

# ETAS ASCMO V5.13

## Release Notes

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# Table of Contents

- Copyright ..... 2
- 1. Introduction ..... 4
  - 1.1. User Documentation ..... 4
- 2. Product Definition ..... 4
  - 2.1. Functions at a glance ..... 4
  - 2.2. General Description ..... 6
    - 2.2.1. System Prerequisites ..... 6
    - 2.2.2. Software Prerequisites ..... 6
  - 2.3. Delivery ..... 6
    - 2.3.1. Used 3rd Party Software ..... 7
  - 2.4. Installation ..... 7
  - 2.5. Licensing ..... 7
- 3. Changes ..... 7
  - 3.1. What's New in ETAS ASCMO V5.13 ..... 7
  - 3.2. Compatibility to Earlier Releases ..... 10
  - 3.3. Fixed Problems ..... 10
  - 3.4. Known Issue Reports ..... 10
  - 3.5. Known Issues ..... 10
- 4. Contact Information ..... 11
  - 4.1. Technical Support ..... 11
  - 4.2. ETAS Headquarters ..... 11

# 1. Introduction

## 1.1. User Documentation

The ETAS ASCMO users guide in PDF format can be found alongside the installation executable or in the application menu „Help → Manuals“. „Help → Interface Description“ describes the API, how to automate ETAS ASCMO.

# 2. Product Definition

## 2.1. Functions at a glance

ETAS ASCMO is the ideal solution for data-based modeling and model-based calibration. It enables users to accurately model, analyze, and optimize the behavior of complex systems based on only a few measurements and using advanced algorithms. Both, steady-state and transient system behaviors can be captured. Furthermore, it allows optimizing parameters of physically based models.

The name ASCMO is the abbreviation of Advanced Simulation for Calibration, Modelling and Optimization.

### ETAS ASCMO-DESK (Base product)

ETAS ASCMO-DESK serves as common launcher for the main products ASCMO-STATIC, ASCMO-DYNAMIC and ASCMO-MOCA. In addition, it contains beneficial tools for managing, and generating driving cycles, to visualize scatter plots and edit calibration data.

The following modules are included:

- **ASCMO Essentials:** Module to visualize and change measurement data and calibration parameters. Various import formats (Excel, MDF, DCM, CDFX,...) are supported. The full MOCA visualization possibilities are available, with various plot types and selection of data points in different input dimensions and plots. Basic calibration tasks like smoothing of parameters can be done here. Technically it's a lightweight MOCA, without the function, optimization and external model steps.
- **Cycle Generator:** Allow to generate driving cycles based on existing cycles with similar properties. It also allows using a simplified powertrain model to convert from vehicle speed to engine speed/load.

There are three main Add-ons to ETAS ASCMO-DESK:

- **ETAS ASCMO-STATIC (main product 1/3)**  
ETAS ASCMO-STATIC allows to describe the steady-state behavior of complex systems using modern data-based modelling approaches with much higher accuracy than classical DoE-models. In addition, both variance and validity of trained models are indicated. The models do not need to be parameterized by the user, which makes ETAS ASCMO-STATIC very easy to use also for less- or even non-experienced users. Furthermore, ETAS ASCMO-STATIC offers a variety of possibilities for visualizing and optimizing the system behavior based on the models and generate statistical DoE test plans (Design of Experiments)
- **ETAS ASCMO-DYNAMIC (main product 2/3)**  
ETAS ASCMO-DYNAMIC allows to describe the dynamic/transient behavior of complex systems. Efficient, statistical learning processes (Gaussian processes) are utilized which have

been modified specifically for the mapping of dynamical behaviors. The models can be exported in several formats such as C-Code or Simulink®. Furthermore, dynamic DoE test plans can be generated.

- **ETAS ASCMO-MOCA (main product 3/3)**

ETAS ASCMO-MOCA allows the efficient parameter optimization of physically based models. The models can be integrated as formula, Simulink®, ETAS ASCET- or ETAS-ASCMO models. ETAS ASCMO MOCA enables automatic optimization of all model parameters at once and minimizes the deviation between model behavior and desired output value. The optimization procedure is fast and easy due to ETAS ASCMO-MOCAs intuitive graphical user interface. In the same way also the parameters of physically based models from other environments such as Simulink® or GT-SUITE® can be optimized.

