

COMSOL MULTIPHYSICS

| | COMSOL Multiphysics® | AC/DC Module | Acoustics Module | Chemical Engineering Module | COMSOL Reaction Engineering Module | Earth Science Module | Heat Transfer Module | Heat Transfer Lab® | Material Library | Material Module | MEMS Module | RF Module | Structural Mechanics Module |
|---|----------------------|--------------|------------------|-----------------------------|------------------------------------|----------------------|----------------------|--------------------|------------------|-----------------|-------------|-----------|-----------------------------|
| Equations | | | | | | | | | | | | | |
| PDE Formulation, Free Equation-based Modeling | | • | • | • | • | • | • | • | • | • | • | • | • |
| General Periodic Boundary Conditions | | • | • | • | • | • | • | • | • | • | • | • | • |
| Evaluation of Material and Energy Balances from Chemistry | | | | | | | | • | | | | | |
| Freely Manipulate the Underlying Equations/Physics | | • | • | • | • | • | • | • | • | • | • | • | • |
| Deformed Mesh and Topology Optimizations* and Sensitivity Analysis | | • | • | • | • | • | • | • | • | • | • | • | • |
| Acoustics | | | | | | | | | | | | | |
| Time-harmonic Analysis | | • | | • | | | | | | | | | |
| Eigenfrequency Analysis | | • | | • | | | | | | | | | |
| Transient Analysis | | | | • | | | | | | | | | |
| Modal Analysis | | | | • | | | | | | | | | |
| Time-harmonic Analysis, Scattered-Field Analysis | | | | • | | | | | | | | | |
| Ultraweak Variational Formulation (UWVF) for Efficient Time-harmonic Simulation | | | | • | | | | | | | | | |
| Perfectly Matched Layers (PMLs) | | | | • | | | | | | | | | |
| Acoustics Damping: | | | | | | | | | | | | | |
| General, Complex Material, Delany-Bazley, and Bulk Viscosity | | | | • | | | | | | | | | |
| Structural Damping: | | | | | | | | | | | | | |
| Rayleigh | | | | • | | | | | | | | • | • |
| Loss Factor | | | | • | | | | | | | | • | • |
| Boundary Conditions: | | | | | | | | | | | | | |
| Sound Hard, Sound Soft, Pressure, Normal Acceleration, Impedance, and Radiation | | • | | • | | | | | | | | | |
| Matched Boundary | | • | | • | | | | | | | | | |
| Point Sources: | | | | | | | | | | | | | |
| Flow, Intensity, and Power | | | | • | | | | | | | | | |
| Far-field Analysis | | | | • | | | | | | | | | |
| Fluid Mechanics | | | | | | | | | | | | | |
| Navier-Stokes, Laminar Flow with Non-constant Viscosity | | • | | | | • | | | • | • | | • | |
| Non-Newtonian Flow, Carreau-Yasuda and Power Law | | | | | | • | | | | | | | |
| Flow with Variable Density | | | | | | • | | | • | • | | • | |
| Nonisothermal Flow, Non-constant Density | | | | | | • | | | | • | | | |
| Stokes Flow | | | | | | | | | | | | • | |
| Electrokinetic Flow | | | | | | • | | | | | | • | |
| Compressible Potential Flow | | | | | | • | | | | | | | |
| $k-\epsilon$ Turbulence Model for Turbulent Flow | | | | | | • | | | | • | | | |
| $k-\mu$ Turbulence Model for Turbulent Flow | | | | | | • | | | | • | | | |
| Evaluation of Fluid Properties from Species Data | | | | | | | | • | | | | | |
| Porous Media Flow: | | | | | | | | | | | | | |
| Brinkman's Extension of Darcy's Law | | | | | | • | | | • | | | | |
| Darcy's Law | | | | | | • | | | • | | | | |
| Richards' Equation for Variably Saturated Media | | | | | | | | | • | | | | |
| Multiphase Flow: | | | | | | | | | | | | | |
| Bubbly Flow Model for Liquid/Gas Mixtures in Laminar and Turbulent Flow | | | | | | • | | | | | | | |
| Mixture Model for Solid Particles in Liquids or Emulsions in Laminar and Turbulent Flow | | | | | | • | | | | | | | |
| General Interface for Two-phase Flow using the Level Set Method | | | | | | • | | | | | | • | |
| General Interface for Two-phase Flow using the Phase Field Method | | | | | | • | | | | | | • | |

