

## SBO45

# Checking Piston Protrusion Heights in Diesel Engines

For those who have spent their days building gasoline engines, the importance of checking and setting piston protrusion heights is a new critical skill to be learnt and tolerance to be maintained. Diesel engines normally run compression ratios in the range of 15.6 to 23.0:1 - depending on whether they are direct or indirect injection. These engines typically have 'overlap' valve train design and usually have around 0.50 - 0.75 mm cold bump clearance between the piston crown and the cylinder head face. It is therefore critical that the piston protrusion height of each piston and conrod assembly be checked in the bore they will be assembled to. There is always a tolerance specification available for each diesel engine and this should be supplied by your engine parts supplier. Modern diesel engines with multi-layer steel (MLS) head gaskets typically have between 3 and 5 different thicknesses. The gasket is chosen according to the highest piston protrusion. If there is a large variation between protrusions, changing piston and rod assemblies between bores may help achieve a more consistent height and sometimes you may even have to change pistons to different conrods. If there is still excessive protrusion because the cylinder block was surface ground, it may be necessary to machine the piston crowns, use pre-topped pistons or use a Head Saver Shim.

Checking piston protrusion heights is best done using a dial indicator and measurement bridge similar to that shown in Photograph 1 below. These should be available from your diesel engine parts supplier. Check that the top surface of the block has no burrs or high spots - be especially careful around bolt holes if the block has not been surfaced. Locate the dial indicator as shown in Photograph 1 or Diagram 1, turn the engine over slowly, and measure the maximum protrusion at two locations per cylinder as shown in Diagram 2. Average the two readings for each cylinder. Failure to check and set the piston protrusion heights and select the correct head gasket can result in valves contacting piston crowns, difficulty starting the engine and/or poor engine performance.



Photo 1.

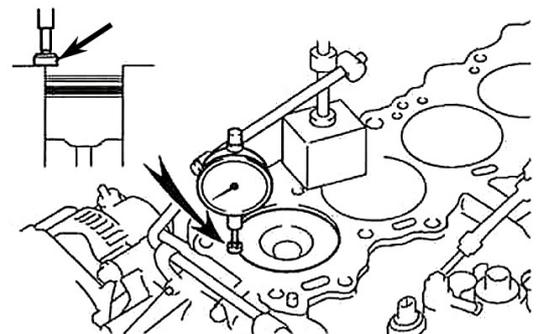


Diagram 1.

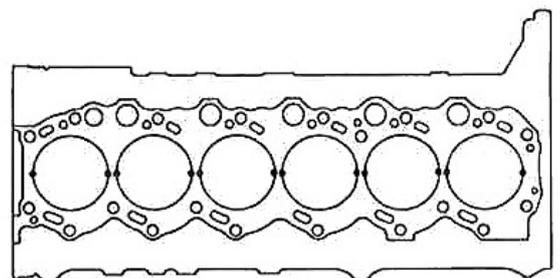


Diagram 2.