

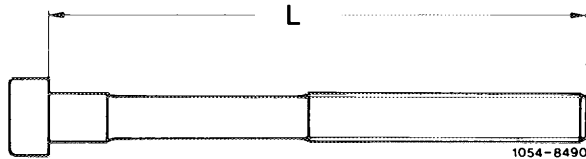
**Tightening torques and torquing angles for cylinder head bolts, with engine cold**

Cylinder head bolt version	Tightening steps	Nm	(kpm)	Torquing angle
Hexagon socket cylinder head bolts (cylinder head bolts with cylindrical shanks)	1st step	70	(7)	—
	2nd step	90	(9)	—
	Settling time			10 min
	3rd step	100	(10)	—
Twelve-point socket cylinder head bolts (waisted shank cylinder head bolts)	1st step	40	(4)	—
	2nd step	70	(7)	—
	Settling time			10 min
	3rd step	—	—	90°
	4th step	—	—	90°

Tighten M 8 cylinder head bolts using key wrench.

**Dimensions of twelve-point socket cylinder head bolts**

Thread dia.	Length as new	Maximum length (replacement)
M 12	104	105.5
M 12	119	120.5
M 12	144	145.0



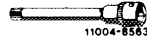
## Special tools

Screwdriver socket 10 mm,  
1/2" drive, 140 mm long  
for hexagon socket cylinder  
head bolts



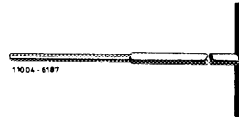
000 589 05 07 00

Screwdriver socket  
1/2" drive, 140 mm long  
for twelve-point socket cylinder head bolts



617 589 00 10 00

Screwdriver with tommy bar  
for hexagon socket bolts  
M 8, 6 mm, 440 mm long



116 589 03 07 00

Torque wrench handle 50–200 Nm (5–20 kpm)



001 589 44 21 00

Attachable ratchet, 1/2" drive  
for torque wrench handle

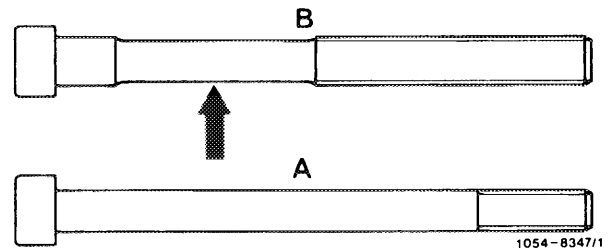


001 589 42 09 00

## Notes

To improve and increase bolt preloading the old cylinder head bolts with cylindrical shanks (A) have been replaced, starting February 1979, by waisted shank cylinder head bolts (B).

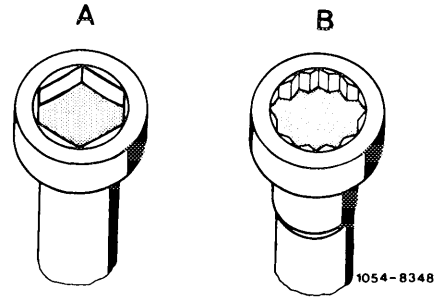
- A Cylinder head bolt with cylindrical shank
- B Cylinder head bolt with waisted shank



These cylinder head bolts have a tapered shank (arrow) and a longer thread.

In situ, the different types of cylinder head bolts can be distinguished by the twelve-point socket (B) and hexagon socket (A).

- A Hexagon socket cylinder head bolt
- B Twelve-point socket cylinder head bolt



At the same time, the impregnation of the cylinder head gaskets has been improved, and the washers made harder.

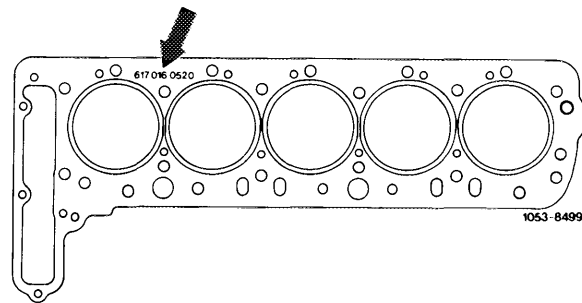
The cylinder head gaskets can be identified by the stamped part No., and the washers by the olive-colored chromate finish.

