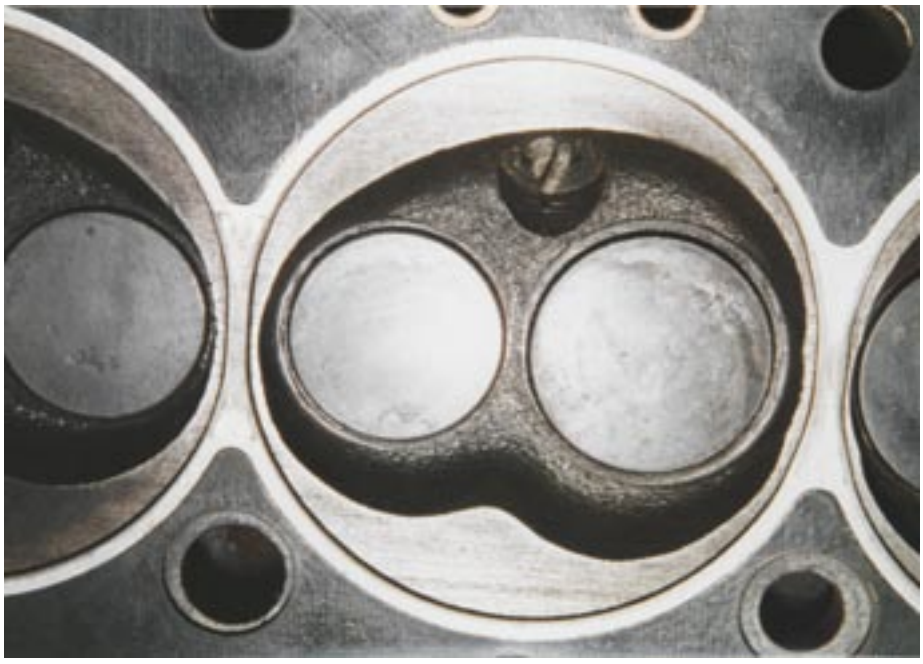


Standard MG Metro Turbo cylinder head combustion chamber and valves. The standard 1275cc engine's combustion chamber is almost exactly the same shape.

lead substitute additive will have to be used if one of these cylinder heads is going to be used.

1300 MG Metro Turbo head

The next best readily available cylinder head is the 1300 MG Metro Turbo unit, but it has smaller inlet valves than the straight 1300 MG Metro cylinder head. Nevertheless, it's still a very good cylinder head for any 1275cc engine though more restrictive than the non-turbo 1300 MG Metro cylinder head because of its smaller inlet valves. In the final analysis, inlet valve size is not all that critical for road use and you'll be very hard pressed to tell the difference between the Turbo and non-Turbo heads in practice.

Despite its smaller valve head size, the Turbo head inlet ports are, on average, the largest of any production A-Series engine ever made. The inlet valves are 1.312in/33.3mm diameter and the exhausts 1.150in/29.2mm.

1300 MG Metro Turbo cylinder heads are well finished, compared with the standard 1275cc A-Series cylinder heads, and can be fitted with hardened valve seats. They are not, however, as well finished as 1300 MG Metro cylinder heads. In fact, it's this type of cylinder head which was fitted with hardened exhaust valve seats by the factory from 1989 on.

These later cylinder heads are the ones today.

Cooper 'S' heads

Next in the desirability stakes we have 1275cc Cooper 'S' heads, but they're not as readily available and were never made in the same numbers as the large inlet valve Metro 1275cc units.

There have also been three basic Cooper S cylinder heads: MkI, MkII and MkIII. Of the three, the MkIII is the best on the basis of reliability. The MkI and MkII cylinder heads had the largest exhaust valve head diameters (1.214in/31mm) ever fitted by the factory and, consequently, tend to crack between the inlet and exhaust valve seats. The MkIII cylinder head with its smaller