* Requires COMSOL Optimization Lab

COMSOL MULTIPHYSICS

Material Transport

| | COMSOL Multiphysics® | AC/DC Module | Acoustics Module | Chemical Engineering Module | COMSOL Reaction Engineering Module | Earth Science Engineering Lab® | Heat Transfer Module | Material Library | MEMS Module | RF Module | Structural Mechanics Module |
|---|----------------------|--------------|------------------|-----------------------------|------------------------------------|--------------------------------|----------------------|------------------|-------------|-----------|-----------------------------|
| Diffusion | | | | | | | | | | | |
| Diffusion and Convection | | | | | | | | | | | |
| Evaluation of Material Transport Properties from Species Data | | | | | | | | | | | |
| Material Balances in Continuously Stirred Tank and Plug Flow Reactors | | | | | | | | | | | |
| Maxwell-Stefan Multicomponent Transport and Reactions | | | | | | | | | | | |
| Multicomponent Transport in Diluted Solutions with Reactions | | | | | | | | | | | |
| Nernst-Planck, Migration of Ions in Electric Fields and Reactions (Electrophoresis) | | | | | | | | | | | |

Heat Transfer

| | COMSOL Multiphysics® | AC/DC Module | Acoustics Module | Chemical Engineering Module | COMSOL Reaction Engineering Module | Earth Science Engineering Lab® | Heat Transfer Module | Material Library | MEMS Module | RF Module | Structural Mechanics Module |
|--|----------------------|--------------|------------------|-----------------------------|------------------------------------|--------------------------------|----------------------|------------------|-------------|-----------|-----------------------------|
| Bioheat Equation for Heat Transfer in Living Tissue | | | | | | | | | | | |
| Conduction with Heat Sources and Sinks | | | | | | | | | | | |
| Convection with Heat Sources and Sinks, Film Coefficient | | | | | | | | | | | |
| Convection with Heat Sources and Sinks, coupled to Fluid Transport | | | | | | | | | | | |
| Evaluation of Heat Transport Properties from Species Data | | | | | | | | | | | |
| Heat Balances in Continuously Stirred Tank and Plug Flow Reactors | | | | | | | | | | | |
| Radiation, Surface-to-Ambient | | | | | | | | | | | |
| Radiation, Surface-to-Surface View-Factor Method | | | | | | | | | | | |
| Thin Thermally Conducting Shells with Heat Sources and Sinks | | | | | | | | | | | |

Electromagnetics Low Frequency

| | COMSOL Multiphysics® | AC/DC Module | Acoustics Module | Chemical Engineering Module | COMSOL Reaction Engineering Module | Earth Science Engineering Lab® | Heat Transfer Module | Material Library | MEMS Module | RF Module | Structural Mechanics Module |
|---|----------------------|--------------|------------------|-----------------------------|------------------------------------|--------------------------------|----------------------|------------------|-------------|-----------|-----------------------------|
| Current Conduction through DC | | | | | | | | | | | |
| Electromagnetic Shells and Floating Point Boundary Condition | | | | | | | | | | | |
| Electrostatics Conducting and Dielectric Materials | | | | | | | | | | | |
| Electrostatics Dielectrics | | | | | | | | | | | |
| RLC Lumped Parameter Calculation | | | | | | | | | | | |
| General Magnetostatics | | | | | | | | | | | |
| Magnetostatics, No Currents | | | | | | | | | | | |
| Quasi-statics | | | | | | | | | | | |
| Quasi-statics with Negligible Coupling for E and H Fields | | | | | | | | | | | |
| Periodic Boundary Conditions | | | | | | | | | | | |
| Sector Symmetry | | | | | | | | | | | |
| Time-harmonic Analysis | | | | | | | | | | | |
| Transient (Time-domain) Analysis | | | | | | | | | | | |
| Infinite Elements | | | | | | | | | | | |
| Force and Torque Computations | | | | | | | | | | | |
| SPICE Interface for Circuit Simulations | | | | | | | | | | | |
| Support for Nonlinear B-H Curves | | | | | | | | | | | |
| Joule Heating | | | | | | | | | | | |
| Induction Heating | | | | | | | | | | | |
| Rotating Machinery | | | | | | | | | | | |
| Mixed AC/DC Simulation for Small-Signal Analysis | | | | | | | | | | | |
| Induced Field Analysis | | | | | | | | | | | |

