# Supplemental Information for Testing of a 'Lever Arm' Shock Absorber

## *About Lever Arm Shocks*

*Most of the British cars we sell parts for use Armstrong lever arm shocks. As mechanics with decades of experience retire, we are seeing an increase in calls about shocks that are believed to be defective. In fact, there is nothing at all wrong with the shock- it simply does not behave like a modern tubular shock. The information in this document comes from the company in England that is making the lever arm shocks we sell.*

## *Basic Operating Principles*

In the lever arm shock absorber, damping resistance is provided by a piston moving in an oil filled cylinder, forcing pressurized fluid through a spring-loaded valve. Normally, two pistons are used, one providing compression (bump), and the other, rebound. The two pistons are connected to a rotating lever arm via a con-rod, crank and spindle. The two cylinders are arranged such that oil passes from one cylinder to the other during the cycle. The specific performance of each unit is set by choice of valve springs and the initial pre-load settings of these springs. The valve is two directional and provides the different resistance characteristics for bump and rebound required for the particular vehicle design.

## *Leak*

One additional characteristic is the 'Leak' feature, whereby oil is transferred between cylinders, under slow, or small movements, without generating significant damping resistance. This effectively provides a 'low-damped' condition for gentle ride conditions; significant damping only arising when rougher ride produces larger or more rapid suspension movement. The 'leak' is enabled by grinding channels into the valve cone surface, permitting passage of oil without lifting the valve from its seat.

The precise valve settings, and leak channel dimensions for optimum performance would have been arrived at during vehicle design and development. This type of design and construction gives rise to a degree of variation between units, particularly on the leak performance. In production, each unit is tested to ensure that it conforms to the appropriate specification

There is a 10% design tolerance on results, which is required for this type of design and construction method.

## *Testing*

Prior to testing, it is vital that the unit is rapid cycled to expel air from the system, and to bring the oil up to operating temperature. Cold oil, or air pockets can produce wildly varying results.

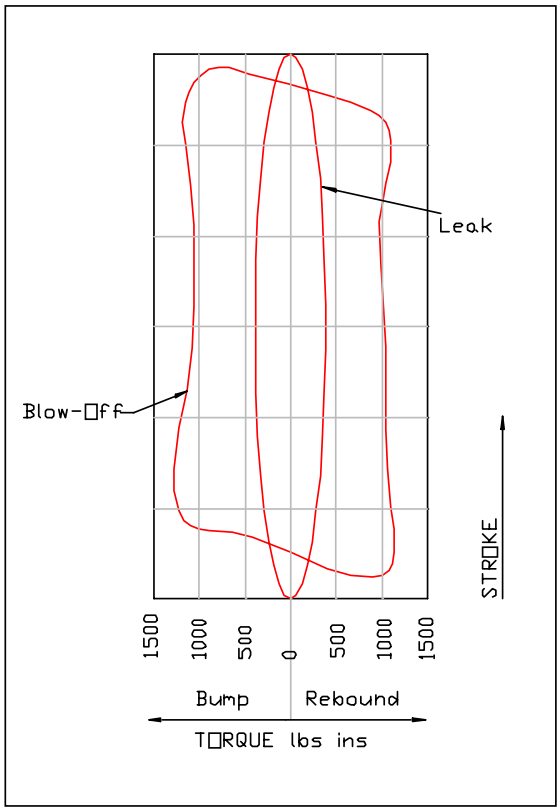
The test is two stages,

1. Rapid cycling of the arm through its full stroke on a test rig to create damping in both directions,

2 Slow cycling to evaluate the leak characteristic.

In both tests, the damping torques generated, are plotted against movement, to produce performance graphs, which are compared with master templates for each application.

*The diagram on the right shows a typical pair of performance plots generated by the special test rig on which all units are checked.*




Typically, the forces involved are150 –200 lbs at a rotational speed of 150 degrees per second for normal operation, and 70lbs at 13 degrees per second, for the leak test. The test speeds are most important**.**

**Evaluation by other means can lead to misleading results and doubtful conclusions.**

## *Testing by Hand*

Tests performed by hand or by applied static weight, will rarely assess the suitability or otherwise of a particular unit: or allow accurate comparisons between units, since the speeds and loads required cannot be achieved.

Any test performed at cycling speeds of less than around 10-20 degrees per second (around 10 rpm depending on the stroke), or employing falling weights attached to the arm, will probably not even open the valves.

More likely, only the internal mechanical resistance, and maybe some degree of the leak resistance will be felt.

It is most unlikely that any of the design characteristics will be initiated during subjective bench testing. Variations detected will not be a reliable guide to the operational performance of the shock absorber.

When comparing units, the combined effect of friction, leak resistance variations, aeration and temperature, can give a very different feel when the units are hand manipulated, but these variations are much less significant when combined with the damping loads generated at normal operating speeds.

Such variations will normally be well within manufacturing and operational tolerances

*Although every effort has been made to ensure the accuracy and clarity of this information, errors and/or omissions on our part are almost inevitable. Any suggestions that you may have that will improve the information (especially detailed installation notes) are welcome. Please use the simple email form on the* ***"Contact Us"*** *page on the Moss website: http://www.mossmotors.com/AboutMoss/ContactUs.aspx*
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