

# ANSYS 15.0 Capabilities Brochure



**ANSYS**<sup>®</sup>



Fluid Dynamics

Structural Mechanics

Electromagnetics

Systems & Multiphysics

Überreicht durch:

**CADFEM**<sup>®</sup>

**Simulation ist mehr als Software<sup>®</sup>**

Geschäftsstellen in Grafing bei München, Berlin,  
Chemnitz, Dortmund, Frankfurt, Hannover,  
Stuttgart, Aadorf (CH) und Wien (A)

[info@cadfem.de](mailto:info@cadfem.de) [www.cadfem.de](http://www.cadfem.de)

**ANSYS**

Competence Center FEM

**ANSYS® 15.0  
Capabilities Chart**

	ANSYS Multiphysics™	ANSYS Mechanical™	ANSYS Structural™	ANSYS Professional™ NLS	ANSYS Professional NLT	ANSYS DesignSpace®	ANSYS Explicit STR™	ANSYS Autodyn®	ANSYS LS-DYNA®	ANSYS CFD™					
										ANSYS Fluent®	ANSYS CFX®	ANSYS CFD-Flo™	ANSYS Polyflow®	ANSYS HFSS™	ANSYS Maxwell®
<b>Structural Analysis</b>															
<b>Analysis Types</b>															
Static	•	•	•	•	•	•									
Modal	•	•	•	•	•	•									
Buckling (linear)	•	•	•	•	•	•									
Buckling (nonlinear)	•	•	•	•			•	•	•						
Transient	•	•	•	Δ	Δ		•	•	•						
Spectrum	•	•	•	•	•										
Harmonic	•	•	•	Δ	Δ										
Random vibration	•	•	•												
Substructuring	•	•	•												
<b>Geometric Nonlinearity</b>															
Large strain	•	•	•	•			•	•	•						
Large deflection	•	•	•	•	Δ		•	•	•						
<b>Material Model Highlights</b>															
Linear material models	•	•	•	•	•	•	•	•	•						
Rate-dependent plasticity	•	•	•				•	•	•						
Rate-independent plasticity	•	•	•	Δ			•	•	•						
Hyperelasticity	•	•	•	Δ			•	•	•						
Viscoelasticity	•	•	•				•	•	•						
Creep	•	•	•												
Reactive materials							•	•							
<b>Contact Modeling</b>															
Bonded/no separation sliding	•	•	•	•	•	•	•	•	•						
Pretension (bolts, etc.)	•	•	•	•	•	•									
Joints	•	•	•	•	•										
Spot welds	•	•	•	•	•		•	•	•						
<b>Nonlinear Contact Modeling</b>															
Rough	•	•	•	•	•	Δ	•	•	•						
Frictionless	•	•	•	•	•	Δ	•	•	•						
Friction	•	•	•	•			•	•	•						
Gaskets	•	•	•												
<b>Advanced Analysis</b>															
Rotordynamics	•	•	•												
Component mode synthesis	•	•	•												
Cyclic symmetry analysis	•	•	•	•	•				•						
Rezoning	•	•	•					•							
Submodeling	•	•	•	•	•	•			•						
Element birth and death	•	•	•				Δ	Δ	Δ						

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<b>Explicit Analysis</b>															
<b>Modeling Capabilities</b>															
Interactive prep/post and solution								•							
Remapping in space								•							
Remapping solution methods								•							
Mass scaling							•	•	•						
Dezoning								•							
Part activation and deactivation								•							
Part addition/removal during a simulation								•							
Erosion based on multiple criteria							•	•	•						
Natural fragmentation							•	•							
Euler solver								•							
2-D solver							Δ	•							
Fluid–structure interaction (FSI)								•							
Implicit–explicit deformations							•	•	•						
Implicit–explicit material states							•	•							
<b>Thermal Analysis</b>															
<b>Analysis Types</b>															
Steady state	•	•		•	•	•				•	•	•	•		
Transient	•	•			•					•	•	•	•		
<b>Thermal Modeling</b>															
Conduction	•	•		•	•	•	•	•		•	•	•	•		
Convection	•	•		•	•	•				•	•	•	•		
Radiation	•	•			•					•	•	Δ	Δ		
Phase change	•	•			•		•	•	•	•	•				
<b>Fluid Dynamics</b>															
<b>Modeling Capabilities</b>															
Variety of inlet and outlet B.C.	•									•	•	•	•		
Steady-state flow	•									•	•	•	•		
Transient flow	•									•	•	•	•		
2-D flow (dedicated solver option)										•			•		
2-D flow (using thin 3-D segment)	•									•	•	•	•		
3-D flow	•									•	•	•	•		
Time-dependent boundary conditions	•									•	•	•	•		
Incompressible flow	•									•	•	•	•		
Compressible flow	•									•	•	•	•		
Natural convection	•									•	•	•	•		
Fan model	•									•	•	•	•		
Periodic domains	•									•	•	•	•		
Porous media	•									•	•	•	•		
Heat transfer	•									•	•	•	•		
Conjugate heat transfer	•									•	•	•	•		
Non-Newtonian viscosity	•									•	•	•	•		
Viscoelasticity													•		
Turbulence (isotropic)	•									•	•	•			