There are 2 versions of ETAS ASCMO-MOCA:

- **Developer**  
Full access to all functions. Especially the definition of the function logic and the sequencing of the optimization process can be created, modified and analyzed. The ready-to-use project can also be exported as ETAS ASCMO-MOCA Runtime to protect the IP
- **Runtime**  
The predefined project from the developer version of ETAS ASCMO-MOCA can be loaded and used without having access to the IP-critical parts.

There are several Add-ons to ETAS ASCMO-STATIC:

- **ASCMO-ME** (Model Export) allows to export the models created by ASCMO in various formats such as: C-code, MATLAB®/Simulink®, ETAS INCA / MDA, Python, Excel VBA, GT-SUITE, FMI/FMU, Bosch AMU and Bosch Flatbuffer (Milea). Once exported, these models can be used without any license in the target environment.
- **ASCMO-SDK** (Software Developer Kit) provides a MATLAB® interface to ASCMO. This allows on one hand to remote control ASCMO from the Matlab command line or via a script. Additionally, user defined functionalities can be integrated into the ASCMO framework as a plugin – this can be any kind of visualizations, data processing or modeling and optimization algorithms. This add-on can also be used to connect to test-bench automation systems.
- **ASCMO-GO** (Global Optimization) is an enhancement to the optimizers included in ASCMO-STATIC. It considers the whole (global) operating range of an engine during the optimization process. This allows e.g., to directly optimize on cumulated engine emissions and fuel consumption while considering smoothness of calibration maps and typical driving cycles.
- **ASCMO-MCI** (Model Compression) allows to build models with a significantly reduced complexity in terms of memory demand and execution time. An advanced compression algorithm minimized the number of necessary base functions needed for the desired model quality. This allows to use the high fidelity ASCMO models in real-time environments such as ECUs.  
The *Symbolic Regression* as part of the MOCA functionality allows the identification of the functional correlation between inputs and outputs of a given system as a formula. The resulting models contain only simple mathematical operations and optionally curves and maps. That's why they can be small and efficient with a high probability to be executed also on time-critical systems. Additionally these models are typically physically interpretable.
- **ASCMO-SIG** (Signal Trace Modeling) allows to build models of signal traces such as cylinder pressure curves based on static inputs. The dependence of the measurement curves on the input parameters can be represented graphically and optimized to a target trace.
- **ASCMO-ODCM** (Online DOE with Constraint Modeling) helps reducing the risk of engine and test bench issues while running a DoE test using e.g. a brand new engine. Iteratively, after each measurement, ODCM is using the feedback of the engine regarding stability and limit

violations to modify the DoE test plan in a smart way. ODCM contains the logic part – a test bench automation is mandatory to perform the tests. (Product under development)

## 2.2. General Description

### 2.2.1. System Prerequisites

The following minimum system prerequisites have to be met:

Required Hardware	1,0 GHz PC 4 GB RAM Graphics with a resolution of at least 1024 x 768, 32 MB RAM
Required Operating System	Windows® 10, Windows® 11
<b>Required Free Disk Space</b>	4 GB (not including the size for application data)

The following system prerequisites are recommended:

Required Hardware	4,0 GHz Quad-Core PC or equivalent 32 GB RAM Graphics with a resolution of 1680 x 1050, 128 MB RAM
Required Operating System	Windows® 10, Windows® 11
<b>Required Free Disk Space</b>	> 4 GB

### 2.2.2. Software Prerequisites

ASCMO requires and installs the Matlab® Compiler Runtime 2022b. It also requires the .Net Framework V4.6, which is delivered with Windows® 10/11.

There are no additional SW-prerequisites for the ETAS ASCMO Base-Product installation and Add-ons. All necessary prerequisites will be installed.

To use the ETAS ASCMO Add-on "Software Developer Kit (SDK)", Matlab® version R2021b up to R2023b and the Matlab® "Optimization Toolbox" and "Statistics Toolbox" are required.

## 2.3. Delivery

The software is delivered with an installation routine Setup\_ETAS-ASCMO\_<Version>.exe. The installation requires administrator rights and installs everything required for running ETAS ASCMO.

