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# M30 Cylinder Head FAQ

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## Courtesy of Mike Wassall

**Overview:** BMW M30 cylinder heads are at the same time the best and worst part of the engine, giving good power output even in the difficult smog years of the 70's and early 80's, but also having an alarming propensity to crack, but some more than others. Year or lack of abuse is no guarantee, they all must be carefully inspected before use. That long aluminum casting is prone to both warping and cracking if overheated. But just because it is overheated doesn't mean it is junk, nor does a pampered life mean it is good, so check it out. Cracked heads don't cause overheating, at least not directly, they cause loss of coolant, which leads to overheating, which blows head gaskets which causes more overheating and cracking. Kind of a vicious circle isn't it.

**I've got a problem, what is it:** OK, you think you have a problem, or even know it, how do you tell what is going on? With the engine shut off, look at the underside of the oil filler cap. Is it just brown and oily, or does it have some whitish gunk on it? A small head gasket leak will give you just the oil filler cap indication, that whitish gunk on it, with some water consumption, but no visible water in the oil, the dipstick will look OK. A large head gasket leak will leave the dipstick coated with that chocolate milk look. Now if you are using water without these symptoms, look for a cracked head like this, remove the radiator cap, **BUT NOT WITH THE ENGINE HOT**. Then start it up and look in the coolant reservoir for bubbles. It can be difficult to tell the difference between bubbles and turbulence, but there is a difference. If you have bubbles that is a usually a sign of a cracked head, but the absence of them doesn't guarantee anything either, but bubbles are a bad sign. If you have access to a smog machine, check the reservoir for emissions, there shouldn't be any CO coming out of the radiator, but it could be either a crack or blown gasket if there is.

**Visual inspection and where they crack:** They like to crack in-between the exhaust valve seat and the coolant passage, usually on cylinders 2-5 sometimes on more than one cylinder. I had one head one time that had four cracks in it so you can definitely have more than one. Examine it very closely, it usually will be very small, take carb cleaner and clean it up, use a razor blade to clean up the surface, and look closely. You will almost always be able to see it, but make sure you check before the head is surfaced, you won't be able to see it afterwards. If you see the start of a crack, don't use it, it won't be long before it is cracked all the way.



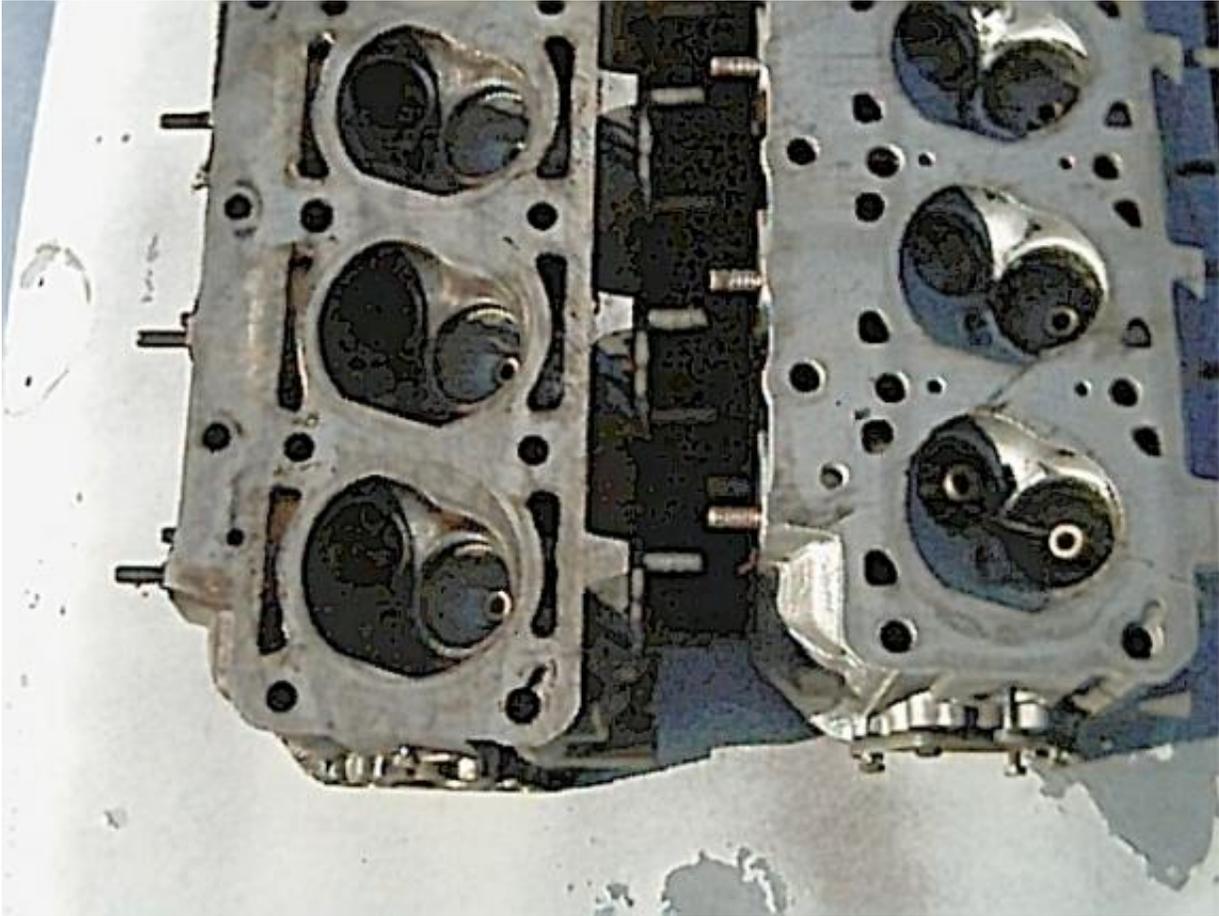
Crack between combustion and chamber and coolant passage on 1977 head  
Crack is in center of picture (faint white line) - Peter Florance