COMSOL MULTIPHYSICS

Electromagnetics High Frequency

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|---|----------------------|--------------|------------------|-----------------------------|----------------------------------|--------------------------------|----------------------|------------------|-------------|-----------|-----------------------------|
| Hybrid-mode Waves | | | | | | | | | | | • |
| Materials with Continuous Spatial Properties Variations | | | | | | | | | | | • |
| TE Waves | | | | | | | | | | | • |
| TM Waves | | | | | | | | | | | • |
| Specific Absorption Rate (SAR) | | | | | | | | | | | • |
| Absorbing Boundaries | | | | | | | | | | | • |
| Coaxial, Waveguide, and Numerical Ports | | | | | | | | | | | • |
| Lumped Ports | | | | | | | | | | | • |
| Near and Far Electromagnetic Field Extension | | | | | | | | | | | • |
| Perfectly Matched Layers (PMLs) | | | | | | | | | | | • |
| Periodic Boundary Conditions | | | | | | | | | | | • |
| S-Parameter Analysis | | | | | | | | | | | • |
| Transition and Impedance Boundaries | | | | | | | | | | | • |
| Eigenfrequency Analysis | | | | | | | | | | | • |
| Time-Harmonic Analysis | | | | | | | | | | | • |
| Transient (Time-domain) Analysis | | | | | | | | | | | • |
| Power Level for Ports | | | | | | | | | | | • |
| Magnetic Frill | | | | | | | | | | | • |
| Lossy Eigenfrequency and Modal Analysis | | | | | | | | | | | • |
| Scattered Field Analysis | | | | | | | | | | | • |
| Microwave Heating | | | | | | | | | | | • |
| SPIICE Interface for Circuit Simulations | | | | | | | | | | | • |

Structural Linear

| | | | | | | | | | | | | |
|--|--|---|--|--|--|--|--|--|--|--|---|---|
| Static Analysis | | • | | | | | | | | | • | • |
| Transient Analysis | | • | | | | | | | | | • | • |
| Frequency Response (Harmonic) Analysis | | | | | | | | | | | • | • |
| Buckling | | | | | | | | | | | • | • |
| Modal Analysis | | • | | | | | | | | | • | • |
| Damped Modal Analysis | | | | | | | | | | | • | • |
| Perfectly Matched Layers (PMLs) | | | | | | | | | | | • | • |
| Structural Damping: | | | | | | | | | | | • | • |
| Loss Factor | | | | | | | | | | | • | • |
| Rayleigh | | | | | | | | | | | • | • |
| Equivalent Viscous | | | | | | | | | | | • | • |
| Mixed U-P Formulation | | | | | | | | | | | • | • |
| Reaction Force Calculation | | • | | | | | | | | | • | • |

Structural Nonlinear

| | | | | | | | | | | | | |
|--|--|---|--|--|--|--|--|--|--|--|---|---|
| Static Analysis | | • | | | | | | | | | • | • |
| Transient Analysis | | • | | | | | | | | | • | • |
| Buckling | | | | | | | | | | | • | • |
| Mixed Formulation | | | | | | | | | | | • | • |
| Geometric Nonlinear (Large Deformations) | | | | | | | | | | | • | • |
| Follower Loads | | | | | | | | | | | • | • |
| Material Models: | | | | | | | | | | | • | • |
| Elasto-plasticity | | | | | | | | | | | • | • |
| Hyperelasticity | | | | | | | | | | | • | • |
| Viscoelasticity | | | | | | | | | | | • | • |
| Viscoplasticity and Creep | | | | | | | | | | | • | • |
| Reaction Force Calculation | | • | | | | | | | | | • | • |