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	ANSYS Fluent®	ANSYS CFX®	ANSYS CFD-Flo™											
<b>Fluid Dynamics</b>														
<b>Modeling Capabilities (continued)</b>														
Turbulence (anisotropic/RSM/LES)	•									•	•	•		
Turbulence (transitional/SAS/DES)										•	•			
Rotating equipment (MRF/frozen-rotor)										•	•			
Rotating equipment (sliding-mesh/stage)										•	•			
Dynamic/moving-deforming mesh	•									•	•	•	•	
Immersed-solid/MST method for moving parts	•										•	•		
Flow-driven solid motion (6DOF)										•	•	•		
Internal radiation (participating media)	•									•	•	•	•	
Internal radiation (transparent media)										•	•			
External radiation										•	•			
Solar radiation and load										•	•			
Species modeling	•									•	•	•	•	
Flow pathlines (massless)	•									•	•	•	•	
Particle tracking (with mass)										•	•			
Coupled discrete phase modeling										•	•			
Acoustics (source export)	•									•	•	•		
Acoustics (noise prediction)										•				
Chemical reaction										•	•		•	
Combustion										•	•			
Cavitation	•									•	•	•		
Multiphase (Eulerian)										•	•			
Multiphase (free surface)	•									•	•	•	•	
Fluid–structure interaction option	•									•	•	•	•	
Internal optimization for flow										•		•	•	
Specialty extrusion models												•	•	
Specialty blow molding models												•		
Specialty fiber spinning models										•				
Specialty fuel cell models										+				
Mesh Morphing											+			
Transient blade row models (turbo)											•			
Flutter/forced response											+			
Multiphase wall film (Eulerian)											•			
<b>Solver Options</b>														
Pressure-based coupled solver	•									•	•	•	•	
Density-based coupled solver										•				
Pressure-based segregated solver										•				
Parallel solving on local PC option	•							•	•	•	•	•	•	
Parallel solving over network option	•							•	•	•	•	•	•	
Customizable, scripting and user functions	•									•	•	•	•	
Adjoint solver for sensitivity analysis										•				

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<b>Electromagnetics – Low Frequency</b>														
Electrostatics	•													•
AC conduction	•													•
DC conduction	•													•
DC insulator field														•
Magnetostatics	•													•
Adaptive field mesh														•
AC harmonic magnetic	•													•
AC harmonic electric	•													•
Electric transient	•													•
Ion optics	•													•
<b>Magnetic Transient</b>														
Rigid motion visualization														•
Translational motion	•													•
Rotational motion	•													•
Double-layer rotational motion														•
Cylindrical motion														•
Automatic matching boundaries														•
Winding definition														•
Automatic coil connections across boundaries														•
Advanced circuit coupling with ANSYS Simplorer®														•
Circuit coupling with adaptive time stepping														•
<b>Advanced Material Characteristics</b>														
Nonlinear anisotropic materials														•
Functional magnetization direction														•
Advanced permanent magnet demagnetization modeling														•
Nonlinear magnetization characteristics														•
Core loss modeling														•
Automatic project creation using UDPs														•
Insulation sheet to model cracks														•
<b>Electromagnetics – High Frequency</b>														
Frequency domain analysis														•
Time domain analysis														•
Eigenmode analysis														•
Integral equation analysis														•
Hybrid finite element integral equation analysis														•
Wave port excitation														•
Lumped port excitation														•
Floquet excitations														•
Plane wave excitation														•



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<b>Electromagnetics – High Frequency (continued)</b>															
Hertzian dipole excitation															•
Cylindrical wave excitation															•
Gaussian beam excitation															•
Linear antenna excitation															•
Linked far-field excitation															•
Linked near-field excitation															•
Voltage source excitation															•
Current source excitation															•
Magnetic bias excitation															•
Modal solutions															•
Terminal solutions															•
Perfect electric conductor boundary															•
Perfect magnetic conductor boundary															•
Finite conductivity boundaries															•
Impedance boundary															•
Layered impedance boundary															•
RLC boundary															•
Radiation boundary															•
Symmetry boundary															•
Master/slave boundary															•
Screening impedance boundary															•
Perfectly matched layer boundary															•
Frequency-dependent materials															•
Field calculation inside conductive materials															•
Discrete-frequency sweep type															•
Fast-frequency sweep type															•
Interpolating sweep frequency sweep type															•
Zero-, first-, second- and mixed-order element types															•
True curvilinear mesh elements															•
Fully automated meshing															•
Fully automated adaptive mesh refinement															•
S, Y, Z matrix results															•
Propagation constant results															•
E, H, J, P field results															•
Field calculator															•
Iterative matrix solver															•
Direct matrix solver															•
Distributed frequency sweep solver capability															•
Distributed model solution capability															•

