
ETAS SCORE-CONGRA 1.8.3

Release Notes

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1 Introduction

The tool is designed to help you define and analyze continuous systems, simulate them and generating code.

The novel approach is that the system is described purely in form of variables, relations and equations.

The equations are "undirected" and depending on which variables are marked as inputs, the equations are solved in the corresponding direction and code is generated representing the result of this direction of equations.

is an Eclipse-based product. If you are familiar with using an Eclipse environment then you should feel at home.

1.1 Definitions and Abbreviations

Term/Abbreviation	Definition
EHI	ETAS Help Desk International
HW	Hardware
KIR	Known Issue Report – For severe Problem Reports which occur after a release, ETAS has introduced the Known Issue Report to inform affected customer immediately. The current Known Issues of former versions can be found on the ETAS website: http://www.etas.com/kir
PR	Problem Report
SW	Software
CG	
CONGRA	Is an abbreviation term used to designate the tool
SYQ	System Equation

1.2 References

- Getting started.pdf
- Safety Advice.pdf

Both are available in the installed product.

1.3 Conventions

The following typographical conventions are used in this document:

Choose **File → Open**.

Menu commands are shown in blue boldface.

Click **OK**.

Buttons are shown in blue boldface.

Press <ENTER>.

Keyboard commands are shown in angled brackets.

The "Open File" dialog box is displayed.

Names of program windows, dialog boxes, fields, etc. are shown in quotation marks.

Select the file `setup.exe`.

Text in drop-down lists on the screen, program code, as well as path- and file names are shown in the Courier font.

A *distribution* is always a one-dimensional table of sample points.

General emphasis and new terms are set in italics.

1.4 User Documentation

The ETAS SCORE-CONGRA user's documentation is provided as PDF (Getting Started) online help. The online help is available at any time via the [Help → Help Contents](#) menu.

The Getting Started manual in PDF format can be found on the installation disk and in the `documents` subfolder of your installation directory.

2 Product Definition

2.1 Functions at a Glance

ETAS SCORE-CONGRA is a tool for designing system and generating code, both simulation and production code. The system can be described both graphically and textually. Main features of the tool are:

- A graphical editor enabling you to describe the content of your system using common graphical editing patterns as known from modeling tools
- A textual editor for the in the "System Equation Language" (syq) enabling you to describe the content of the system in an alternative way.
- An execution environment that answer important questions on the solvability, stability as well as sensitivities in the specified system.
- Extensible code generators translate a given system into code. This code can be executed or simulated, or post processed and integrated in real life production code for e.g. control applications.
- A coupling with a simulation tool, which allows you to run the generated code on another platform and validate your model.

2.2 General Description

2.2.1 System Prerequisites

The following minimum system prerequisites have to be met:

Required Hardware	2.0 GHz Dual-Core PC or equivalent 4 GB RAM DVD-ROM drive (applicable for DVD based installation only) Network adapter Graphics with a resolution of at least 1024x768
Required Operating System	Windows® 10 64 bits
Required Free Disk Space	800 MB (not including the size for application data)

The following system prerequisites are recommended:

Recommended Hardware	2,0 GHz Quad-Core PC or equivalent 8 GB RAM DVD-ROM drive (applicable for DVD based installation only) Network adapter Graphics with a resolution of 1920x1080
Recommended Operating System	Windows® 10 64 bits
Recommended Free Disk Space	>2,0 GB

2.2.2 Software Prerequisites

ETAS SCORE-CONGRA will require a Computer Algebra System (CAS) to execute most of its functionality. The free CAS Maxima is provided with the installer. If installed during the installation of , Maxima is also configured correctly in the tool.

MATLAB installation is required for seamless integration between and MATLAB/Simulink.

2.2.3 Release Test Configuration

This release has been tested on the following host systems:

- Windows 10 64bit

Tests have been performed with

- MATLAB 2015b (64bit), 2016b, 2017b, 2018b

2.3 Delivery

The software is delivered with an installation routine on a DVD including ETAS SCORE-CONGRA software, documentation, tools, utilities, and further information. All software documentation is available in the Portable Document Format (PDF), which requires Adobe® Reader®.