### 2.3.1. Used 3rd Party Software

See document "Open\_Source\_Software\_in\_ASCMO.pdf", "Open\_Source\_Software\_in\_Lima.pdf" and "Open\_Source\_Software\_in\_McdCore.pdf".

## 2.4. Installation

See "Installation" chapter in manual (User Guide).

## 2.5. Licensing

See "Installation" chapter in manual (User Guide).

## 3. Changes

This chapter describes changes with respect to the previous version of ETAS ASCMO V5.12

### 3.1. What's New in ETAS ASCMO V5.13

#### General

- ASCMO can now import Parquet files (Bosch variant)
- ASCMO's p-Code can now be started in Matlab R2023b (newest supported version)

#### ASCMO-Static

- Allow to show model uncertainty (sigma) of Random Decision Trees.
- The RMSE is shown in the log after model training.
- Removed Undo Data Change functionality.
- Improved the speed of evaluation of MLP models. Optimization should now 10 times faster.

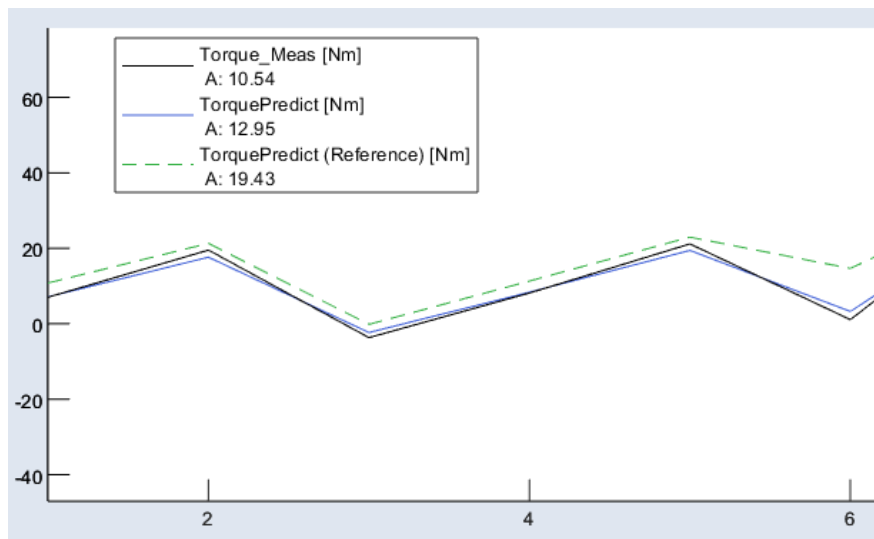
#### ASCMO-Dynamic

- Models can now be exported to Python.
- New model type: Temporal Convolutional Neural Network. It's available as modelling method CNN with layer type Temporal Convolution.
- CNNs now offer the option "Dropout".
- RNNs and CNNs now offer the option "Skip Connections".

#### MOCA

- In addition to parameters, now also the bounds can be imported from another open MOCA instance.

- Map smoothing dialog now allows to display 2D cuts of maps (X-Z and Y-Z view).
- Allow to show evaluation on reference parameterset. Residuals and predictions can now be shown for two parametersets in one plot.



- Matrix parameters can now depend on another parameter e.g., to be able to optimize only a single value of a larger vector/matrix: [1 2 %aScalar% 3]
- Plot cursors have been improved and shows as context menu the no. of points above/below the cursor.
- Plots now have the same width regardless of the number of signals, so cursors are aligned in multiple plots.
- Allow to export the function as a DLL for MOCA Runtime (a license management can then be added by the user)
- The pause toolbar button now also stops the evaluation of the function, not just external model evaluation.
- Scalars with an enumeration, Curves with an enumeration as axis and enumeration Group Axes can now be imported from a DCM file and the related A2L file.

