



QuarterCAR User Manual

SuspAct QuarterCAR — version 1.0.0
Publisher: SuspAct / Baldwin Concepts BV
Contact: info@suspact.com · +31 6 31378198

1. Introduction

QuarterCAR is a desktop application for learning how spring rates, damping, and masses affect the frequency response of a vertical vehicle suspension model. You build a mechanical network (objects connected by springs and dampers), excite the road with a sinusoid, run a time simulation, and study position/speed plots or transmissibility sweeps.

The simulation is educational and simplified. It is not a substitute for professional vehicle setup or homologation. Only trained professionals should apply settings to real vehicles.

Throughout this manual, figures are taken from the example project `MassdamperWheel_3systems.json` (mass damper vs baseline quarter-car), which can only be run after a license has been activated (Not in Demo mode)

2. Example project at a glance

The example contains three models in one session:

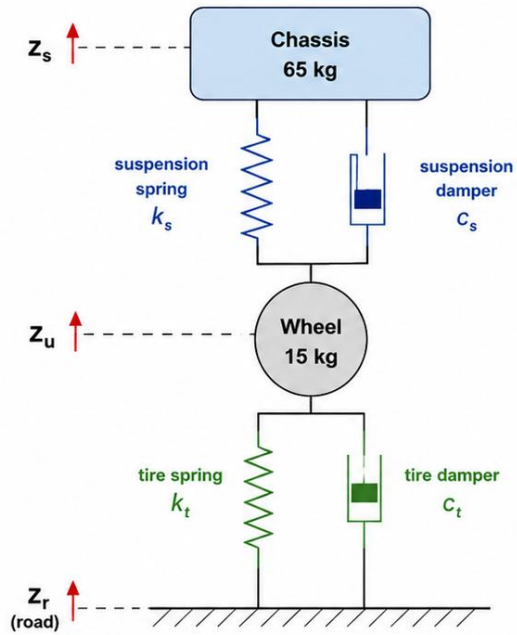
MassdamperWheel_3systems.json — three models in one project

Model	Objects	Free bodies	Sweep saved
NoMD	3	wheel, chassis	Yes
WithMD	4	wheel, chassis, MAssdamp	Yes
WithMD copy	4	wheel, chassis, MAssdamp	Yes

Example project overview

Example: NoMD (3 objects)

Quarter-car model without mass damper

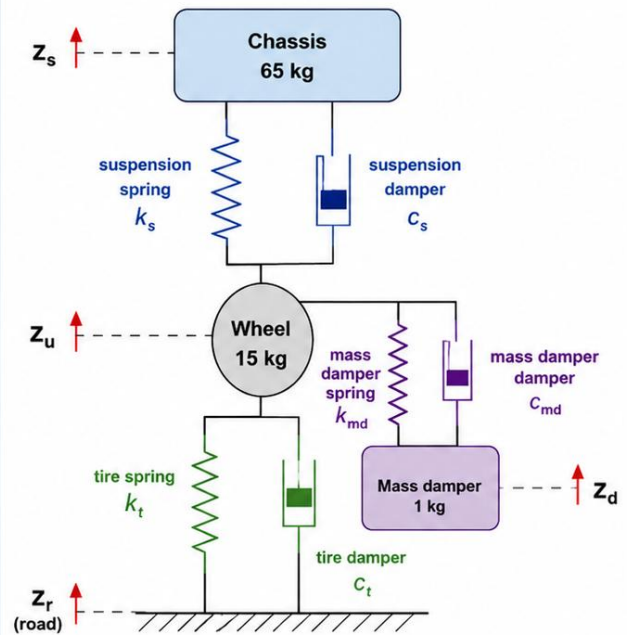


Elements

-  Suspension spring (k_s) and damper (c_s)
-  Tire spring (k_t) and damper (c_t)
-  z_s, z_u, z_r : vertical displacements (upward positive)

Example: WithMD (4 objects)