**Cylinder head gaskets**

Engine 615, part No. 615 016 16 20

Engine 616, part No. 616 016 14 20

Engine 617, part No. 617 016 05 20

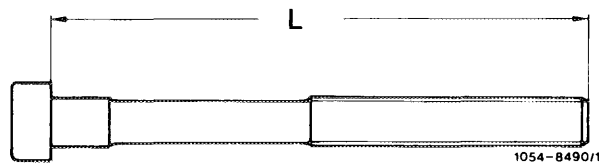


Twelve-point socket cylinder head bolts no longer need retorquing at the first inspection (500–1000 km) or after about 500–1000 km following repairs.

Twelve-point socket cylinder head bolts are to be given initial torque and then tightened by the final torquing angle (see table).

Since waisted shank cylinder head bolts are permanently stretched by tightening they have to be replaced once they exceed the maximum lengths indicated in the following table.

To account for the permanent stretch the tapped holes in the crankcase have been lengthened and the cylinder head bolts shortened by 1 mm.



### Dimensions of cylinder head bolts

Thread dia.	Length as new (L)	Max. length (L) (replace)
M 12	104	105.5
M 12	119	120.5
M 12	144	145.0

In event of repair, be sure always to use cylinder head gaskets with improved impregnation and the harder washers for engines with twelve-point socket cylinder head bolts.

Tighten cylinder head bolts by initial torque and torquing angle.

Estimate torquing angle. For this purpose position adjustable torque wrench handle in ratchet **at released position** (locked). Apply adjustable torque wrench handle and ratchet **parallel** to center line of engine, and turn until it is at **right-angles** to engine.

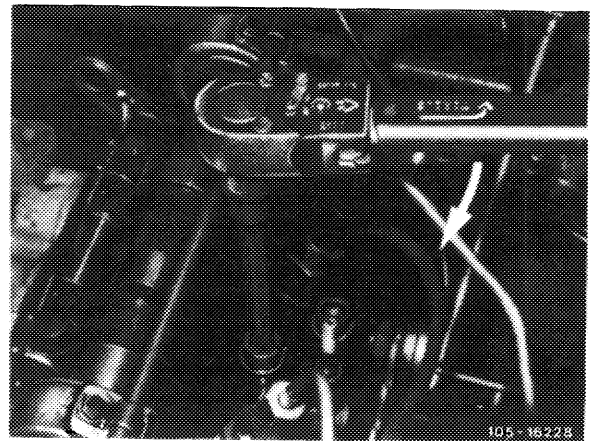
Do not use a torque-limiting wrench for applying the torquing angle.

**Twelve-point socket cylinder head bolts must not be used in engines with hexagon socket cylinder head bolts.**

This applies equally well to the installation of partial engines and new crankcases.

Be sure always to use the same cylinder head bolt version as that installed in the old engine.

Over and above that, it is strictly forbidden to mix different types of cylinder head bolts in one engine.



Engines with hexagon socket cylinder head bolts will accept all cylinder head gasket versions, including cylinder head gaskets with improved impregnation, as well as the harder type of washer.

However, this rule does not apply to engines in which the cylinder heads feature water distributors (05–100). Engines of this type require cylinder head gaskets as per part No. 615 016 07 20 and 615 016 08 20.

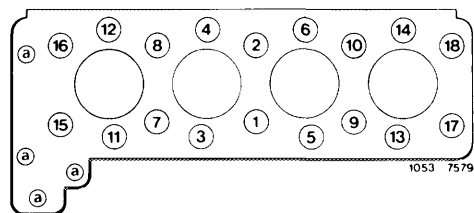
Hexagon socket cylinder head bolts must always be tightened by torque and retightened after 500–1000 km. Retorquing does not apply to vehicles in (AUS), (J), (S) and (USA) versions starting 1977.

Tightening by torque dispenses with the old procedure of "hot" torquing.

A 10-minute settling interval therefore has to be left between the 2nd and 3rd torquing steps (see table). Besides, the 3rd torquing step has been increased by 10 Nm (1 kpm) to 100 Nm (10 kpm).

Cylinder head bolts are to be tightened step by step in the order of the torquing diagram.

Engines 615, 616



Engine 617

