

# Physical Design of Hydraulic Valves in Modelica

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## Abstract

This paper focuses on the physical design of hydraulic relief and servo valves and its applications. Specifically, this paper serves to illustrate how the physical design parameters of hydraulic components can be incorporated into system modeling and their effect on the system dynamics and stability characteristics. Detailed physical models of a relief valve and a servo valve developed using the Hydraulics Library<sup>®</sup> are discussed in this paper with particular emphasis on the effect of design parameters on the stability characteristics. A simple design of experiment (DoE) to illustrate robust design methods for hydraulic system design is also shown with the use of the FMI Toolbox (FMIT) for MATLAB<sup>®</sup>. Furthermore with the help of these two valve models, we seek to bring to the attention of the community, a limitation in open loop controls analysis in an acausal modeling environment where the feedback loops are embedded in the physics of the model.

## References

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