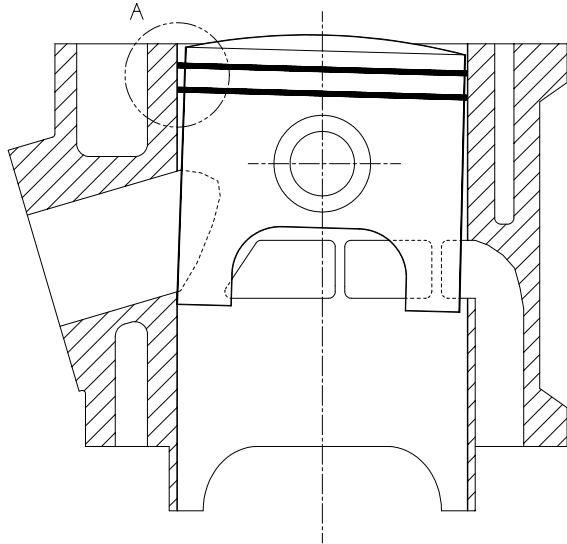
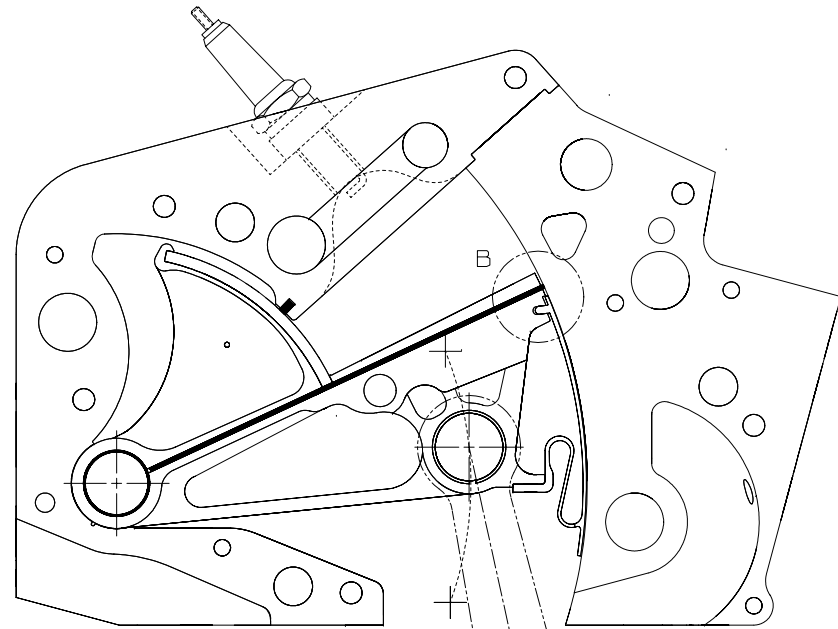


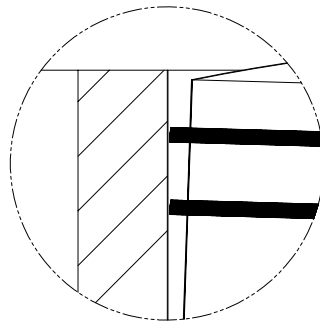
PISTON CONTROLLED BY PIVOT BEARINGS



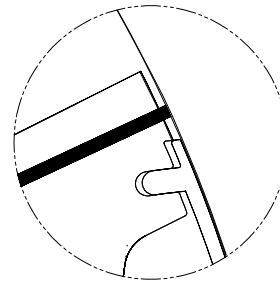
The Pivotal Piston is restrained by pivot bearings and it is now possible to allow sufficient clearance for piston expansion to remove the risk of seizure, without incurring damage during cold running.



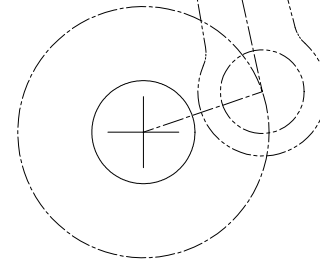
In order to convert combustion pressure into torque, the piston slides within the cylinder restrained and supported by its skirt. The clearance required for expansion makes it possible for the piston to rock and slap in the cylinder, causing the compression seals (rings) to become unseated from the surface of the cylinder.