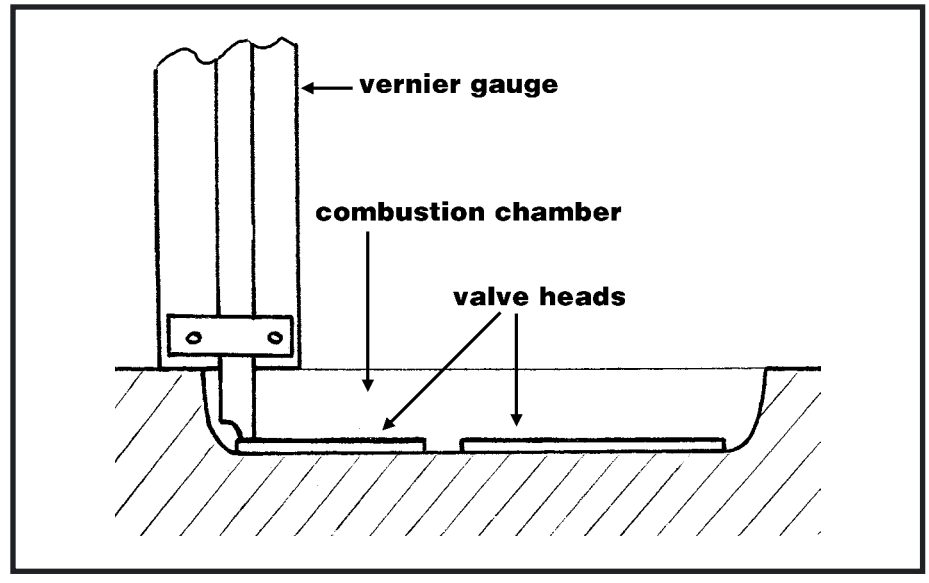
Valve is at full lift. Zero the dial and then count back as the valve returns to its seat.

lift and any amount of cylinder head planing can be accommodated.

You can use any standard 1275cc Mini pre-A+ engine's head or the 1275cc Metro 1300 (non-MG/Vanden Plas) A+ engine's cylinder head on a 850cc, 998cc or 1098cc engine.

These cylinder heads are not as well machined as the earlier Cooper 'S' or A+ MG Metro heads. The inlet ports are also smaller than the Cooper 'S' or A+ 1300 MG/Vanden Plas ones, but this gives good fuel economy without significantly affecting engine performance 'on the road'. The other factor is that the combustion chamber, while not being particularly 'neat' is slightly deeper and this adds up to more exhaust valve head to block clearance. In many instances the standard 1275cc cylinder head can be planed 0.040in/1.0mm without valve head to block deck clearance problems. Check the original dimensions before planing any of these cylinder heads: this way not too much material will be removed from the head gasket face of the cylinder head.

The problem with most of the better readily available production cylinder heads (MG Metro) is that the inlet ports are actually a little bit large if one of these cylinder head is put on a smaller capacity engine such as an 850cc, 998cc or 1098cc. An MG head is not the way to maximum economy even though a good power



With the cylinder head assembled, the distance from the cylinder head matching surface down to the flat surface of the exhaust valve head is measured using the tail of a vernier calliper. Measure each exhaust valve: the smallest dimension is the one to use for calculations. Include the compressed head gasket thickness in the full amount of clearance.

Early small bore engine valves: exhaust valve used on all small bore 850cc, 998cc and 1098cc engines, extreme left (1.000 inch diameter); 850cc and 998cc single carburettor inlet valves, centre left (1.100 inch diameter); 1098cc single carburettor engine inlet valve, centre right (1.150 inch diameter); and twin carburettor 998cc and 1098cc inlet valve, extreme right (1.219 inch diameter). The valve spring retainer, collets and retaining circlip used by all of the above are at the bottom of the photo.

Collets/keepers/split locks: early style ones for 850cc, 998cc and 1098cc engines, extreme left; 1275cc single groove ones (which were later universally used on all engines up until A+ engines came out) centre left. A+ 998cc and 1275cc triple groove ones for standard diameter valve stems, centre right; A+ MG Metro Turbo, triple groove, large diameter valve stems, extreme right.

length was approximately 3.440-3.450in/87.4-87.5mm for all of them. The 848cc, 997cc Cooper (1961-1963), the single and twin carburettor 1098cc engines all used this type of valve, valve spring retainer and collet/circlip arrangement up until 1974.

The valve stem diameter was 0.279in/7.09mm for all small bore engines (1959-1991).

