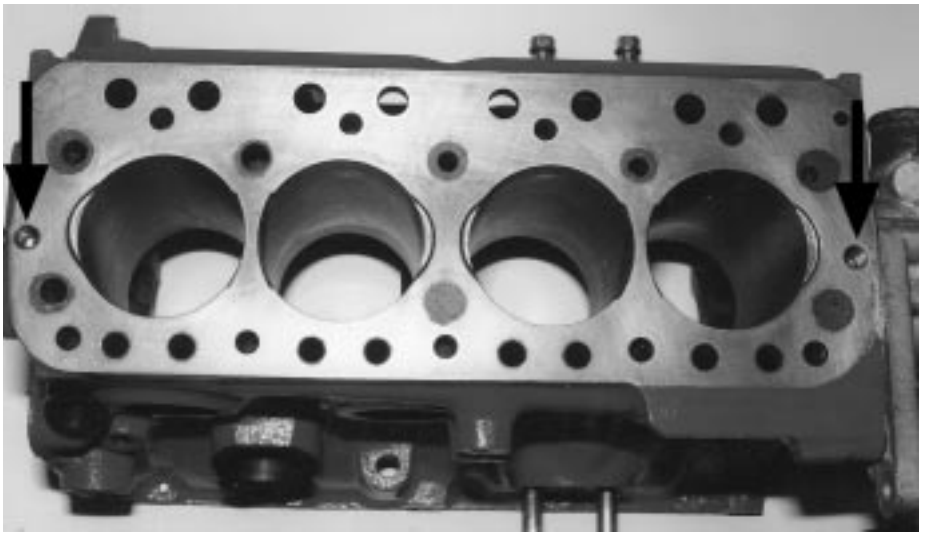
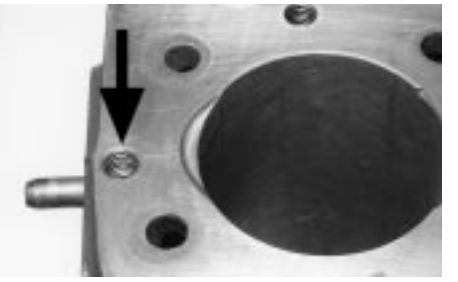
Contents



The two extra head stud holes are arrowed here.

with nine studs go just as well as engines which have eleven studs, but the reliability of the cylinder head gasket will not normally be as good. A modified road going engine will always prove to be reliable with nine studs and up to 10.0:1 compression - provided the block and cylinder head gasket surfaces are truly flat. **Caution!** - For high compression (11.0:1 plus) racing engines using nine stud heads, always replace the head gasket every 200 racing miles and always have a spare cylinder head gasket for immediate replacement.

The most common point of gasket failure on a nine stud engine, irrespective of the compression ratio, is at each end of the cylinder head where there is no stud. The most common point of gasket failure on an eleven stud engine which has 11.0:1 plus compression is across the middle cylinders. If this happens on a correctly prepared block and cylinder head, the engine will almost always have done a considerable amount of work, and replacement of the cylinder head gasket the instant the leak is noticed restores the situation.

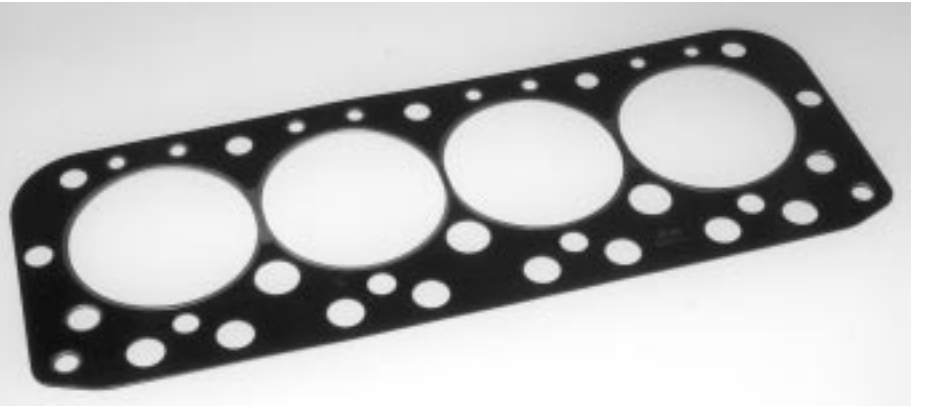


Here extra stud hole has been drilled and tapped.

The cylinder head gasket to use on any high performance 998cc engine is the MG Metro Turbo one, available from UNIPART singularly or in a complete gasket set. These cylinder head gaskets are not expensive and hold the compression seal better than any other original equipment cylinder head gasket by a considerable margin. Even though these cylinder head gaskets are for the 1275cc engine, they're used on high performance 998ccc engines.