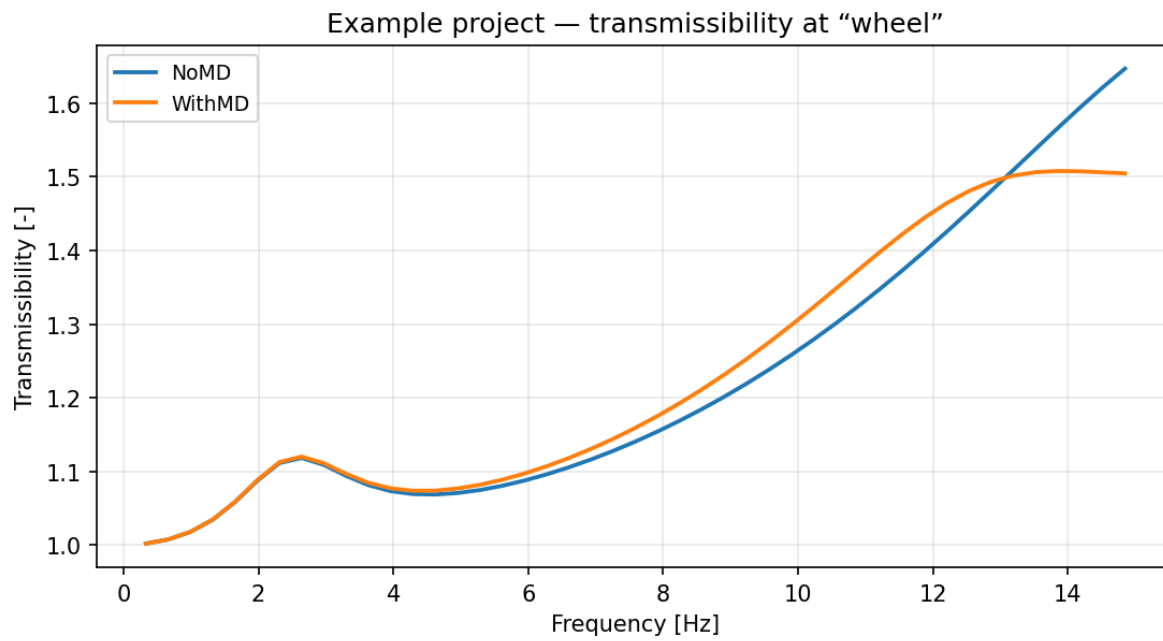
Quarter-car model with mass damper



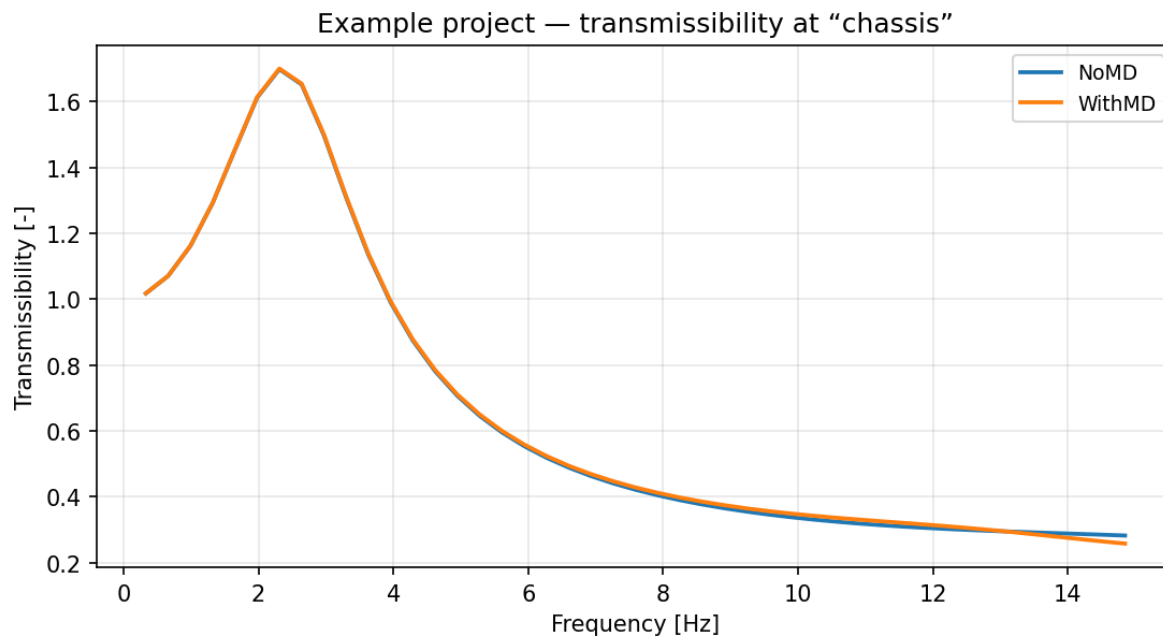
Elements

-  Mass damper spring (k_{md}) and damper (c_{md})
-  Suspension spring (k_s) and damper (c_s)
-  Tire spring (k_t) and damper (c_t)
-  z_d, z_s, z_u, z_r : vertical displacements (upward positive)