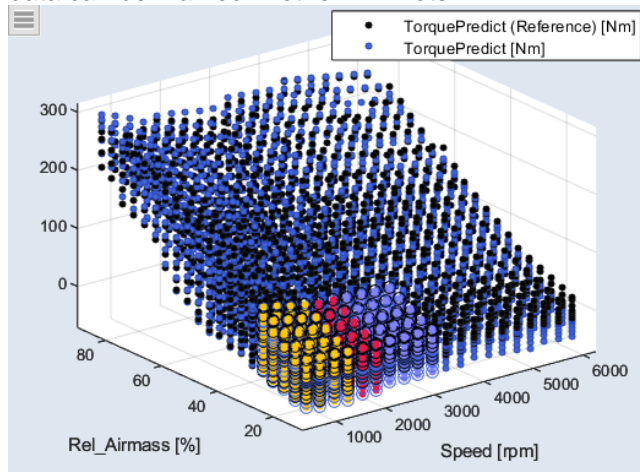
Parameter Name	Type†	Enumeration
logic_parameter_true	Text Scalar	Label 0: False
logic_parameter_false	Text Scalar	0: False
		1: True

Type†	Optimize	Smoothness	Label	Value
Text Curve	<input type="checkbox"/>	-	3: HO3	0.00000
Text Curve	<input type="checkbox"/>	-	4: HP2	0.00000

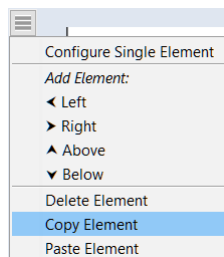
- When importing a DCM file with variants the user can choose a specific variant to import. When exporting a variant, this can be done as “Patch Parameter or Export Variant” and choose an existing DCM file and replace a specific variant.



- New Visualization: 3D Signal Plot. Multiple signals can be displayed in a 3D Plot and data can be marked in other 2D Plots.



- Added a Search/Filter field to the parameters table.
- Improved editing in tables. Typing overwrites a cell, double clicking a cell selects the whole content, better selection colors, ...
- Visualization elements can now be copied & pasted.



- FMU V3.0 can now be simulated and various data types are supported (integer, single precision...).

### Expedes Static

- The ODCM classifier threshold can now be changed during a running measurement campaign with the interface method `odcmSetClassifierThreshold`
- The default ODCM modelling algorithm has been switched to the ASCMO Static ASC GP classifier with Matern Kernel. This should lead to better identifying of non-feasible points. The actually used algorithm can be changed via interface.
- Expedes Static can now be started with an ODCM license without an ASCMO Static license.
- The ODCM Front-End now allows to chose the classifier and settings.

## 3.2. Compatibility to Earlier Releases

- Downward compatibility:  
ETAS ASCMO V5.13 can open all project files from ASCMO V4.2 to V5.12.
- Upward compatibility:  
ETAS ASCMO V5.13 files can be opened with ASCMO V5.13 or newer.
- ASCMO-SDK (p-code) needs Matlab R2021b as minimal required version to run ASCMO in Matlab.
- No FNP (Flexnet Puplicher) licenses are accepted as Machine Based licenses anymore, only FNE (Flexnet Embedded) license are valid. Old licenses can be updated in the License Manager.

## 3.3. Fixed Problems

- [Shared] ASCMO-3448  
Fixed import of parquet files which had an unexpected time channel name.
- [ASCMO Static] ASCMO-3594  
Fixed that optimization with GP-SCS models did not work.
- [ASCMO Static] ASCMO-3517  
Fixed out of memory issues when using a Matern kernel in AutoML.
- [MOCA] ASCMO-3502  
Fixed that Time Delay init value could not be negative.
- [ASCMO Static] ASCMO-3544  
Fixed that the wrong data is deleted, when deleting rows in the Training/Test data table
- [ASCMO Static] ASCMO-3560  
Fixed that optimizer did run indefinitely in certain situations.

## 3.4. 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: [www.etas.com/kir](http://www.etas.com/kir)

## 3.5. Known Issues

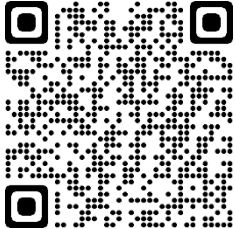
This section describes the set of known problems of the released version of ETAS ASCMO V5.13.

1. The Japanese manual and online help describe ASCMO Static/Dynamic ASCMO V5.11 and MOCA V5.12. An update will be made available later via the ETAS Download Center.
2. TSim Plugins in MOCA need an installed Matlab Compiler Runtime R2017b

## 4. Contact Information

### 4.1. Technical Support

For details of your local sales office as well as your local technical support team and product hotlines, take a look at the website: [www.etas.com/hotlines](http://www.etas.com/hotlines)



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