SLEEVED BLOCKS

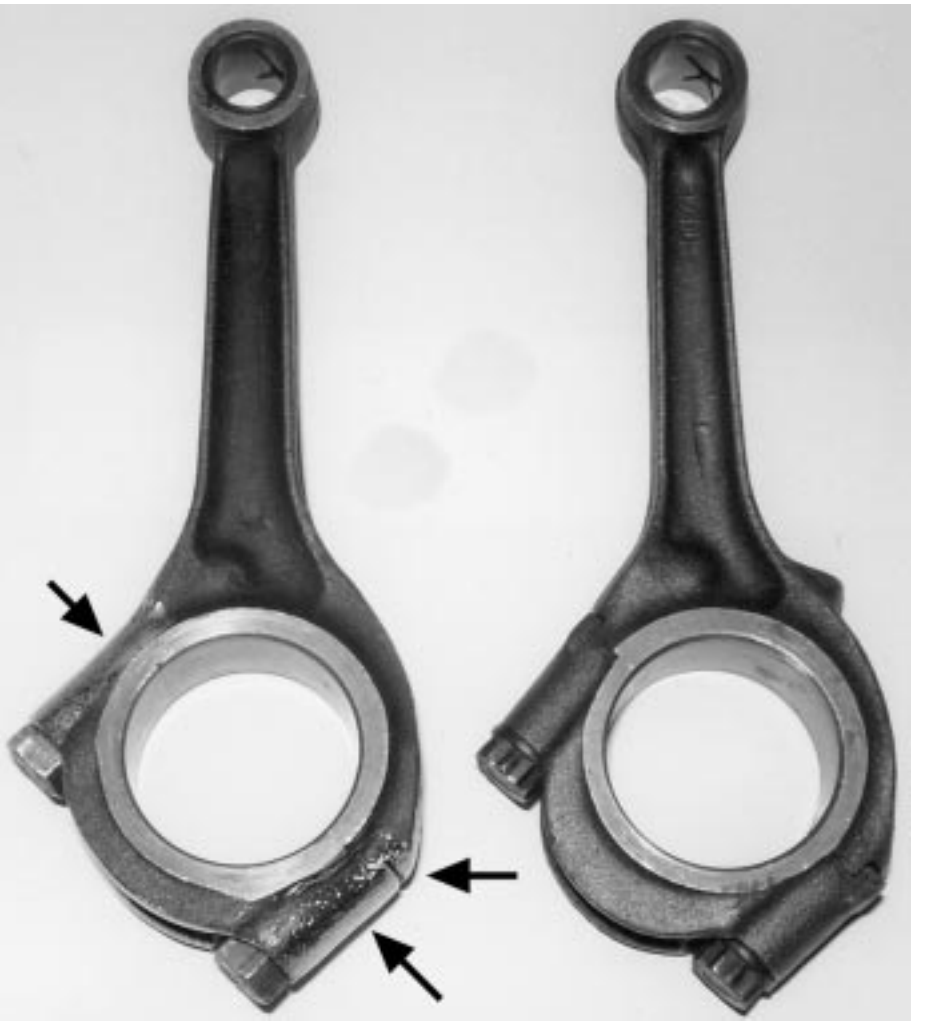
Some of these blocks are sleeved from the factory. Blocks get sleeved by factories because it's cheaper to sleeve the blocks to make them serviceable than it is to scrap them and start again. The usual reason a block is sleeved is because it has porous bores or has pin holes on the bore surfaces. When blocks like this are found they get put to one side and, when there is a sufficient number of them, they are sleeved on a mass-production basis, which is fine for a normal road going engine. The sleeving is well done, but the sleeves are quite thin and over boring is limited to 0.020in/0.5mm maximum. **Caution!** - No sleeved block should ever be used for a racing engine, and it's preferable **not** to use them in any high performance application. Thin sleeves crack lengthwise



Unipart Metro Turbo cylinder head gasket.

Standard A+ connecting rod bolts.

Lightened and balanced 998 connecting rod (left). Shot peen the reworked areas (arrowed).

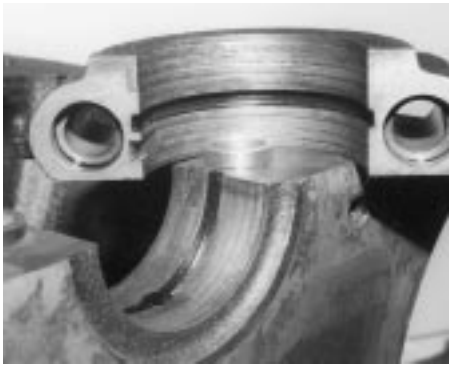


Lightened (arrowed areas) connecting rod on left, standard on right.