The DVD contains the following items:

File or Directory	Description
Autostart.exe	The executable for starting the ETAS Product Installation program.
Start.exe	The ETAS Product Installation program.
Start.ico	The ETAS SCORE-CONGRA icon.
install\ETAS_SCORE-CONGRA_	Directory containing the software installation of ETAS SCORE-CONGRA.
\Documentation	Directory containing copies of the PDG user documentation.

File or Directory	Description
\Documentation\Open Source Software	Directory containing information about 3rd party open source software used in or provided for use with ETAS SCODE-CONGRA. Including copies of the licenses under which this software is used.
\HTML	Directory containing text and images for the DVD.

2.3.1 Used 3rd Party Software

ETAS SCODE-CONGRA makes use of third-party software components. Licensing information for these components can be found in `Documentation\OSS Attributions.pdf`.

2.4 Installation

ETAS SCODE-CONGRA is distributed as a standard Microsoft Windows installer. Run `setup.exe` and follow the on-screen instructions to install the ETAS SCODE-CONGRA tool. Installation procedures and hints can be found in `Documentation\ETAS SCODE-CONGRA Getting Started.pdf`.

2.5 Licensing

Licenses can be ordered via your regional ETAS sales representative.

For evaluation of the product, there is the possibility to request evaluation licenses with a 3 months duration. Please contact your regional ETAS Sales Representative.

3 Changes

This chapter describes changes with respect to the previous version of ETAS SCODE-CONGRA.

3.1 What's New in ETAS SCODE-CONGRA 1.8.3

In this section, we give a rough overview over the new features available since version 2.5.0:

Specification:

- For parameters also inequality constraints can be used, e.g. "param pi is != 0".
- Tearing of a single relation can be performed (e.g. for symbolically unsolvable equations)
- Tearing edges have a new option to control the generation of limitation during the tearing computation.
- Integrate edges can be reversed to "differentiate" edges (graphically and textually via the @state annotation) in flows.
- Custom images can be added (textually and graphically) for systems that are also used in generated ESDL.

Graphical editing:

- Enable multiple select for context menus in graphical editor (e.g. "Set type as")

Solving:

- Solution Records in the User Cache can be attributed with 'solveNumerically="true"' to allow for storing of algebraically not solvable requests (avoids repeated calls to the Computer Algebra System)
- External function calls in the User Cache can be provided also when using normalization.
- Solver communication cache is now stored in the workspace enabling the reuse of this information across sessions.

Code Generation:

- Use of the @symbol annotation to support a distinct naming in generated code artifacts.
- C Code generation supports C99 and C89 standards through compiler option - DC_VERSION_89.
- Jacobian matrix generation:
 - The annotation @jacobian has been renamed to @extendedStateSpace, so has the related generator option.
 - Jacobian matrix can be generated as a separate function for Extended State Space Computations.
 - Jacobian matrix can be included in computation files to compute it simultaneously with other computation steps.
- /Simulink generation:
 - Generate C-MEX S-Functions in addition to other generated files to support the usage of models in ETAS LABCAR
 - Parameters can be exported as Simulink parameter objects or variables

- Support usage of differentiate operator in Simulink
- Support for export of equations and parameters in a format ETAS ASCMO MOCA can import
- ESDL code generation:
 - Only generate getters and setters for flow outputs and inputs
 - Display tool logo or custom image on ESDL blocks
 - Nicer layout of generated ESDL blocks
 - Consistency of generated computation code for systems

Automatic verification:

- Enhancement to code verification:
 - stimulation with out-of-bounds values with adjusted checking of expected values for out-of-bounds" inputs
 - additional "in-range" checks for all variables

Report generation:

- Possibility to generate a report based on a model with the following components:
 - Cover
 - Disclaimer
 - Textual model
 - Images for flows and systems
 - Computations
 - Table of model elements

UX:

- Removed CONGRA xecution perspective, everything is now in one CONGRA perspective which is visible per default in a new workspace.

3.2 Compatibility to Earlier Releases

It is recommended to use a new workspace with each new release. Additional semantic checks and analysis introduced may cause models systems originally developed in earlier releases to generate new warnings and errors.