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|--|----------------------|--------------|------------------|-----------------------------|-----------------|--------------------------------|----------------------|------------------|-------------|-----------|-----------------------------|--|
| Structural Contact | | | | | | | | | | | | |
| Surface-Surface | | | | | | | | | | • | • | |
| Friction | | | | | | | | | | • | • | |
| Augmented Lagrangian Method | | | | | | | | | | • | • | |
| Dynamic Friction | | | | | | | | | | • | • | |
| Multiphysics Contact | | | | | | | | | | • | • | |
| Quasi-static and Transient Contact | | | | | | | | | | • | • | |
| Structural Elements | | | | | | | | | | | | |
| Shells | | | | | | | | | | | • | |
| Beams | | | | | | | | | | | • | |
| Plates | | | | | | | | | | | • | |
| Truss/Cables | | | | | | | | | | | • | |
| Properties and Material Databases | | | | | | | | | | | | |
| Material Library with Functions describing a Range of Properties for over 2500 Materials | | | | | | | | | | • | | |
| Basic Materials Library for Solids with Electrical, Structural, and Thermal Properties | • | • | • | • | | | | • | • | • | • | |
| Fluids Materials Library with Transport Properties and Surface Tension Data | | | • | • | | | | • | • | • | • | |
| MEMS and Piezoelectric Materials Library | | | | • | | | | | | • | • | |
| Heat Transfer Coefficients Library | | | | | | | | | • | | | |
| Thermodynamic, Transport Properties and Chemical Kinetics Expressions Library | | | | | | • | | | | | | |
| Electric (AC/DC) Material Properties | | • | | | | | | | | | | |
| Predefined Multiphysics Couplings | | | | | | | | | | | | |
| Acoustics-fluid Interaction (Aeroacoustics with Compressible Flow) | | | • | | | | | | | | | |
| Electro-thermal Interactions: | | | | | | | | | | | | |
| Joule Heating | • | • | | | | | | | | | | |
| Inductive Heating | | • | | | | | | | | | | |
| Microwave Heating | | | | | | | | | | | • | |
| Rotating Machinery | | • | • | | | | | | | | | |
| Fluid-thermal Interactions: | | | | | | | | | | | | |
| Incompressible Fluid-thermal Interactions | | | | | | | | | | | | |
| Nonisothermal Flow | • | | | • | | | | • | | | | |
| Nonisothermal Turbulent Flow | | | | • | | | | • | | | | |
| Nonisothermal Flow and Fluid-solid Heat Transfer | | | | • | | | | • | | | | |
| Flow with Multiple Species Transport | | | | | | | | | | • | | |
| Fluid-Chemical Reactions | | | | • | • | | | | | | | |
| Electrophoretic Material Transport | | | | • | | | | • | | • | | |
| Electroosmotic Flow | | | | • | | | | | | • | | |
| Fluid-Structure Interaction (FSI) | | | | | | | | | | • | • | |
| Acoustic-Structure Interaction | | | • | | | | | | | • | • | |
| Piezoelectric Analysis | | | • | | | | | | | • | • | |
| Thermal Stresses | | | | | | | | | | • | • | |
| Thermal Electric-Structural Interaction | | | | | | | | | | • | • | |
| Poroelasticity | | | | | | | | • | | | | |

COMSOL MULTIPHYSICS

Multiphysics Couplings

| | COMSOL Multiphysics® | AC/DC Module | Chemical Engineering Module | COMSOL Reaction Engineering Module | Earth Science Engineering Lab® | Heat Transfer Module | Material Library | MEMS Module | RF Module | Structural Mechanics Module |
|---|----------------------|--------------|-----------------------------|------------------------------------|--------------------------------|----------------------|------------------|-------------|-----------|-----------------------------|
| Peltier Cooling | | | | | | | | • | | |
| Electromagnetic-Structural Effects | | | | | | | | | • | • |
| Electro-Optical Effects | | | | | | | | | | • |
| Equation-based Multiphysics, Free Formulation | • | • | • | • | • | • | • | • | • | • |
| Fluid-electrical Effects: | | | | | | | | | | |
| Electrophoresis | | | | | | | | | | • |
| Dielectrophoresis | | | • | | | | | | | • |
| Streaming Potential | | | | | • | | | | | |
| Electroosmosis | | | | | • | | | | | • |
| Fluid-Magnetic Effects: | | | | | | | | | | |
| Ferrofluids | • | • | | | • | | | | | |
| Magneto-hydrodynamics (MHD) | | • | | | • | | | | | |
| Weakly Compressible Flow with Thermal Effects | | | | | | | | • | | |
| Fluid-thermal-chemical Interactions in Tubular Reactors | | | | | | | | | | • |
| Fluid-thermal Effects with Phase Change | | | | | | | | | | • |
| Poroelasticity, Fluid-structural Effects | | | | | | | | | • | |
| Structural-optical Effects | | | | | | | | | | • |