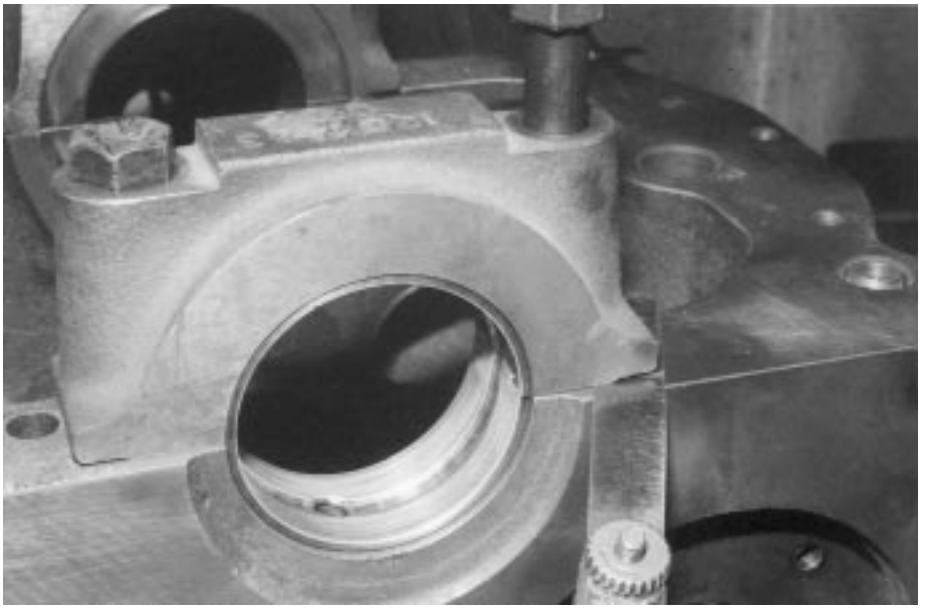
failure with any standard production-type connecting rod, but with the 998 it is generally a low risk situation. New connecting rods are available from Motorsport Parts.

The only things that do need to be replaced for use above 7500rpm are the connecting rod bolts. The standard connecting rod bolts are excellent but, for use above 7500rpm, as a safety precaution should be replaced with high strength aftermarket bolts such as those made by ARP for instance.

Caution! - Always fit new standard connecting rod bolts during a high performance engine build and, if you will use very high revs or race, fit high strength aftermarket bolts. If standard bolts have to be used in any high revving application, always fit new ones in the initial build and then replace them frequently (every 10 hours of full bore running). Engine use will have to be logged to keep track of the hours. A broken connecting rod bolt means a destroyed engine at 8000rpm. New standard bolts fitted to a high performance road engine are all that are required.



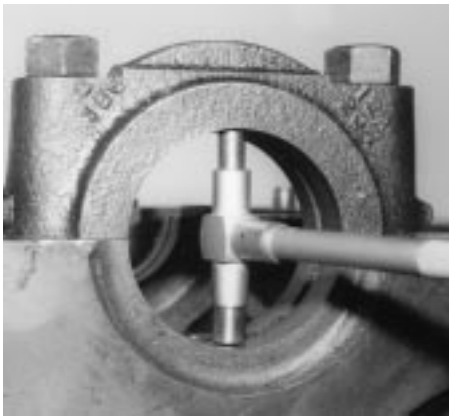
Main bearing tunnel bores have a surface like this.



Gap between cap and block being measured with feeler gauges to ascertain bearing crush.

tolerance and the surface finish of the main bearing tunnel bores is altered. For high performance engines there are two advantages achieved by having the block align-honed: the surface finish is better and the main bearing tunnel diameter can be reduced to the minimum factory size (which will mean that the bearing shell inserts will have the maximum 'bearing crush' allowable within the factory specifications).

Main bearing tunnel bores which have had a bearing spin in them are seldom on size and almost always have a series of radial score marks. Do a visual check to see that there are no radial score marks and measure the tunnel diameter using an inside micrometer (or a telescopic gauge) to check that they are on size. The 998cc engine's main bearing tunnel bores are nominally 1.8965in/48.29mm in diameter.



Telescopic gauge being used to measure diameter of main bearing tunnel bore.

Caution! - When the bearing shell inserts are installed in the block there must be a certain amount of 'bearing crush.' Having the correct amount of crush is what prevents the bearing shells from spinning and ruining the engine. To check crush each main cap/bearing combination in turn is fully assembled and one bolt is then released. The side of the main cap which has the bolt undone will lift and it is the distance the cap lifts which is the effective 'crush height.' On the A-Series engine the crush height is 0.004in/1.0mm-0.005in/1.25mm.

