

CarSim Model and License Options

This memo summarizes model and license options for CarSim 2020.1. Unless noted otherwise, all optional features are supported on all operating systems and in combination with all other features.

CarSim for Windows

The basic CarSim installer provides a database and browser with user interface, plotter, animator, both 32-bit and 64-bit math model solver programs, extensive documentation, and many example vehicles, procedures, and simulations.

The CarSim math model supports a four-wheeled motor vehicle with or without a trailer (with one, two, or three axles), using any combination of independent and solid-axle suspensions, and possibly a twist-beam rear suspension, and possibly an independent steered front suspension with a virtual kingpin on the motor vehicle. The model works as-is, and can optionally be extended with the built-in scripting language (VS Commands), Simulink, LabVIEW, and ETAS ASCET. The math model can also be extended using external programs written in MATLAB, Visual Basic, C/C++, Python, and other languages that can interact with Windows DLLs. Up to 200 built-in moving objects can be controlled to simulate traffic and safety-related scenarios.

The 32-bit and 64-bit versions of the CarSim math models run at the same speed. The two versions are provided solely to provide compatibility with third-party software. When used alone, all calculations are done with the 32-bit versions for compatibility with the CarSim main GUI; when used with third-party 64-bit software (e.g., 64-bit Simulink), the 64-bit CarSim solvers must be used.

The basic CarSim for Windows package includes two licenses:

1. The CarSim Solver for Windows License is needed to make a new simulation run with a math model.
2. The CarSim Browser and Graphical User Interface License is needed to run the main GUI, manage the database, control runs, view animations, etc.

It is rare to provide one of the basic licenses alone; both are needed for normal operation and both are provided in the basic package. (The option for obtaining just one license is to support custom automation capabilities for sites with many CarSim installations.)

The CarSim Solver for Windows License supports all CarSim vehicle configurations based on a single unit (no trailer) with a rigid sprung mass.

ADAS Sensors

The optional CarSim Sensor License allows activation of up to 99 built-in range and tracking sensors to sense the moving objects (up to 200), sending variables to external controller models in Simulink, LabVIEW, or other environments.

Multiple Vehicles

The optional CarSim Multiple Vehicle License allows use of up to 3 additional lead vehicles in a single solver instance. Multiple vehicles may be configured in the CarSim Browser.

Trailer

The optional CarSim Trailer License allows use of a trailer with one, two, or three axles. If the multiple vehicle license is used, trailers may be added for all of the vehicles in the simulation.

Engine Mount

The optional CarSim Engine Mount License allows the use of vehicle models with an engine and torque rod with additional degrees of freedom (DOF). These are modeled as six mounts: four for the engine and two for the torque rod.

The Engine Mount feature cannot be used at the same time as the Frame Twist model feature.

Frame Twist

The optional CarSim Frame Twist License allows use of models with frame twist DOFs that represent the distribution of torsional compliance along the length of the Sprung Mass body and therefore affect the load transfer to the tires. When enabled, the Frame Twist option affects the motor vehicle and a trailer, if linked.

The Frame Twist feature cannot be used at the same time as the Engine Mount feature.

3rd Party Tire Models (TNO, Siemens, COSIN, and Michelin Tires)

The CarSim Windows installation includes DLLs for tire models from TNO (MF-Tyre/MF-Swift v6.2), Siemens (MF-Tyre/MF-Swift v2020.1), COSIN (FTire) and Michelin (TameTire), with example datasets. There are six license options below:

1. TNO Delft-Tyre v6.2 (MF-Tyre only) runs under any CarSim license together with all options that run under Windows OS.
2. TNO Delft-Tyre v6.2 (including MF-Swift) requires an optional paid license from Siemens in addition to a basic CarSim license. With this license the MF-Swift model will work together with all options that run under Windows OS.
3. Siemens MF-Tyre v2020.1 runs under any CarSim license together with all options except the **Enveloping contact**, **Rigid-ring** and **Turnslip** options that run under Windows OS.
4. Siemens MF-Swift v2020.1 (including **Enveloping contact**, **Rigid-ring** and **Turnslip** option) requires an optional paid license from Siemens in addition to a basic CarSim license. With this license the MF-Tyre/MF-Swift model will work together with all options that run under Windows OS.
5. COSIN FTire requires an optional paid license from COSIN in addition to a basic CarSim license. With this license the FTire model will work together with all options that run under Windows OS.

6. Michelin TameTire requires an optional paid license from Michelin in addition to a basic CarSim license. With this license the TameTire model will work together with all options that run under Windows OS.

These external tire models support 32-bit and 64-bit versions.

Siemens MF-Tyre/MF-Swift v2020.1 is also available for RT use on dSPACE DS1006, SCALEXIO and Concurrent RT. The RT versions requires a paid license from Siemens.

COSIN FTire models run much slower than real time and should not be considered for use in a CarSim Windows Driving Simulator.

AVL Cruise Powertrain

The optional CarSim AVL Cruise License allows the CarSim vehicle model to link to a powertrain model defined in the AVL Cruise software. The DLL for AVL Cruise must be obtained from AVL, along with the license for Cruise and the Cruise interface to CarSim.

Integration with AVL Cruise is supported for both 32-bit and 64-bit solvers on Windows only; support does not exist for running this combination on real-time systems. The connection is native, which means a 3rd party software like Simulink or LabVIEW is not used as the interface.

Parallel Solver

This optional counted license allows additional process instances to simultaneously run CarSim simulations on the targeted machine (process-level parallelism). This is useful for simulations involving multiple vehicle interactions orchestrated by external software such as MATLAB Simulink, or for custom server deployments of CarSim expected to be running many CarSim simulations.

CarSim Real Time

RT Platforms

The CarSim installer for Windows includes support for six RT platforms:

1. dSPACE DS1006/DS1005/DS1103 and SCALEXIO
2. National Instruments LabVIEW RT/VeriStand (ETS OS and Linux RT OS)
3. ETAS LabCar RTPC
4. Opal RT-LAB (QNX RT OS and Linux RT OS)
5. Concurrent Real Time System
6. A&D Technology

An optional RT license is needed to run on any of the above systems. The same set of optional licensed features that are available for the CarSim Windows installation are also available for CarSim RT: ADAS Sensors, Trailers, Engine Mounts, and Frame Twist.

The CarSim RT solvers do not work with the external component models from COSIN or AVL, with the exception that Siemens tire models are available for dSPACE DS1006/SCALEXIO and Concurrent RT.

Extra Live Animations

CarSim RT supports a live animation license that supports a single connection between the math model and VS Visualizer, which in turn supports up to three monitors. If more connected computers running VS Visualizer are needed, additional live animation licenses can be purchased for all systems except dSPACE.

Windows DS for CarSim

The optional CarSim DS License is available to support a Windows-based desktop driving simulator.

A separate package adds files to an existing CarSim Windows installation to provide a virtual proving ground and a vehicle dataset that has been well tested in the DS environment. Driving hardware is either a Logitech G29 or G920 steering wheel and pedal set.

The DS database includes software to support a single live connection between a vehicle math model and the VS Visualizer, which in turn supports up to three monitors. Additional live animation licenses can be purchased if more connected computers are needed to run more VS Visualizer instances.