Solvers

| | | | | | | | | | | | | |
|---|---|---|---|---|--|---|---|---|--|---|---|---|
| Support for Shared-memory Parallelism in Assembly and in a Range of Solvers | • | • | • | • | | | • | • | | • | • | • |
| Stationary Linear and Nonlinear Solver | • | • | • | • | | | • | • | | • | • | • |
| Time-dependent Nonlinear Solver (DASPK, HHT alpha, IDA) | • | • | • | • | | • | • | • | | • | • | • |
| Eigenvalue Solver (ARPACK) | • | • | • | • | | | • | • | | • | • | • |
| Adaptive Mesh Refinement Solver | • | • | • | • | | | • | • | | • | • | • |
| Parametric Linear and Nonlinear Solver | • | • | • | • | | | • | • | | • | • | • |
| Parameter sweeps on Linux Clusters and Windows Compute Clusters | • | • | • | • | | | • | • | | • | • | • |
| Nonlinear Parameter Estimation from Data Sets | | | | | | • | | | | | | |
| Stationary, Parametric and Time-Dependent Segregated Solver | • | • | • | • | | | • | • | | • | • | • |
| Solvers for Constrained Optimization* (SNOPT) | • | • | • | • | | | • | • | | • | • | • |
| Direct Linear Solvers: | | | | | | | | | | | | |
| UMFPACK LU Factorization | • | • | • | • | | | • | • | | • | • | • |
| SPOLES LU and LDL ^T Factorization | • | • | • | • | | | • | • | | • | • | • |
| PARDISO | • | • | • | • | | | • | • | | • | • | • |
| PARDISO out-of-core | • | • | • | • | | | • | • | | • | • | • |
| TAUCS Cholesky Factorization | • | • | • | • | | | • | • | | • | • | • |
| Incomplete LU Factorization | • | • | • | • | | | • | • | | • | • | • |
| Iterative Linear Solvers: | | | | | | | | | | | | |
| Conjugate Gradients | • | • | • | • | | | • | • | | • | • | • |
| FGMRES and GMRES | • | • | • | • | | | • | • | | • | • | • |
| Algebraic Multigrid | • | • | • | • | | | • | • | | • | • | • |
| Geometric Multigrid | • | • | • | • | | | • | • | | • | • | • |
| BiCGStab | • | • | • | • | | | • | • | | • | • | • |
| Preconditioners/Smoothers: | | | | | | | | | | | | |
| Incomplete LU Factorization | • | • | • | • | | | • | • | | • | • | • |
| Jacobi (Diagonal Scaling) | • | • | • | • | | | • | • | | • | • | • |
| SOR, SSOR, and SSOR Vector | • | • | • | • | | | • | • | | • | • | • |
| Algebraic Multigrid | • | • | • | • | | | • | • | | • | • | • |
| Geometric Multigrid | • | • | • | • | | | • | • | | • | • | • |
| Vanka | • | • | • | • | | | • | • | | • | • | • |

* Requires COMSOL Optimization Lab

COMSOL MULTIPHYSICS

Scripting

| | COMSOL Multiphysics® | AC/DC Module | Acoustics Module | Chemical Engineering Module | Earth Science Engineering Lab® | Heat Transfer Module | Material Library | MEMS Module | RF Module | Structural Mechanics Module |
|---|----------------------|--------------|------------------|-----------------------------|--------------------------------|----------------------|------------------|-------------|-----------|-----------------------------|
| Command Line-based MATLAB® Script (MATLAB required) | • | • | • | • | • | • | • | • | • | • |