Cylinder bores are best dead parallel, but taper of up to 0.002in/0.05mm is often accepted as being within tolerance. However, **no** engine produces top power with **any** perceptible bore wear: consider 0.002in/0.05mm of wear to be the absolute limit and even this is far from ideal. Check that the piston to bore clearance (checked using a feeler gauge) is to specification. Pistons are available from various manufacturers in 0.010in/0.25mm, 0.020in/0.50mm, 0.030in/0.75mm, 0.040in/1.0mm and finally 0.060in/1.50mm oversizes.

For high performance applications you just can't beat a new set of pistons

Measure the bore with an inside micrometer and the piston diameter with an outside micrometer - the difference is the piston to bore clearance.

Orange and grey clutch covers have strengthening plates.

a 998cc engine. Such a powerful diaphragm takes a quick toll on the crankshaft's thrust washers, which can lead to early engine failure. Note that it is actually recommended by the manufacturer that 'grey' covers only ever be used with Cera-Metallic clutch plates.

PADDLE CLUTCH PLATE

Those looking for maximum clutch reliability should consider a 'paddle clutch' which has Cera-Metallic 'pucks' riveted to the actual clutch plate. The standard clutch plate weighs 550grams, while a 'paddle clutch' plate weighs 700grams. These clutch plates do not wear in the same manner as conventional clutch plates, irrespective of what sort of harsh treatment the clutch receives. These clutch plates are basically 'bullet-proof' and, as a consequence, have to be worth the extra expense. They do wear away, of course, but very, very slowly.

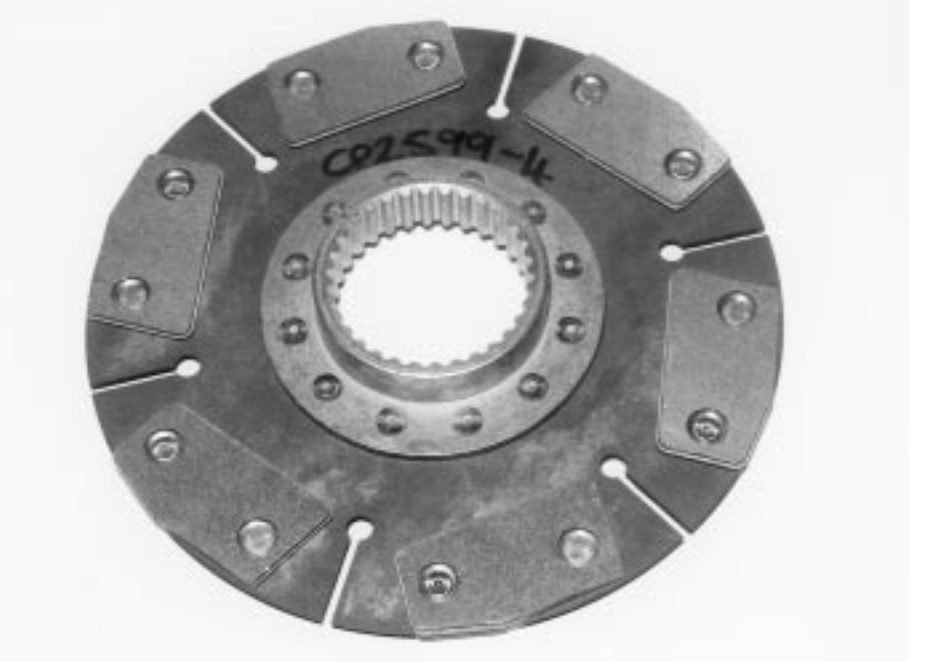
The standard clutch plate, when new, has a nominal thickness of 0.275in/7.0mm, while the Cera-Metallic lined 'paddle' clutch plate has a nominal thickness of 0.290in/7.3mm (0.015in/0.4mm thicker).

Engines equipped with these clutch plates do tend to 'squeal' a bit when the clutch is engaged, but who cares about a bit of noise as long as the clutch is 100% reliable? For racing this is definitely the only way to go: these clutches can be abused as much as you like and will not normally fail.

There is no point in fitting a Cera-Metalic paddle clutch plate without fitting an uprated clutch cover assembly. A genuine Unipart Mark II Mini Cooper S clutch cover assembly used in conjunction with a Cera-Metallic paddle clutch plate is usually the solution to the clutch problems often associated with torque of up to 80 foot-pounds. The actual diaphragm **must** be dead flat when assembled.

Admittedly, it is not normally recommended that a Cera-Metallic clutch plate be used in conjunction with a 'dark blue' clutch cover assembly; this is because of the surface glazing of the flywheel and pressure plate sometimes experienced with this set-up: a problem which can cause the clutch to slip.

For use with up to 70 foot pounds of torque, a new genuine Borg & Beck 'dark blue' clutch cover and a Cera-



Cera-Metallic 'paddle' type clutch plate.