

High Performance Valves for Adaptive Pneumatic Impact Absorbing Systems

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Energy absorbing pneumatic systems are mainly passive devices, which do not present ability of adaptation to various loading conditions. One of the most promising technology allowing for elimination of the abovementioned shortcomings are Adaptive Inflatable Structures, which form a new, special class of Adaptive Impact Absorption systems. The concept is based on application of compressed gas and controlling its pressure as an effective methodology allowing for adaptation of energy absorbing structures (airbags, fenders, barriers) to actual impact loading.

The proposed solution of the restricting the fluid flow problem is based on an application of high performance valves utilizing bistable snap-through effect and a flow driven deformation of fabric membranes. The described valves provide the possibility of fast opening and closing of the valves, which is required for realization of the optimal control strategy for the pneumatic absorbers.