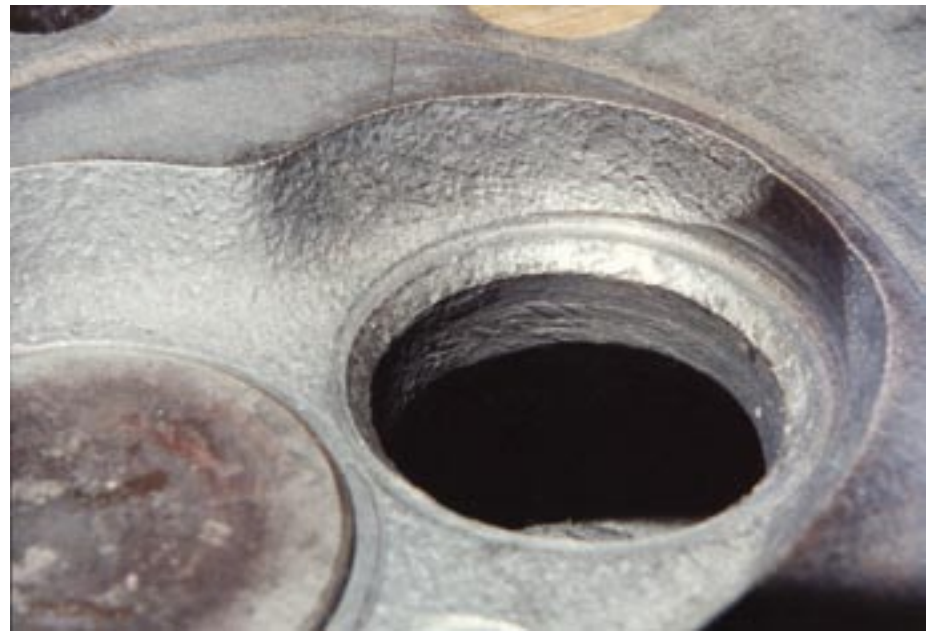
The exhaust valves were exactly the same for all of these engines and they had a 1.000in/25.4mm diameter head. There were, however, three head sizes of inlet valve. The 848cc engine had 1.095in/27.8mm valve heads, the single carburettor 1098cc and the 997cc Cooper of 1961 had 1.156in/29.4mm valve heads, and the 998cc Cooper and the twin carburettor 1098cc MG, Riley Kestrel, Wolseley and Vanden-Plas had 1.219in/30.9mm valve heads.

There were single and dual valve spring combinations used on these engines. The 848cc had $1^{11}/_{16}$in/42.86mm free standing length single valve springs with 37lb/17kg of seated pressure and 70lb/32kg of over the nose fully open pressure. The 997cc Cooper and the eingle carburettor 1098cc engines had the $1^{3}/_{4}$ in/44.45mm free standing length valve springs with 55lb/25kg of seated pressure and 90lb/41kg of open pressure. In the late 1960s the 848cc engine used these stronger single valve spring as well.

The 998cc Mini Cooper, the 1098cc MG, Riley Kestrel, Wolseley and Vanden-Plas engines all used dual valve springs which had a free length of $1^{3}/_{4}$in/44.45mm for the outer and $1^{45}/_{64}$in/43.3mm for the inner. The combined seated pressure was 73lb/33kg and the fully open pressure was 118lb/53kg.

The valve spring retainer is the same for all of the above engines and it is easily recognised by the large 30 degree chamfer on the outer edge and a machined in groove on the top face.

The valve spring fitted height of all small bore engines (848cc, 997cc, 998cc and 1098cc engines) is approximately 1.325in/33.5mm and it remained this size from 1959 across the board until the end of A+ 998cc engine production in 1991. The maximum valve lift with standard valve springs is 0.390-0.400in/9.9-10.1mm. The dual valve springs are the strongest and will allow 6500rpm.



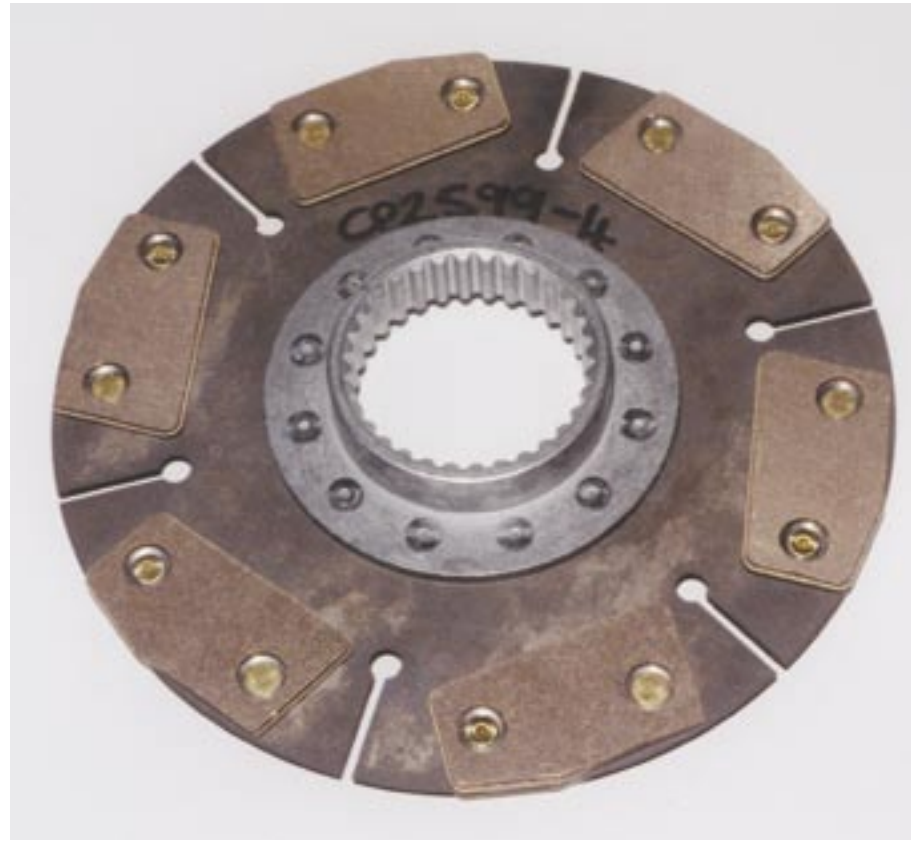
Exhaust valve seat in a head used with unleaded fuel for many miles: massive deterioration is obvious. All the exhaust valve seats in this head were the same. This is not valve seat recession, it is valve seat deterioration. Valve seat recession is the next stage, as the original valve seat has not been completely eroded away yet.

