Active Shock Brand Semi Active Dampers

General Kinetics Active Shock brand Semi-Active damper technology provides real time control for your suspension system, ending the compromise between performance and ride quality. The patented continuously variable damping valve is controlled by a patented Ride State Aware™ algorithm that reads sensors embedded in the damper and the chassis to output the ideal damping force target in real time.

General Kinetics is a world leader in semi-active suspension technology and can provide outstanding shock mitigation performance in the most demanding applications.

Applications:

- Vehicle Suspensions where extreme mobility or cargo protection is needed
- Long Hall and Transit Seat Suspensions
- Off-road construction and logging vehicle seats
- Blast Mitigating Seats

Damping Range

The damping is controlled with a patented electronically controlled hydraulic valve that changes the damping orifice size in real time. A typical Active Shock semi active damper can provide between 1/2 to 10 times the damping of a standard shock with a full scale step response time of approximately 10 msec. This means that in a typical landing from a jump that lasts 150 msec, the damper valve will be moved to the optimal damping setting very quickly and will be in control of the vehicle movement and response throughout the event. Typical handling maneuvers last 1-2 seconds, enough time for the system to update the damping over 1000 times during a single handling event. The damping range is an operating area rather than a curve as found in a passive damping system. An example of the damping area can be seen in the Technical Document section.

Bore Size

The Active Shock damper can be designed to fit into any conventional suspension system. The packaging dimensions of the Active Shock semi-active damper are almost identical to a standard shock absorber with the exception of the external control valve and manifold. The nitrogen reservoir can either be direct mounted to the manifold or remote mounted.

Specific packaging requirements can be met on a per application basis. The stroke length and piston diameter are tailored based on the application need for damping force.

Reliability

The mechanical and hydraulic components used are all based on proven robust conventional damper designs. All electro mechanical components are fully waterproof and have been designed for the harsh environment found in the wheel arch of a vehicle. Military versions are capable of full immersion to meet fording requirements. All new components are durability tested on dedicated test rigs and in vehicles over realistic road conditions. Electronics are also subjected to a full battery of EMI and vibration testing.

Active Shock semi active damping systems are typically designed to last the life of the vehicle with zero maintenance. Self-diagnostic software is capable of alerting the operator of the system status if needed. In addition, the continuously variable control valve was designed to have a benign failure mode; if all power to the controller is lost or a sensor fails the shock defaults to the damping values of a typical passive shock. This allows the vehicle to still be driven however there will be some reduction in performance in off-road and handling events.

System Components

The General Kinetics Active Shock semi active damping system is a standalone system designed to be integrated into the vehicle architecture with minimal space claim above that of a passive damping system. The system consists of the components listed below. For seat applications, only an SCU, shock and damping valve are required.

Dampers are designed using conventional design and construction techniques commonly used in damper design. Damper bore sizes are selected to provide the necessary flow characteristics that when coupled with the damping valve result in the maximum force output in compression and rebound required by the application. Depending on packaging constraints either integrated internal or external position sensors used to supply the Shock Control Unit with information on piston speed and travel.

Damping Valve is fitted to the damper and acts like a variable orifice pressure relief valve. Patented closed loop control allows the valve to react quickly to commands from the Shock Control Unit while remaining stable. Flow to the valve is controlled by a series of check valves in the damper that allows a single valve to control both compression and rebound damping.

The Shock Control Unit (SCU) is mounted to the spung mass adjacent to the top shock mount. It monitors the integrated sensors and calculates the optimal damping at 1000 times per second, then outputs a control signal to the continuously variable damper valve. This results in a damper force in parallel with the spring force that can be used to remove the energy from the spring or from the suspended mass. Both 12V and 24V valves and SCUs are available to fit most vehicle power.

Master Controller can be mounted anywhere on the vehicle. The master controller is networked with the SCUs and monitors the information about whole body movements provided by the SCU sensors. The

Master determines where energy is stored in the suspended mass, whether in pitch, heave or roll, and sends an overriding command to the damper to dissipate the energy. The result is body control for handling events that greatly improves vehicle control and speed over terrain. The master controller can also be networked to the vehicle CAN to monitor signals such as speed or steering and use the data in calculating damping commands. The unit can also broadcast information such as error codes on the vehicle network to aid in servicing the system.

Steering Sensor is fitted to the steering shaft of the vehicle if one is not already present in the vehicle. The steering sensor provided direction and rate data to the Master Controller to be used for calculating damping commands in roll events.

Wiring Harness contains signal and power connections for the SCUs, Master Controller and sensors contained in the system. In most cases the wiring for the system is integrated in the vehicle wiring harness during vehicle production.

Ride Height and Springs

The Active Shock damper is universally compatible with conventional steel springs in either coaxial coil over or separately mounted installations.

In applications requiring a change in ride height or with varying payloads, air springs can be used in parallel with the Active Shock damper. The two technologies complement each other particularly well. The air spring is used to adjust ride height and the Active Shock damper is used to compensate for the change in payload and natural frequency.

The dampers can be integrated with an air ride system or converted to a hydro pneumatic damper for ride height control and compensation.

The air or hydro pneumatic spring load is automatically controlled to either maintain a predetermined ride height or allow the user to select from several preset driving modes, for instance low height for fast on-road driving or high ground clearance mode for off-road use. A ride height controller is integrated into the Master and collects position information from the SCUs to determine when to add or release air to the air spring or fluid to the damper. The algorithms goal is to maintain the desired ride height despite changes to payload, but not to react to fast driving events that cause wheel displacement. In addition there are a number of safety and fail safe elements to prevent the system from responding incorrectly in various situations.

All load leveling valves, ports, pressure relief valves and pressure sensors are COTS parts supplied completely installed in a custom load leveling system. The valves are very low current (less than 1 amp) and are directly driven by the Master load level controller.