

# Linear Actuators Analysis

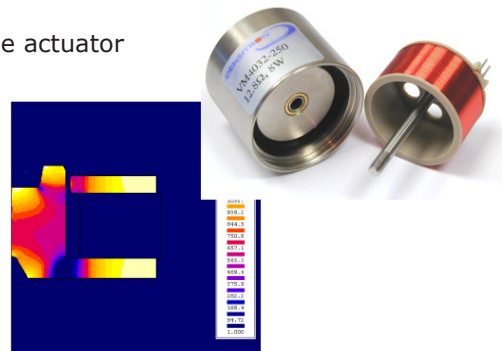
To design, analyse or optimise a linear actuator or its drive, CEDRAT Group offers a wide suite for electromagnetic analysis.

## Linear actuator design and analysis

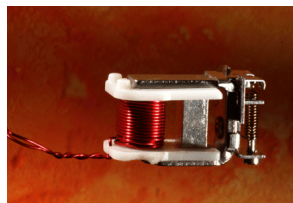
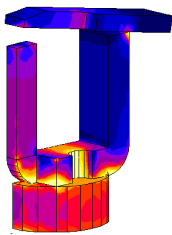
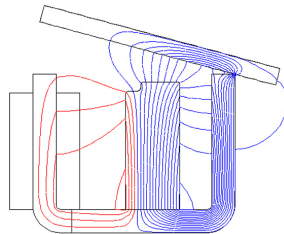
For a fine design and analysis of any linear actuator (voice coil, electromagnet, protection relay...), Flux package features many tools to speed up the simulation and get the most accurate results, for both electromagnetic and thermal computations:

- Geometry building facilities such as import of CAD files (STEP, IGES, DXF...)
- Advanced electric circuit to model the command of the actuator
- Electromechanical coupling in 2D and 3D to account for the motion of the actuator during the computation (mass, friction, drag force, spring stiffness...) as well as to compute all mechanical quantities (speed, position, force...).

The different simulation methods (steady state multi-position computation, constant speed or transient response) make Flux a powerful tool to study any configuration of the device.



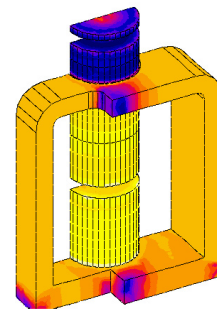
Voice coil actuator (courtesy of Densitron).



Protection relays modelled in 2D and 3D with Flux.

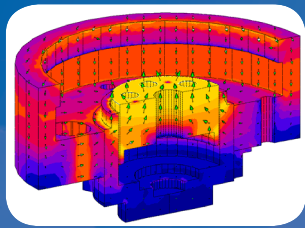
## Optimisation

To optimise an actuator, the multiparametric solver and postprocessor of Flux are the perfect tools.



Flux density displayed on half of an electromagnet modelled with Flux.

Flux multiparametric solver allows any parameter to be varied (geometric dimension, mesh, materials, sources, time...) in one computation and then to solve various configurations in only one run. Flux multiparametric postprocessor gives a direct access to all the results, with various formats: point values, isovalues, colour maps, 2D/3D curves, AVI animations, export to Word and Excel...

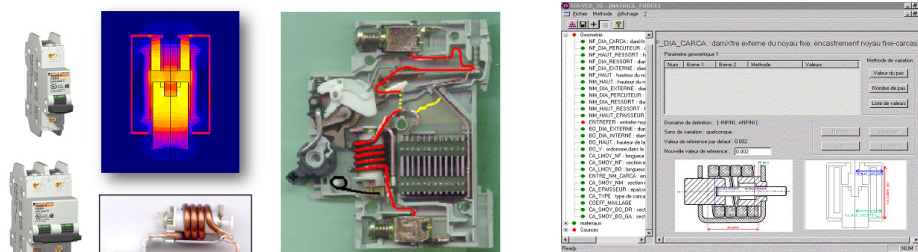


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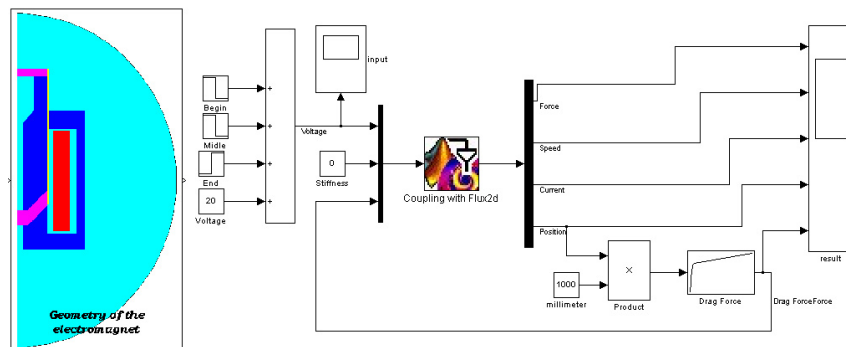
## The actuator and its drive

The transient behaviour of a linear actuator is widely dependent on its drive. Modelling then both the actuator and its drive gives a better prediction of the behaviour. The association of Flux (for transient electromagnetic computation) and SIMULINK (for drive and control) gave birth to the most advanced tool for system design. Thanks to its co-simulation capabilities, Flux to Simulink Technology enables to account for saturation and eddy currents as well as motion and control loops within the same simulation run.

The results can then be analysed either with Simulink or with the fully equipped Flux multiparametric postprocessor.



Circuit breaker optimised with Flux STUDIO (courtesy of Schneider Electric).



Drive and control of an electromagnet with the Flux to Simulink Technology.

## References

For any type of linear actuator, CEDRAT Group solutions are the reference in many organisations worldwide:

Actaris, AEMF, Asco Joucomatic, Borg Warner, Celestion, CNES, Delphi, Densitron, European Space Agency, Eaton, Fluid Automation, Gauss Magneti, Goodrich, Hager Electric, Ikerlan, Iskra Stikala, Isliker Magnete, ISL, JCAE, Legrand, Leach international, LG electronics, Luxalp, Magneti Marelli, Magnet Schultz, Mecalectro, Parker Hannifin, PSA, Protonic, Robert Bosch, Schienle, Schneider Electric, Sulzer Innotec, TEC Automatismes, Thales, TRW, Walker Magnetics, Zodiac...

More technical information:

[www.cedrat.com/en/publications/categories/device-systems/linear\\_actuators/](http://www.cedrat.com/en/publications/categories/device-systems/linear_actuators/)

For more information, please contact:

CEDRAT Group  
 15 Chemin de Malacher - Inovalée  
 38246 Meylan Cedex - France  
[software@cedrat.com](mailto:software@cedrat.com)  
 Phone: +33 (0)4 76 90 50 45 - Fax: +33 (0)4 56 38 08 30