make this fuel and appoint selected outlets to sell it, used 0.099 grams per litre of tetraethyl-lead which provides acceptable valve seat protection and the fuel is 98 RON/86.2 MON.

Two unleaded fuels have been available in the UK for some time now, and these are Premium unleaded, which is required under BS7070 (British Standard 7070) to have a minimum RON of 95, and Super unleaded, which is required to have a minimum RON of 97. There is a slight problem with Super unleaded, however, if the petrol station holding it in its tanks is not a busy one. Super unleaded gets its extra octane by having various 'volatiles' mixed into it, and they tend to evaporate quite quickly. The longer the fuel remains in the tanks of the petrol station, the less the octane rating of the fuel. Premium unleaded does not have these 'volatiles' in it and, as a consequence, maintains its manufactured octane (95) rating longer. Because of this, Premium unleaded will, in some instances, cause your car to go better than Super unleaded. As with all petrol/gasoline, if maintaining the octane is important (if you're using a high compression engine, for example), the fresher the fuel the better, and the recommendation is to buy your fuel from a busy forecourt. Old Super unleaded fuel can end up with a lower octane than Premium 95 in certain circumstances. The highest octane unleaded fuel commercially available in the UK today (2005) is Shell Optimax, which is 98.3 RON and 86.9 MON.

The USA, while still using the RON and MON tests to rate fuel, has taken this all one step further by introducing an Anti-Knock Index (AKI) number, based on the RON and the MON added together and then divided by 2. Other names for this system you see used in the USA are PP (Pump Posted) or perhaps PON (Pump Octane Number). As you can see, when you're talking octane, you need to be quite clear what criteria are being used.

In the USA there are three basic grades of AKI street legal unleaded



Here, the assembled clutch diaphragm is flat, which is the correct attitude for maximum clamping pressure and rapid diaphragm pressure reduction when the clutch pedal is depressed.

Caution! - Not all aftermarket replacement diaphragms are rated at 854lb of clamp. They may look the same and have the same 'dark blue' paint, but they're not necessarily as powerful and could be the cause of clutch slippage, though this problem will usually only show up on a 1275cc engine. Usually any 'dark blue' diaphragm clutch from any manufacturer or remanufacturer will work well for 998cc or 1098cc engines. However, for 1275cc engines the cost of a new Unipart 'dark blue' diaphragm is not excessive and ensures adequate clamping pressure.

Caution! - Do not use a grey or orange diaphragm clutch cover on a road going engine if you can possibly avoid it. They are really quite strong, and can be the cause of almost immediate and ruinous crankshaft thrust washer failure. All clutches need to be set up with the actual diaphragm dead flat when assembled.

CERA-METALLIC CLUTCHES

Cera-metallic clutch plates can be fitted to either type of clutch assembly. One of the most important features of fitting a cera-metallic clutch plate to a pre-Verto clutch assembly is to ensure that the diaphragm is set up correctly so that it has maximum clamp and minimum release pressure. The design of the diaphragm spring means that it is exerting maximum clamp pressure when it is completely flat. This is checked when the flywheel assembly is off the engine by doing a dummy assembly. With the new cera-metallic

Here clutch diaphragm is flat and this is the correct attitude for maximum pressure.