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<b>Electromagnetics – High Frequency (continued)</b>														
Antenna parameter calculation														•
Infinite antenna array calculation														•
Finite antenna array calculation														•
Radar cross section calculation														•
Frequency selective surface calculation														•
Metamaterial calculation														•
Specific absorption rate calculation														•
EMI/EMC calculation														•
Imported geometry healing														•
Fully scriptable														•
Link to ANSYS Mechanical														•
Dynamic link to Ansoft Designer®														•
Link to ANSYS SIwave™														•
Link to ANSYS SImplorer														•
<b>Coupled Physics</b> (Sometimes requires two or more products)														
Acoustics	•	•								•	Δ	Δ		
Acoustics–structural	•	•												
Electric–magnetic	•												•	•
Fluid–structural	•	•						•		•	•	•		
Fluid–thermal	•									•	•	•		
Electromagnetic–fluid	•									+	+	+		•
Electrostatic–structural	•													
Magnetic–structural	•													•
Electromagnetic–thermal	•												•	•
Piezoelectric	•	•												
Piezoresistive	•	•												
Thermal–electric	•	•												•
Thermal–structural	•	•		•	•	•	•	•						
Thermal–electric–structural	•	•												•
Thermal–electric–fluids										•				
Electromagnetic–thermal–structural	•												•	•
Electromagnetic–thermal–fluids										•				
Reduced-order modeling (ROM)	•	•												•
<b>Pre-Processing</b>														
<b>Modeling Capabilities</b>														
IGES/STEP geometry reader	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Beam modeling	•	•	•	•	•	+	•	•	•					
Composite lay-up		•	•	•	•		•	•						
<b>Meshing Capabilities</b>														
Defeaturing	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Surface meshing	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Tetrahedral meshing	•	•	•	•	•	•	•	•	•	•	•	•	•	•

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<b>Pre-Processing</b>														
<b>Meshing Capabilities (continued)</b>														
Parallel meshing														
Prism inflation layers	•	•	•	•	•		•	•	•	•	•	•		
Swept-hex meshing	•	•	•	•	•	•	•	•	•	•	•	•		
Thin-sweep meshing	•	•	•	•	•	•	•	•	•	•	•	•		
Multizone hex meshing	•	•	•	•	•		•	•	•	•	•	•		
Automatic hexa-core meshing	•	•	•	•	•		•	•	•	•	•	•		
Automatic hexa-dominant meshing	•	•	•	•	•		•	•	•	•	•	•		
Cut cell Cartesian meshing										•				
Curvilinear elements													•	•
Adaptive mesh refinement	•	•	•	•	•	•				•	•	•	•	•
<b>Boundary Conditions</b>														
Solid model loads and boundary conditions	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Tabular loads and boundary conditions	•	•	•	•	•		•	•	•	•	•	•	•	•
Function loads and boundary conditions	•	•	•	•	•		•	•	•	•	•	•	•	•
Apply temperature loads	•	•	•	•	•	•				•	•	•	•	•
<b>Post-Processing</b>														
Report generator	•	•	•	•	•	•	•	Δ	Δ	•	•	•	•	•
Contour displays	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Vector displays	•	•	•	•	•		•	•	•	•	•	•	•	•
Isosurface displays	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Slicing planes	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Quantitative calculations	•	•	•	•	•		•	•	•	•	•	•	•	•
Particle tracing	•									•	•	•	•	•
Animation	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Output (images, Excel® data)	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CFD turbomachinery										•	•	•		
<b>General</b>														
ANSYS Engineering Knowledge Manager™ (EKM) data management ready	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Parallel solvers (HPC licenses required)	+	+	+	+	+			•	+	+	+	+	+	+
Solver scripting language	•	•	•	•	•				•	•	•	•	•	•
Parameter manager	•	•	•	•	•			Δ		•	•	•	•	•

Δ = Limited set of feature capabilities    + = Additional product required

**ANSYS, Inc.**  
www.ansys.com  
ansysinfo@ansys.com  
866.267.9724

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