Baseline quarter-car model with and without Mass damper

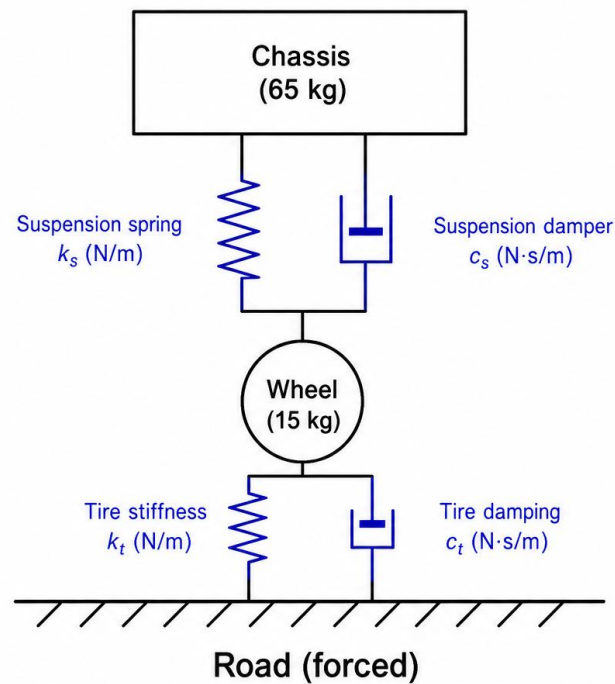


Wheel transmissibility comparison



Chassis transmissibility comparison

Quarter-car model (3 objects)



Quarter-car model schematic

3. Model layouts

The baseline NoMD model consists of a wheel mass, chassis mass, suspension spring/damper, and tire spring/damper. The WithMD model adds an additional tuned mass damper connected to the wheel.

4. Active model

Run simulation only runs the active model (toolbar dropdown or double-click on Models).

Objects / Springs / Dampers / Inerters show that model only.

Toolbar road/time settings apply to that model.

Results are stored on that model; others stay unchanged until you select and run them.

Same behavior for Run transmissibility sweep.

5. Transmissibility results

A transmissibility sweep runs the model at multiple frequencies and plots the peak-to-peak response divided by the road excitation amplitude. Comparing NoMD and WithMD shows the effect of the additional tuned mass damper.

The results are shown for all models loaded as long as there are simulation results available.

6. System requirements and installation

Windows 10 or 11 (64-bit) is recommended. Install using QuarterCAR-Setup.exe or use the portable build from the dist/QuarterCAR folder.

7. First start

Launch QuarterCAR and accept the terms of use. The title bar shows Demo mode when no valid license is active.

8. Main window layout

The interface contains toolbar controls, model tabs, object/spring/damper editors, and graph/transmissibility views.

9. Building a model

Objects represent masses or fixed points. Springs and dampers connect objects using conn_a and conn_b object numbers.

10. Running a time simulation

Set road amplitude, frequency, simulation start/end times, and timestep dt. Run the simulation to visualize positions, speeds, and forces.

10. Multiple models and files

Multiple models can exist inside one project. Use the Models tab to switch between them and compare transmissibility curves.

11. Demo mode vs licensed

Demo mode is limited to 3 objects and 15 Hz. Licensed versions allow more objects, inerters, PDF export, and higher frequencies.

12. Troubleshooting

Check missing connections, object numbering, and demo limitations if a simulation does not run.

13. Support

Support: info@suspact.com · +31 6 31378198

Appendix — Regenerating manual figures

python scripts/generate_manual_figures.py "C:\Users\BEven\Downloads\MassdamperWheel_3systems.json"