as undeclared variables (the list is just given so the user so it is possible to check if there are errors or not in his input model)

➢ **ZNODES: extension of definition**

The ZNODES specification is a character string describing the nodes to be considered by some functions (mainly output routines).

The definition of the ZNODES specification has been extended with the following functionalities:

▪ *A ZNODES specification can be the combination of singular ZNODES specifications separated by ";"*

▪ *Any singular ZNODES spec can be additive or subtractive (using the prefix '!')*

▪ *The singular ZNODES definitions are*

  o *ALL, ONLY*

  o *[model path], [model path]:ONLY*

  o *#[node list separated by ',']*

  o *@[label or partial label]*

  o *[model path]@[label or partial label], ONLY@[label or partial label], [model path]:ONLY@[label or partial label]*

Solver Library:

➢ **New functions: FLUXGL / FLUXGR / FLUXGF / FLUXGT**

Functions similar to FLUXL / FLUXR / FLUXF and FLUXT but with ZNODES inputs to defined the node groups

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 17

➢ **New function: PRQBOU**

This subroutine prints the heat flows along all conductors in submodel MODEL which cross the submodel boundary

➢ **New function: PRTTMD**

This subroutine prints the maximum temperature difference between the nodes described in NODES in the model described by MODEL, and prints the 2 nodes for which the maximum difference is observed

➢ **New function: PRQNOD**

This subroutine prints the heat flows along all conductors of the group of nodes described by NODES in submodel MODEL which cross the boundary of the group of nodes

➢ **New function: DMPTHN**

This subroutine produces a set of CSV files containing nodal data in vector form (temperature, capacitance, and total heat load, one row per node) and conductance matrices (separately linear, radiative and fluidic). The latter are complete NxN matrices (N being the number of nodes in the model), with a zero entry wherever there is no conductor defined between the row and column nodes. This format is designed to be amenable to loading into numeric computation tools such as MATLAB®. There is also a list of nodes in the same row/column order, giving node type, number, label and model name

➢ **Bug in the TSINK function**

A bug was introduced in this function in version 4.3.0. This bug is fixed

➢ **SLFWBK_OLD**

This obsolete routine SLFWBK has been kept using the name SLFWBK_OLD. If SLFWBK is called it is automatically redirected to SCRANK (with a warning for the user)

➢ **Explicit storage into the H5 file through a "CALL POSTHER()"**

This lets the user have a full control of the storage in the h5 file. A POSTHER_INIT and a POSTHER_CLOSE functions are also available to create and close h5 files

➢ **Negative times: automatically not stored in the h5 file**

This is an easy way to store only the last orbit of a cyclic convergence run

➢ **Problem of OUTINT management**

The update of the OUTINT control variables was not taken into account except when the OUTPUTS block was called

➢ **Error in the damping factor management**

A case has raised a problem of damping factor management. This is corrected in this version

Skeleton:

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 18

➢ **Files with a blank in reading instructions:**

A correction has been made to allow this kind of files

➢ **Updated to manage the new POSTHER storage routines**

Posther:

➢ **1st official release of POSTHER as a THERMISOL component**

Implementation based on ASG24 needs

B-Plot:

➢ **1st official release of B-PLOT as a THERMISOL component**

This new version is compatible with the new h5 file standards. The inclusion of B-Plot into THERMISOL should provide a better maintenance of this software.

NTP (or NTPHJ) files are however not supported by this version.

4.3.0

Pre-processor:

➢ **New executive blocks : $VTEMPERATURE / $VTIME / $VRESULT**

Those blocks allow a better management of dependencies

➢ **Management of $EVENTS**

Events are now available. See the documentation for more details

➢ **Spell of "$TABLES"**

The 2 syntax are allowed: $TABLE or $TABLES

➢ **Declarations in $VARIABLES (or $CONSTANTS) with formulae added to GENMOR code**

This will automatically update variables depending on formulae

➢ **More implicit declarations**

The Mortran syntax possibilities have been extended with the possibility of using formulae into an implicit node reference. Some data can also be directly accessed instead of the indirect access through functions (NS: status of a node, N: internal number of a node, GLS/GRS/GFS: status of a coupling). Those data can be accessed in read/write modes.

➢ **Syntax with sub-models**

Mortran syntax using sub-models where unstable. This is corrected.

➢ **Automatic conversion from Single to Double**

REAL declarations are converted to DOUBLE PRECISION ones.

Floats like 5.3 are converted with a "D0" at the end.

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 19

Exponents "e" or "E" are converted to "D" exponents

➢ **Correction on the $PARAMETERS block**

The use of this block is fully validated and operational

➢ **Double declarations of Arrays return errors**

Pre-process checker extension

Solver Library:

➢ **New GET / SET functions**

To access some Mortran values. This was necessary for the building of a "black box" module

➢ **Optimisation of SOLVIT**

The $VTEMPERATURE block calls are manage to prevent from divergences due to instabilities between the user's code and the resolution

➢ **Interpolation routines: 2ⁿᵈ order now available**

The user can now choose between first and second order interpolations.

Skeleton:

➢ **#READ converted to ##READ after expansion**

To avoid further re-expansions.

➢ **Expansion of blocks $INCLUDES bugged**

This is corrected

➢ **Syntax for #READ-COMMON modified**

Old syntax was not convenient

4.2.3

Generality:

➢ **Compatibility with the v4 environment**

This is the first release compatible with the v4 environment. It includes a package for the SYSTEMA v4 interface.

➢ **Stabilisation of the H5 interface**

The H5 result file lays on a standard interface used for the SYSTEMA / Applications communications.

Pre-processor:

➢ **Declared constants in the block $LOCALS available in all model**

Instead of the definition blocks only

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 20

➢ **$LOCALS : guaranty of Double Precision full compatibility**

Less digit were preserved before.

➢ **Automatic Split of the Subroutines**

Mortran subroutines can be automatically split to sped-up the compiler performances. The GENMOR subroutine is automatically split. User subroutines can do use this option through the argument "SPLIT=xxxxx"

4.1.0 vs 4.0.34

Released with THERMICA 3.2.30

This version is equivalent to the version 4.0.34 but with some updates for POSTHER (but those functionalities were not stabilized wet – the next version 4.2.3 stabilizes the format and the functionalities).

- Correction of cyclic interpolation for negative times

- Optimisation of divergence behaviour detection during steady-state analysis (SOLVIT)

4.0.34 vs 4.0.29

This version is almost equivalent to version 4.0.29. Improvements on the convergences were made.

- Correction of memory leak caused by string analysis

- New error message for the TSINK function if thesum of the GR is equal to zero

- Automatic call of $OUTPUTS for last transient time-step

- Optimisation of divergence behaviour detection during steady-state analysis (SOLVIT)

- Correction of the SOLVFM routine for the case of isolated nodes

- New format in the convergence result file (csv) for steady-state loops

- Addition of POSTHER functionalities with new CONTROL declarations

4.0.31

This version introduced a permutation in the order of the iterative convergence. This feature has not been kept in further versions.

4.0.29

AIRBUS

THERMISOL

Release Note

Réf : RN.000040344.AIRB
Edition : 10
Date : 29/09/2023
Page : 21

First THERMISOL public release

Included in THERMICA 3.2.20_1