3.3 Known Issue Reports

If a product issue develops, ETAS will prepare a Known Issue Report (KIR) and post it on the internet. The report includes information regarding the technical impact and status of the solution. Therefore, you must check the KIR applicable to this ETAS product version and follow the relevant instructions prior to operation of the product.

The Known Issue Report (KIR) can be found here:

<http://www.etas.com/kir>

3.4 Known Problems

This section describes the set of known problems.

3.4.1 Software-Related Items

Issue Reference	Description
SCT-920	<p>Corrupt SYQ file after adding flow or system</p> <p>If the textual model file (SYQ) ends with an end of line comment without a line break, then, when adding a flow or system via the context menu in the graphical editor, this might render a wrong SYQ file after saving. The declaration of the new flow (or system) might start in the comment line.</p> <p>Workaround: Manually insert a line break in the SYQ file, and always be sure to use a line break after the last comment line.</p>
SCT-922	<p>Unchanged diagrams are marked as dirty</p> <p>In case several graphical editors for the same model are opened, and only one of them is changed, all diagrams are marked with the "*" for being "dirty".</p> <p>Workaround: None.</p>
SCT-923	<p>Renaming a flow is not reflected in the execution environment</p> <p>The execution environment and the specification of objects are closely synchronized, and the execution environment gets updated with changes in the specification. This however does not hold true if you rename a flow or computation.</p> <p>Workaround: Reopen the renamed computation/flow in the execution environment. You will have to redo any changes you did (in particular values).</p>
SCT-987	<p>Equation solving operation in external CAS tools cannot be cancelled</p> <p>The solving of equations in an external CAS tool cannot be cancelled. Depending on the nature of the system/flow to be solved, the time taken by the CAS Tool (e.g. MuPAD) can be several minutes (esp. in case of algebraic loops). This process cannot be interrupted.</p> <p>Workaround: Wait until the CAS tool is finished, or manually terminated in the Task Manager.</p>
SCT-646	<p>Licensing dialog will block the tool</p> <p>Solving a system of equations using MuPAD as a solver is only possible with an additional license. The tool might be blocked during solving if this license is not available.</p> <p>Solution: Please install a license of MATLAB first before using MuPAD as a solver.</p>
SCT-924	<p>Clean Project operation not complete</p> <p>In some cases, artefacts generated by a generator are not completely removed by the "Clean Project" operation</p> <p>Workaround: manually delete the "src-gen" folder</p>

<p>SCT-926</p>	<p>[Sirius] Layout synchronization does not work reliably In some the graphical layout doesn't get updates.</p>
<p>SCT-933</p>	<p>Generated resources cannot be referenced, especially subcomputations in case of subsystem libraries The generated resources (e.g. *.syq files containing computations) are not put into the index at point of generation. Consequence is that the importing of objects in these generated files (especially: computations of generated "library" systems) does not work ad hoc. Workaround: Close and reopen the project containing the generated files (i.e. the library) after building and generation.</p>
<p>SCT-925</p>	<p>Removing packages from a project has side effects on other packages The deletion of a package in a project that does contain multiple packages does also temporarily remove the model and flow nodes in the project explorer under other SYQ files in other packages. Workaround: Close the project and open it again.</p>
<p>SCT-927</p>	<p>MuPAD returns negative result when reaching maximum depth for nested procedure calls When passing complex solving commands to MuPAD that involve algebraic loops with a large number of relations, variables and assumptions MuPAD might return a negative result. Workaround: Try to reduce the number of assumptions, to manually break/tear the affected algebraic loops or to use a different solver.</p>
<p>SCT-958</p>	<p>Inconsistent graph for sub-system and sub-system "preview" The graphical preview (mouse-over over a subsystem) does not update in case of adding a tearing edge in a subsystem.</p>
<p>SCT-946</p>	<p>Border node arrangement might not work as expected if there are many border nodes If there are many border nodes, the algorithm to arrange border nodes might produce wrong results in case the calculated positions of the border nodes intersect with each other. Workaround: Repeat the arrange command, and/or use manual rearrangement of the border nodes or use the "Layout->Linked Border Nodes" context menu.</p>
<p>SCT-949</p>	<p>Comments in the SYQ file might get deleted When doing modifications to the model in the graphical editor, esp. when deleting elements, also comments in the SYQ file might get deleted (Root cause is that these comments are associated with the deleted elements) Workaround: you might want to use the "local history" to check on inadvertent deletion of comments.</p>