**What kind of a head to look for:** The early ones are the weakest, I might reuse one if I couldn't find a later one cheap, but I would not buy one, they are just too fragile. The intermediate ones are very similar to the early ones, but they have a much thicker wall between the combustion chamber and the water jacket than the early ones. The wall thickness is 8MM on the early ones and 13MM on the later ones. The still later ones have holes for water passages, instead of the slots like the earlier ones. These are the best and most resistant to cracking, but it still happens sometimes, particularly with reactor equipped cars. There is also a Spanish made head, which has AMC cast into the side of the head instead of the year. These don't look as nice as factory heads, the casting is noticeably rougher, but they have a very good reputation and I wouldn't hesitate to use one. The casting is similar to the late one having holes instead of slots for water passages.



AMC head showing casting mark - Mike Wassall

As a side note, the latest M30 engined cars, the E32 and E34 735 and 535 do have a somewhat different head which apparently can be used and does have 1MM larger intake valves and larger ports, but also a larger combustion chamber so it has lower compression, and the shape of the port is different also, so I don't recommend that head even though it flows better. The approximate casting dates are, thru 78 will be the early head, 79-80 the intermediate one, and 81 and later the late one. But personally verify before use, I'm not sure of the exact dates. You can even check for straightness in a wrecking yard, use a carpenters square or metal rule and feeler gauges, verify it's trueness on the block the head came off of, that cast iron rarely warps. A couple or three thousandths is fine to bolt on as is, but if it is more than that, have it checked by a machine shop and surfaced if necessary. The manuals make a big deal out of head thickness, but I haven't found that to be a problem, the factory spec for thickness is 129MM or 5.079" for those of us without expensive digital calipers. I have found the later ones tend to be slightly thicker at 5.083, but I have used heads as thin as 5.055 or so without any problems and using the stock head gasket, not that special thick one the manuals mention. This assumes stock parts, if you have 10:1 pistons with a 312 Schrick cam, all bets are off.



Older and newer casting shown side by side. Slotted coolant passages on older head - Mike Wassall

Casting numbers: BMW heads use the last two digits of the year as a casting number that is visible between cylinders one and two on the intake side. That is a good reference as to if a head is original or replacement or when it was made, but the casting number isn't likely to be the year of the car, expect the casting number to be the year previous to the year of the car, a 79 528i would likely come with a casting of 78 on the head. The Spanish heads have AMC cast into the head about where the year would be on a BMW factory head, but no year reference that I have found. The year is your best external guide, there is a part number cast into the head also, but I have seen early, intermediate and late heads all with the same number. And also late heads with several different numbers, so it doesn't really tell you much.