Postprocessing and Visualization

| | COMSOL Multiphysics® | AC/DC Module | Acoustics Module | Chemical Engineering Module | Earth Science Engineering Lab® | Heat Transfer Module | Material Library | MEMS Module | RF Module | Structural Mechanics Module |
|---|----------------------|--------------|------------------|-----------------------------|--------------------------------|----------------------|------------------|-------------|-----------|-----------------------------|
| Plots of all Field Variables, Predefined Quantities, and User-defined Quantities | • | • | • | • | • | • | • | • | • | • |
| Surface Plots | • | • | • | • | • | • | • | • | • | • |
| Contour Plots | • | • | • | • | • | • | • | • | • | • |
| Slice Plots | • | • | • | • | • | • | • | • | • | • |
| Isosurface Plots | • | • | • | • | • | • | • | • | • | • |
| Line Plots | • | • | • | • | • | • | • | • | • | • |
| Edge Plots | • | • | • | • | • | • | • | • | • | • |
| Boundary Plots | • | • | • | • | • | • | • | • | • | • |
| Subdomain Plots | • | • | • | • | • | • | • | • | • | • |
| Arrow Plots | • | • | • | • | • | • | • | • | • | • |
| Principal Stress/Strain Plots | • | • | • | • | • | • | • | • | • | • |
| Streamline Plots | • | • | • | • | • | • | • | • | • | • |
| Particle Tracing Plots | • | • | • | • | • | • | • | • | • | • |
| Particle Tracing Plots with Predefined Forces | • | • | • | • | • | • | • | • | • | • |
| Geometry Edge Plots | • | • | • | • | • | • | • | • | • | • |
| Cross-section Plots | • | • | • | • | • | • | • | • | • | • |
| Domain Plots (on Boundaries, Edges, Subdomains, and in Points) | • | • | • | • | • | • | • | • | • | • |
| Plots of Experimental Data | • | • | • | • | • | • | • | • | • | • |
| Animations/Movie Files (AVI, QuickTime, Animated GIF) | • | • | • | • | • | • | • | • | • | • |
| Maximum and Minimum Markers | • | • | • | • | • | • | • | • | • | • |
| Pre- and User Defined Color Scales and Color Maps | • | • | • | • | • | • | • | • | • | • |
| Editable Plot Titles and Axis Labels with Support for HTML and LaTeX Tags | • | • | • | • | • | • | • | • | • | • |
| Overlaid Plots and Plots in Separate Windows | • | • | • | • | • | • | • | • | • | • |
| Numeric Data Display of all Quantities and Variables and General Functions of these | • | • | • | • | • | • | • | • | • | • |
| Interpolated Values of all Quantities and Variables | • | • | • | • | • | • | • | • | • | • |
| Integrated Quantities on Boundaries and Subdomains | • | • | • | • | • | • | • | • | • | • |
| Probe Plots during the Solution Process | • | • | • | • | • | • | • | • | • | • |
| Visualization of the Mesh and its Element Quality | • | • | • | • | • | • | • | • | • | • |
| Accurate Recovery of Fluxes and Stresses | • | • | • | • | • | • | • | • | • | • |
| Reaction Force Calculation | • | • | • | • | • | • | • | • | • | • |
| Plot while solving | • | • | • | • | • | • | • | • | • | • |

External Interfaces

| | COMSOL Multiphysics® | AC/DC Module | Acoustics Module | Chemical Engineering Module | Earth Science Engineering Lab® | Heat Transfer Module | Material Library | MEMS Module | RF Module | Structural Mechanics Module |
|--|----------------------|--------------|------------------|-----------------------------|--------------------------------|----------------------|------------------|-------------|-----------|-----------------------------|
| MATLAB® and Simulink® | • | • | • | • | • | • | • | • | • | • |
| MatWeb® | • | • | • | • | • | • | • | • | • | • |
| Simpleware +ScanFE™ | • | • | • | • | • | • | • | • | • | • |
| C and FORTRAN (MATLAB® required) | • | • | • | • | • | • | • | • | • | • |
| SolidWorks® and Autodesk® Inventor® (CAD Import Module required) | • | • | • | • | • | • | • | • | • | • |
| PSpice (via Netlist File Export-Import) | • | • | • | • | • | • | • | • | • | • |
| Comparison with Experimental Data | • | • | • | • | • | • | • | • | • | • |
| ODB++(X) and NETEX-G Import and 3D Modeling | • | • | • | • | • | • | • | • | • | • |
| CHEMKIN® | • | • | • | • | • | • | • | • | • | • |
| CAPE-OPEN | • | • | • | • | • | • | • | • | • | • |

CHEMKIN is a registered trademark of Reaction Design.

