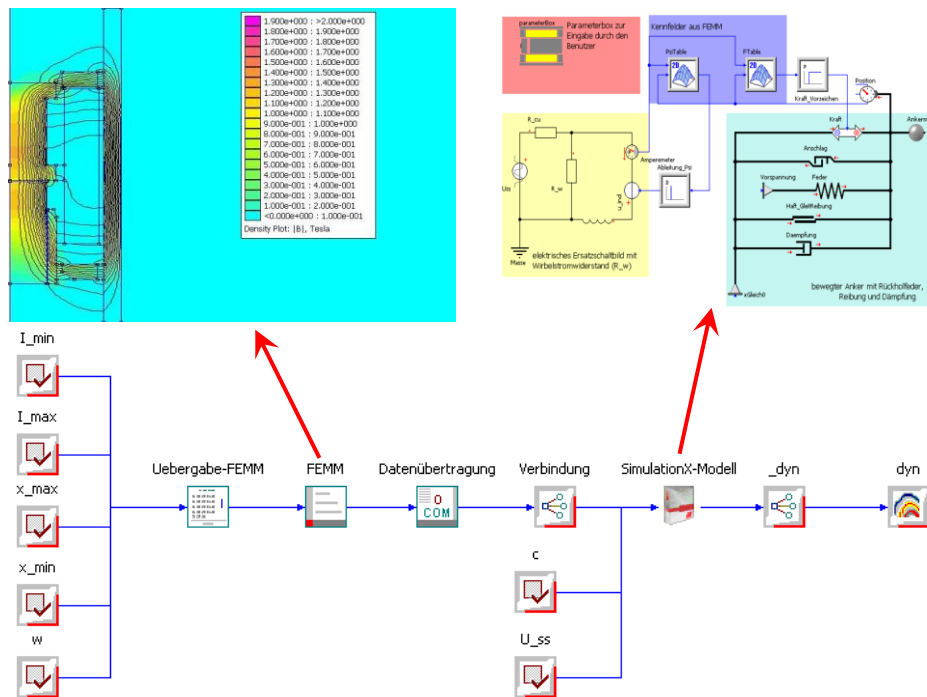# Multidisciplinary Analysis and Optimization of an Electromagnetic Valve Actuator

As a world market leader for gas springs and hydraulic vibration dampers, Stabilus GmbH is currently developing gas springs with an electromagnetically operated valve for automotive applications. Such an electromagnetic valve actuator is a complex mechatronic system.

During system design the several subsystems are modelled separately and coupled to each other. Steady state magnetic fields and force-stroke-current characteristics are determined by the finite element software FEMM. The dynamic behaviour is modelled by SimulationX®. Furthermore, the finite element program COMSOL® calculates the transient temperature distribution. The multidisciplinary analysis and optimization tool OptiY® is used to integrate and automate the several simulation steps. Thus the fundamentals for an automated system design are accomplished.

Workflow for multidisciplinary analysis and optimization with coupled FE- and Network-simulation

Defining system parameters given by boundary conditions and objective functions in terms of constraints and criteria, the characteristics of the actuator are improved systematically using numerical optimization regarding the magnetic forces, power losses and dynamic behaviour.

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