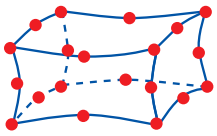
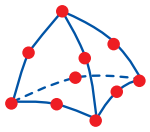
ANSYS Emag 12.0 Generates Solutions



SOLID236
3-D 20-node brick



SOLID237
3-D 10-node
tetrahedron

Improved accuracy, speed and platform integration advance the capabilities of low-frequency electromagnetic simulation.

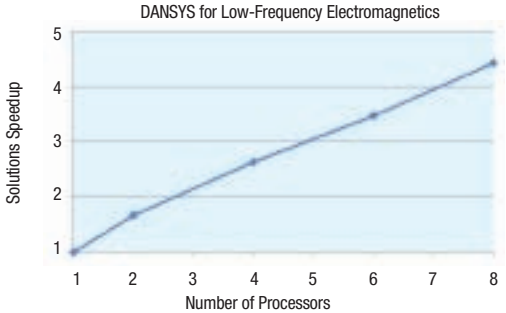
As the combined development teams from Ansoft and ANSYS set out to integrate the world-class Ansoft electronic design products into the ANSYS portfolio, ANSYS customers can benefit immediately from improved and extended electromagnetics capabilities in release 12.0.

Elements

A new family of 3-D solid elements for low-frequency electromagnetic simulation is included in the 12.0 release of ANSYS Emag software. Solid elements (SOLID236 and SOLID237) are available for modeling magnetostatic, quasi-static time harmonic, and quasi-static time-transient magnetic fields. These two elements are formulated using an edge-based magnetic vector potential formulation, which allows for improved accuracy for low-frequency electromagnetic simulation. The elements also provide a true volt degree of freedom — as opposed to a time-integrated electric potential — enabling circuit coupling with discrete circuit elements and simplifying pre- and post-processing for electromagnetic simulation. SOLID236 and SOLID237 also include much faster gauging than prior releases, which significantly reduces overall solution times. Users can apply this new element technology to most low-frequency electromagnetic applications, such as electric motors, solenoids, electromagnets and generators.

Solvers

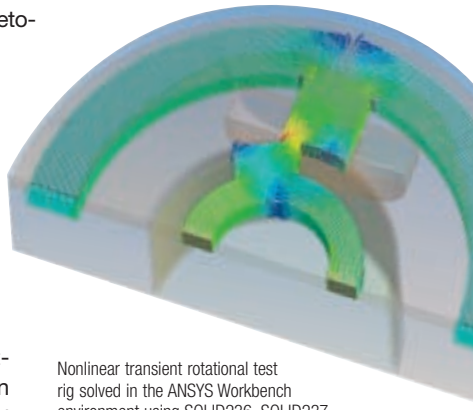
At release 12.0, the distributed sparse solver includes support for low-frequency electromagnetics. SOLID236 and SOLID237 elements support both distributed and shared-memory parallel processing for low-frequency electromagnetic solutions. As a result of faster simulation speeds, users can solve much larger and more complex low-frequency electromagnetic models.



Solution scaling of a SOLID237 model with 550,000 degrees of freedom

ANSYS Workbench Integration

Release 12.0 offers several ANSYS Workbench enhancements for electromagnetic simulation. A new capability facilitates multiple load step analysis for magnetostatics. This allows users to compute the magnetostatic response to time-dependent loading, specifying voltage and current loads with time-dependent tabular data. The results are more flexibility for magnetostatic problems with time-dependent loads along with transient simulation for electromagnetics, with the addition of a simple command snippet, within the ANSYS Workbench environment.



Nonlinear transient rotational test rig solved in the ANSYS Workbench environment using SOLID236, SOLID237 and the new stranded conductor option (TEAM24 benchmark)

The integrated platform also includes an option for a meshed representation of a stranded conductor. The current density for the new stranded conductor supports tabular loading for the new multi-step magnetostatic analysis. This capability allows for a more accurate representation of current, improves overall simulation accuracy and leverages existing CAD data for coil geometry. This new ANSYS Workbench technology can be applied to any electromagnetic application subject to time-dependent loading, including electric machines, solenoids and generators. ■

Stephen Scampoli of ANSYS, Inc. contributied to this article.