AMESim

LIBRARIES - ELECTROMECHANICAL

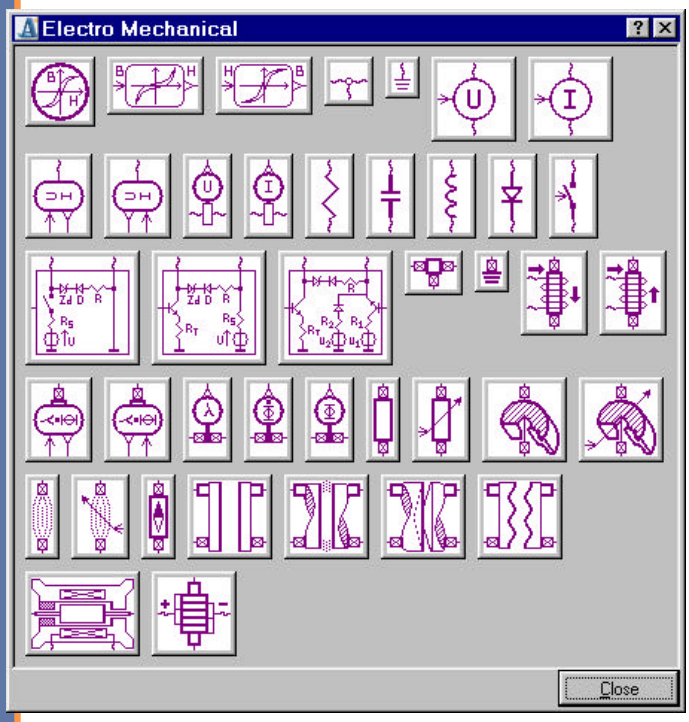
KEY POINTS

- Steady-state and transient simulation.
- Graphical interface enables you to create new designs quickly.
- State of the art theory. Easy parameters filling from manufacturers' experiments or data from technical drawings.
- Recognizable technological icons facilitating direct model correlation with technical drawings.
- Full multi-domain compatibility for total system analysis with energetic couplings study.
- Complex modeling without writing a single line of code thanks to a Basic Element approach.
- Build and save your own models for easy reuse.
- Sensitivity analysis and size optimization.
- Time domain and frequency analysis for vibration modes characterization (eigenvalues, modal shapes, transfer functions).
- Matlab®/Simulink® interface for control design.
- Direct Integration of your own C and Fortran code.
- Fully compatible with other AMESim libraries.

Overview

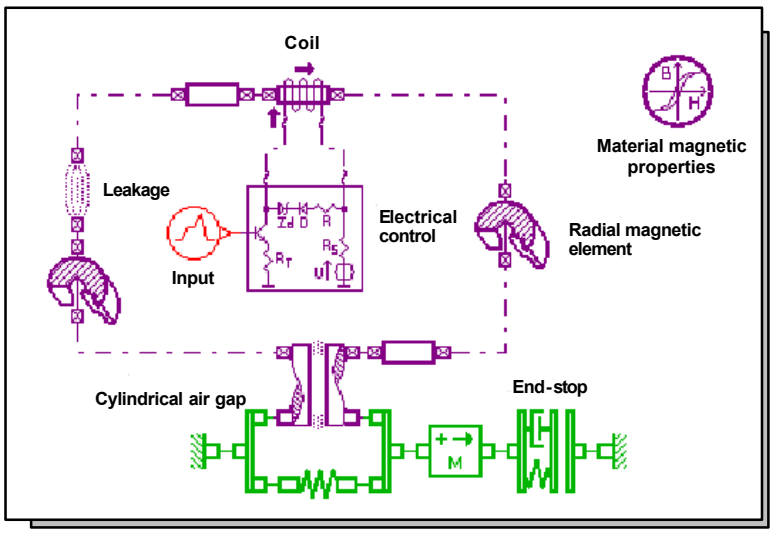
The AMESim® Electromechanical library is the ideal tool for engineering applications where interaction between electrical, magnetic and mechanical domains takes place.

This library is used to study the dynamic behavior of the magnetic part of electromechanical systems and actuators like solenoid valves (VFS, VBS, PWM), solenoids or piezo-driven injectors, variable valve trains, variable-reluctant actuators, sensors or torque motors. This library also includes the magnetic properties of different materials, magnetic elements, magnets, leakage and electronic models.



Benefits

Complex mechanical systems are actuated and controlled by hydraulic and magnetic components. The overall system response and dynamic behavior results from a combination of responses from each individual element. The AMESim Electromechanical library offers continuity in the design process because all AMESim libraries are compatible with one another and thus allow multi-domain simulation. As a matter of fact, the Electromechanical library is the perfect complement to the AMESim Mechanical and Hydraulic Component Design libraries for modeling advanced systems.



A simplified model of a solenoid built with the AMESim Electromechanical library.

Features

The AMESim Electromechanical library offers a large number of capabilities:

- The displacement and velocity of a moving armature modify current dynamics in the coil. Predicting the overall time response requires a direct interaction between dynamic models of the mechanical and magnetic components.
- Hysteresis and eddy currents are taken into account in magnetic models: the time response is affected and energy losses occur.
- Importing look-up tables of magnetic characteristics coming from any type of 2D/3D magnetic FEA simulation packages with FLUX2D® offering direct export of data in AMESim format.
- Electric systems are represented at a proper level of complexity without overloading the user with useless details and difficulties to find parameters.

Requirements

The AMESim Electromechanical library runs on Unix®, Linux® platforms and Pentium®-based PCs.

Electromechanical components

- Magnetic material parameters.
- Magnetic properties.
- Electrical node.
- Null voltage source (earth).
- Voltage and current source.
- Conversion between electric and signal variables.
- Voltage and current transducers.
- Resistor, capacitor, inductor.
- Diode.
- Non ideal switch.
- Electrical control circuits.
- One and two voltage levels electrical control.
- Magnetic node.
- Null magnetomotive voltage source.
- Coils with first and second sign convention.
- Conversion between magnetic and signal variables.
- Magnetomotive force transducer.
- Magnetic flux and flux rate transducers.
- Constant and variable magnetic elements.
- Constant and variable radial magnetic element.
- Constant and variable leakage.
- Permanent magnet.
- General, cylindrical and conical air gaps.
- Air gap with specific geometry.
- Electromechanical transducer.
- Linear piezoelectric stack actuator.

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