<p>SCT-942</p>	<p>Selecting subsystem from different project not working When setting the subsystem graphically by choosing a subsystem from a different project, the resulting diagram becomes unsaveable. Workaround: Set the subsystem in the textual editor and (before) make sure to reference the project correctly and to import the subsystem.</p>
<p>SCT-993</p>	<p>Seamless integration may not work if different versions of ETAS tool is installed When there are several tools of in an older version installed, it might happen, that from Simulink opening the latest SCODE tool does not work. Workaround: Launch SCODE first and then perform a double click on the block</p>
<p>SCT-192</p>	<p>Solutions manually provided to the cache may be ignored When providing manually a solution to the cache, if the request is a conditional equation then the solution has to be conditional otherwise it will be ignored. Workaround: Provide the same solution in the else expression and the solution will be used.</p>
<p>SCT-937</p>	<p>Sensitivity on lines into subsystem not shown correctly When using sensitivity analysis, the lines to and from subsystems may not be displayed with their correct thickness. Workaround: none</p>
<p>SCT-1467</p>	<p>TX_Solver: Endless loop when solving with MuPAD For some projects solving ends up in an endless loop. Workaround: The user has also the computation (means the generated SYQ file) open in the editor. This file needs to be closed then the loop will terminate.</p>
<p>SCT-944</p>	<p>Outline view does not update the arrow style If values are changed in the execution environment during sensitivity analysis or simulation the outline view is not updated. Workaround: None</p>
<p>SCT-1002</p>	<p>Maxima solver is using a lot of resources In cases of complex equations, the maxima solver uses a lot of resources and may not terminate in time. In some cases, tries to reinvoke Maxima, which leads to concurrently running maxima instances consuming even more memory. Workaround: Use an alternative solver (e.g. MuPAD or cache solvers).</p>

<p>SCT-935</p>	<p>TX_GraphicalEdit: The positions are interchanged when removing or adding an element</p> <p>When a node gets added in the graphical editor and a different node gets deleted in the textual editor without saving in between, the nodes might change their index and they get reordered after saving.</p> <p>Workaround: Always save after a single change or Save before switching the editor type.</p>
<p>SCT-896</p>	<p>Computation can be invalid</p> <p>It can happen that a generated computation is marked as faulty by the IDE, primarily, if it contains a library call. Then no further code that depends on the computation will be generated.</p> <p>Workaround: Open the computation in the editor. It is then indexed again, which leads to a correct file. Thus, the code generation process continues.</p>
<p>SCT-96</p>	<p>Execution Environment does not support nested tearing</p> <p>Computations with nested tearings cannot be executed in the execution environment.</p> <p>Workaround: Use execution environments for the generated code, e.g. of the or C code.</p>
<p>SCT-211</p>	<p>Integrate/Delay relations with arguments of libraries is not possible</p> <p>Modelling of such relations will work in the tool, even though the generated code might be erroneous.</p> <p>Workaround: Do not use integrate/delay relations with arguments of libraries.</p>
<p>SCT-12834</p>	<p>On the fly units not supported in ESDL generation</p> <p>When using "on-the-fly" units like "var [m/sec] speed;" the generated ESDL code misses the declaration of this derived unit.</p> <p>Workaround: Explicitly define a unit instead of using on the fly units.</p>
<p>SCT-12835</p>	<p>Unit-ful math functions not supported in ESDL generation</p> <p>When having unit-ful variables, (e.g. var m distance), and using unit-ful math-functions like "power", the code of e.g. distance^3 leads to wrong ESDL code, since the used ESDL function for "power" is only available as a unit-less function.</p> <p>Workaround: Manually "normalize" the expression before using these functions and convert to the unit, e.g. replace the expression (distance^3) by the expression ((distance/1[m])^3* (1[m])^3)</p>
<p>SCT-34</p>	<p>Data type for double delays is not correct in Simulink code generation when using single precision</p> <p>When using 32 bit precision a value that is delayed twice will be of type <code>double</code> instead of <code>single</code> in /Simulink code generation.</p> <p>Workaround: Manually adapt generated code if necessary.</p>
<p>SCT-14285</p>	<p>Problems with mex compilation in MATLAB 2018b</p> <p>Automatic mex compilation might fail when using MATLAB R2018b depending on the system setup.</p> <p>Workaround: Deactivate automatic compilation and manually compile using the suggested command that is prompted in the CONGRA console.</p>