77 Casting date on intake side of head - Peter Florance

**Interchangeability:** This is one of my favorite things about BMW's, lots of different parts fit lots of different years. You can take a head from a 68 2500 and put it on an 88 535is, with the right head gasket. All the heads use the same valves, rockers and rocker shafts, so that stuff all interchanges. You can put any of the heads on the 2.5, 2.8, 3.0, or 3.3 engines without any problems as long as you have the right cam, but Motronic and non-motronic cams aren't interchangeable. The only combination that's tricky is if you try and use an early slotted cooling passage head on a 3.5 motor, you need to use the early euro 3.5 head gasket. The later 3.5 gaskets have a big hole in-between the coolant passages and water will pour right into the crankcase, I know I tried it! You can however use a complete motronic head assembly (including cam) in an E12 if you get the adapter nut mentioned in the 3.5 conversion FAQ.

**Rebuilding:** I don't use new stuff if I can avoid it, but I do carefully inspect the old parts. The shafts can wear as can the rockers themselves, either the bushing that rides on the shaft or the pad itself which can become either grooved or scalloped or both. The pad that rides on the cam should be nice and smooth and rounded, definitely not scalloped as many I have seen. And of course, check out the cam, it shouldn't have any ridges or the like, but it's usually pretty apparent. It's a little tedious, but fairly straightforward, everything goes back together the opposite of the way it came apart. Make sure that you either use the upgraded cam oiler banjo bolts or use Loctite on them, they do like to loosen up and you want all the oiling and oil pressure you can get. The famed "Iron Maiden" head disassembly tool may be of assistance if you can find one, but you still have to drive the rocker shafts in and out and that is the real problem. Especially if the head is warped some, those shafts are very easy to crack. It takes some force to drive them out but you don't want to hit it too hard

or else you can either mushroom the end, making it much harder to get out, or crack it if you are using a tool that doesn't put most of the impact on the outer perimeter. For instance, you have a nice piece of 3/8" rod you want to use to drive out the rocker shafts. DON'T! Something that small will just push on the plug in middle and crack the rocker shaft. If it is summertime, you might want to put the head out in the sun in the morning and let it warm and expand and do the dirty work in the afternoon after it is just a little bit bigger. One more note, all four rocker shafts are different, so make sure you have them in the right place when you start. You can check on how the valves seal, pour rubbing alcohol into the port and look for leakage. Ideally you should see none, but a little tiny bit of weepage is actually ok, but not if it actually drips out. Nice tight valves and guides are good, but the factory manual even says wear limit is .006, which is quite a bit of clearance. And with only new valve guide seals I have taken oil consumption from a quart every 6-700 miles to not having to add between 4K changes. So, in my opinion, new valve guides aren't nearly as essential as they are made out to be, but always change the seals if you are in there. There are two different types of valve guide seals, '79 and later and replacement guides use the late type, 11.5MM I think it is, and '78 and earlier use the early type, 14MM. A word of caution on grinding or lapping your own valves, for some reason, they seem to seat in another 5 or 10 thousandths after a few thousand miles, even a machine shop valve job can do it, but not a good one. So if you lap them in yourself, and I have, set the valves a little loose and adjust them after 3 or 4 thousand miles or when you get backfiring into the intake manifold.

**Welding a cracked head:** I would avoid it, but if push comes to shove, make sure they grind out all of the crack, not just lay a little bead on the top. I have had a couple of heads welded myself and one cracked again at about 60k and the other one was going strong when the car was totaled at about 30k.

**Performance and stock cams:** Nothing I have done has resulted in a noticeable increase in performance. A full and expensive porting job would likely do some good, but short of that, gasket matching and the like doesn't hurt, but don't expect anything either. Cam spec's are as follows for US spec pre motronic cars:

Car	Cam Lift Duration	
528i	7.928	260
530i	7.422	272
2800	7.116	264
2500 and 3.0 carbureted	6.850	260

The 528i cam is cleanest, and provides the best torque, but does fall off at higher revs, but is excellent for an auto equipped car. The 530i cam doesn't have quite the low end grunt, but is happier at that rush towards redline, so I prefer it in a stick shift car. The other two I wouldn't mess with unless you just want to get a car running. If you don't know what cam you have, you have to measure the lift, all the cams I have seen, I think even including motronic ones, have the same number cast into them which ends in 057. That apparently is the casting number for the blank, but not an actual part number.



Cam casting number - not the cam part number. - Mike Wassall

Hopefully this FAQ will tell you what you need to know about heads, and all the things the books don't tell you. If you still have questions feel free to e-mail me at [mgwwassall@cs.com](mailto:mgwwassall@cs.com)

Mike Wassall

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