

SB041

Compression Tests and Static Leak Down Tests

If an engine is experiencing a loss in power, increased fuel consumption, unacceptable emissions output levels, excessive oil consumption or a pressurised crank case, it is not uncommon for the engine to be pulled down before conducting some basic and preliminary diagnostic checks such as a compression test and a static leak down test.

Compression Test

A compression test will determine if there is sufficient cylinder pressure to support combustion. It is important that all injectors or spark plugs are removed, the air filter removed and any other restrictions in the intake system removed or held open. The battery must be fully charged and the starter motor in good working condition. The test is best performed with the engine warm to hot. Where available, the manufacturer's guidelines for performing a compression test should be followed. The compression gauge should be fitted to the required cylinder, the engine cranked over for at least four compression strokes and the compression gauge observed and reading recorded. This is known as a 'dry' compression test.

The compression reading will probably be low on the first stroke and increase each time the piston comes up on the compression stroke - especially if the engine is cold. If the cylinder pressure is low, squirt two shots of heavy engine oil into the cylinder and repeat the test. This is known as a 'wet' compression test. If on repeating the compression test there is a significant increase in cylinder pressure, then that cylinder has worn rings, a worn piston, a worn cylinder wall, or a combination of these. If adding oil doesn't make a significant difference, then the cylinder may have sticking valves, burned valves, misadjusted valves, a worn camshaft, worn lifters or incorrect valve timing.

If you get low compression readings in two adjacent cylinders while all the other cylinders are normal, it usually indicates the head gasket is blown between these two cylinders. Correct compression readings should be within specification and not vary by more than 10% between cylinders.

Static Leak Down Test

If you get low compression readings during a compression test, then the static leak down test can be used to target the cause of those readings. This test will help to distinguish between leakage past the intake valves, exhaust valves, piston rings, a blown head gasket or cracks in the cylinder head or block.

Bring the cylinder in question to top dead centre (TDC) on the compression stroke. Connect a compressed air hose to an adapter and into the spark plug or injector hole in that cylinder. Pressurise the cylinder and then listen for escaping air. The three places to listen for escaping air are at the air intake, the exhaust pipe and the open oil filler opening. Air hissing out the tail

pipe indicates exhaust valves that are not sealing on their seats. Air hissing out of the air intake indicates inlet valves are not sealing on their seats. Air escaping through the oil filler cap opening indicates the piston rings, pistons or cylinder walls are badly worn or damaged.

Air from the air intake or the tailpipe could also indicate incorrect valve timing or a damaged timing belt or timing chain. Air coming from a neighbouring cylinder's spark plug or injector hole indicates a blown head gasket between those two cylinders. Air bubbles in the radiator indicate a blown head gasket, cracked cylinder head or cracked cylinder block.

These two tests are diagnostic tests to check engine compression. The compression test determines how much pressure is being produced in each cylinder at cranking speed, which is then checked against a recommended specification. The static leak down test checks the percentage of leakage from cylinders and helps determine where leakage is occurring. Equipped with this information, you can determine whether the engine needs to be removed for major engine repairs, the cylinder head needs removing or it may simply be a matter of adjusting valve timing or replacing a timing belt or chain. Whatever the outcome, you are in a position to make an informed decision as to what is the most suitable way to proceed to repair the engine.