<p>SCT-14946</p>	<p>Extended State Space generation not working if computation includes conditional equations No extended state space will be generated for such models. Workaround: None.</p>
<p>SCT-13064</p>	<p>Char table parameters are only created once If char tables are defined in subsystems their parameters are only created once even though the subsystem is used several times. Workaround: Use instance-specific char tables.</p>
<p>SCT-14924</p>	<p>Preferences are not correctly enabled when toggling between pages Dependencies of options might not be updated across preferences pages, i.e. an option can stay disabled even though it should be enabled due to a change on a different preference page. Workaround: Reopen the dialog.</p>
<p>SCT-14918</p>	<p>Multiple SCODE Workbench installations share the same update site location This leads to the unexpected result that when (un-)installing plugins for one installation this might affect other installations. This only applies to concurrent installations of the same SCODE version. Workaround: Do not have several installations of the same SCODE Workbench version.</p>
<p>SCT-14705</p>	<p>Limited input variables are used unlimited in MATLAB char table evaluation An input variable that is limited will be used in an unlimited form when evaluating char tables in MATLAB code. Workaround: None.</p>
<p>SCT-13163</p>	<p>Renaming allows invalid folder names When renaming a folder (which represents a package in the CONGRA model) it is possible to use names that are invalid in the CONGRA grammar. Workaround: Don't use special characters and reserved keywords in folder names and check for error markers.</p>
<p>SCT-14243</p>	<p>Gradient for conditional equations within not symbolically solvable algebraic loops is computed as zero In this case the gradient should not be calculated at all, but the resulting computation shows zero as result. Workaround: None.</p>

<p>SCT-14730, SCT-14731, SCT-14733, SCT-14734, SCT-14739</p>	<p>Several issues with FMU generation Please note that the FMU generation has several known issues that will be fixed in the next version of ETAS SCODE-CONGRA. Workaround: To get access to a beta version please get in contact with ETAS.</p>
<p>SCT-15567</p>	<p>Models using “differentiate” edges can lead to erroneous MATLAB code When using reversed timing edges, it is possible to define implicit inputs additionally as inputs. This could result in invalid function argument lists with repeated variable names and thus in MATLAB code that cannot be executed. Workaround: Manually revise the function argument lists in case the MATLAB code shows an error. Additionally, make sure that no implicit inputs are marked as inputs in your CONGRA model.</p>
<p>SCT-15576</p>	<p>Naming conflict between variables and functions for ESDL code generation (case sensitivity) In CONGRA you can use the same name for a variable and a function, given that there is a difference in cases. The ESDL generation will not work though for such models. Workaround: Be careful to not reuse names, even with different cases.</p>
<p>SCT-15579</p>	<p>System interface used in tearing can lead to invalid ESDL class When systems are defined with interface variables used in a tearing, the tearing variables are declared and initialized using the following wrong syntax: <code>real x1 = this.<interfaceVariableName></code>. No AMD code is generated. Workaround: Manually revise the generated ESDL code and remove “this” for the affected tearing variables.</p>
<p>SCT-15608</p>	<p>Constants are not defined in verification code The values of constants are missing within the verification code, leading to compilation or runtime issues. Workaround: Resolve constants already in the CONGRA model.</p>

4 Notes

4.1 General

- Please note that the FMU generation has several known issues that will be fixed in the next version of ETAS SCODE-CONGRA. To get access to a beta version please get in contact with ETAS.

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5 **Contact, Support and Problem Reporting**

For details of your local sales office as well as your local technical support team and product hotlines, take a look at the ETAS website:

ETAS subsidiaries	Internet: www.etas.com/en/contact.php
ETAS technical support	Internet: www.etas.com/en/hotlines.php