DETAIL A



DETAIL B

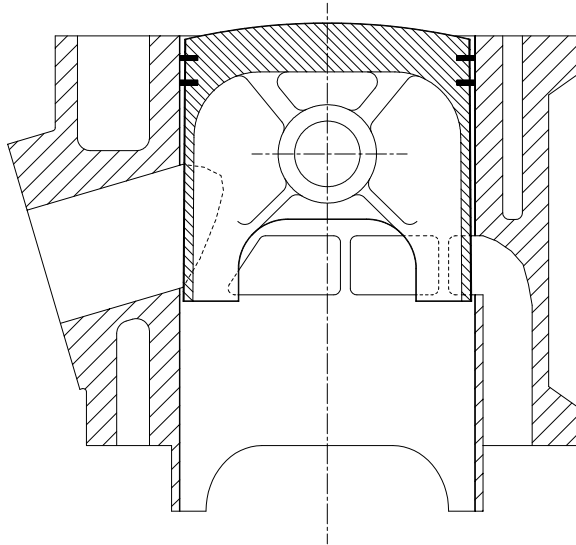


With the Pivotal Piston fully under control there is no more piston rock or slap and the compression seals are always held at a normal orientation to the chamber walls. This improves the compression sealing and extends the sealing life.

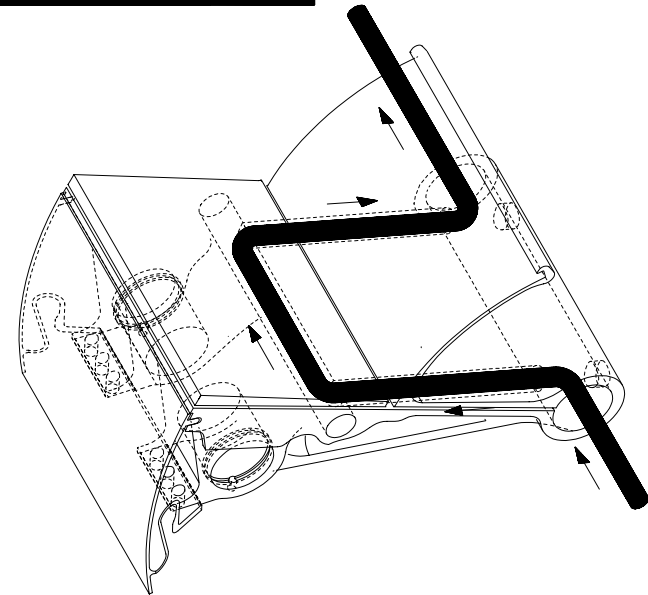
As the Pivotal Piston no longer acts as a bearing, the friction between the piston and cylinder is greatly reduced. This also leads to an increased service life and a considerable reduction in lubrication requirement.

DIRECTLY WATER COOLED PIVOTAL PISTON

TOTAL SURFACE AREA OF PISTON
IN WATER CONTACT THROUGHOUT
THE FULL 360° CYCLE (55 sq. cm)



As heat is released during the combustion process, it enters the piston through its crown. The rate at which heat can be dissipated from a hot piston crown to the cylinder wall via the piston's skirt is limited. This causes the piston to expand. Consequently the piston requires sufficient clearance when it is cold in order to avoid seizure when it is hot.



The Pivotal Piston is not reliant on skirt/liner contact to carry heat from the piston. Heat is easily removed from the piston crown because the pivot shaft provides the entry and exit points for cooling water. Direct cooling allows the engine to be run at sustained high load.

This direct cooling can be engineered to any degree that is required. Unlike a conventional sliding piston which is reliant on a cooler cylinder to duct heat away from the piston skirt it is possible to run the Pivotal Piston at any temperature required, even at a lower temperature than the engine itself.