CAD IMPORT AND FEATURES

Creating and Manipulating Geometries

| | CAD Import Module | CATIA V4 Import Module | CATIA V5 Import Module | PRO/E Import Module | VDA-FS Import Module | COMSOL Multiphysics® |
|--|-------------------|------------------------|------------------------|---------------------|----------------------|----------------------|
| Free Drawing in 2D (Ellipses, Rectangles, Points, Lines and Bezier Curves) | • | | | | | |
| Free Drawing in 3D (Blocks, Cones, Cylinders, Ellipsoids, Spheres, Points and Lines) | • | | | | | |
| Extruding, Revolving and Embedding 2D Faces to 3D Objects | • | | | | | |
| Creating Arrays of Objects | • | | | | | |
| Create Composite Objects using Boolean Algebra | • | | | | | |
| Coerce to Points, Curves and Solids in 2D | • | | | | | |
| Coerce to Points, Curves, Faces and Solids in 3D | • | | | | | |

Importing, Repairing and Exporting Geometries

| | CAD Import Module | CATIA V4 Import Module | CATIA V5 Import Module | PRO/E Import Module | VDA-FS Import Module | COMSOL Multiphysics® |
|---|-------------------|------------------------|------------------------|---------------------|----------------------|----------------------|
| Import NASTRAN® Mesh—Translate them to Geometry Objects | • | | | | | |
| Import MRI, CT and microCT data via Simpleware *ScanFE—Translate them to Geometry Objects | • | | | | | |
| Import STL (.stl) Files | • | | | | | |
| Import VRML (.vrl) Files | • | | | | | |
| Import 2D DXF (.dxf) Files | • | | | | | |
| Import GDS (.gds) Files *** | • | | | | | |
| Import STEP (.stp) Files | | | • | | | |
| Import IGES (.igs) Files | | | • | | | |
| Import ACIS®/SAT® (.sat, .sav, .asab, .asat) Files | | | • | | | |
| ODB++(X) Import and 3D Modeling *** | • | | | | | |
| NETEX-G Import and 3D Modeling *** | • | | | | | |
| Import Parasolid® (.x_t, .x_b) Files | | | • | | | |
| Bidirectional Interface with SolidWorks® | | | • | | | |
| Bidirectional Interface with Autodesk® Inventor® | | | • | | | |
| Geometric parametric sweeps **** | | | • | | | |
| Import* CATIA®V4 (.model) Files | | | | • | | |
| Import* CATIA®V5 (.catpart, .catProduct) Files | | | | • | | |
| Import* Pro/E (.prt, .asm) Files | | | | | • | |
| Import* VDA-FS (.vda) Files | | | | | | • |
| Repair CAD-imported Objects | | | • | | | |
| Knit Faces and Fill Gaps | | | • | | | |
| Defeature (remove) Fillets | | | • | | | |
| Defeature (remove) Small Faces | | | • | | | |
| Defeature (remove) Sliver Faces | | | • | | | |
| Defeature (remove) Spikes | | | • | | | |
| Defeature (remove) Short Edges | | | • | | | |
| Conversion of Imported Geometries to the Parasolid File Format | | | • | | | |
| Export** of Converted and Manipulated Parasolid Geometries | | | • | | | |

* Requires the CAD Import Module
 ** Only for file formats that are supported by the CAD Import Module
 *** Only in MEMS, RF and AC/DC Module
 **** Requires SolidWorks® and/or Autodesk® Inventor®

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COMSOL DOCUMENTATION

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| Quick Installation Guide |
| Installation and Operations Guide |
| License Agreement |
| New Feature Highlights |
| Compatibility Notes |

COMSOL Multiphysics

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| Quick Start and Quick Reference |
| User's Guide |
| Modeling Guide |
| Model Library |
| MATLAB® Interface Guide |
| Reference Guide |

Material Library

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| User's Guide |
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AC/DC Module

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| User's Guide |
| Model Library |
| Reference Guide |

Acoustics Module

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| User's Guide |
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CAD Import Module

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| User's Guide |
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Chemical Engineering Module

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| User's Guide |
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Earth Science Module

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| User's Guide |
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Heat Transfer Module

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MEMS Module

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Reaction Engineering Lab

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RF Module

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Structural Mechanics Module

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| Verification Manual |

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