

Valve seat inserts for gas engines

Situation

The conversion of vehicle engines to gas-powered operation has increased even more due to the recent rises in oil prices. However, numerous engines are only suitable for being converted to gas power by adapting the cylinder head and changing the valve-and valve seat material specification.

The solution

The KS product range includes sintered valve seat inserts with outstanding material properties suitable for engine conversions to gas. By using such sintered valve seat inserts - HT series - higher mileage can be achieved by gas-powered engines. This mileage exceeds by far everything that standard valve seat materials are normally capable of achieving under these circumstances.

The special material composition of the HM and HT valve seat series can only be accomplished by sintering the materials. This process enables hard and soft, high-melting and low-melting materials to be combined to a unique material which can hardly ever be combined by conventional alloying and melting processes. Soft metals, such as copper, ensure the self-lubricating effect in the process. Hard materials, such as chromium, silicon or carbides, guarantee high wear resistance, and high-melting metals, such as for instance tungsten, provide for the special thermal stability of the sinter material.



The main problem

with the combustion of gas is that the combustion is hotter and dryer than when petrol fuels are used. In the vaporisation process of liquid fuels, thermal energy is drawn from the surrounding area. As a result, the drawn-in fuel/air mixture is cooled down. Cooler intake air therefore results in lower combustion temperatures and, consequently, in a better internal cooling of the engine compared to gas-engine technology. When the engine is driven with petrol fuels, the drawn-in fuel/air mixture contains micro-droplets of fuel which serve to lubricate the valve seat inserts. Due to the lack of this liquid-film lubrication on valve seats in gas-driven engines, increased fretting results on valves and valve seats, due to the overall principle.

Basically, there is consequently a combination of two different problems that must be taken into account with gas-driven engines.

1. Increased fretting is caused by the lack of fluid lubrication on the contact area of seat inserts and valves.
2. Due to the lack of liquid film on the contact areas of valve and valve seat insert, there is no longer a separating agent in place. Microweldings between valve and seat insert are therefore caused prematurely as a result of increased valve temperatures.

The right of changes and deviating pictures is reserved. For exact details about applications, please refer to our current catalogue / CD / OnlineShop.



Advantages of sintered KS valve seat inserts

1. Convenient installation

The sintered seat inserts can be either pressed-in or driven in mechanically. The seat inserts do not need to be shrink-fitted using liquid nitrogen or dry ice. And is it not necessary to heat the cylinder head. Pressing-in is the preferable method for mounting these seat inserts.



Components cooled down with liquid nitrogen become very brittle. Consequently, handling problems, e.g. such as impacts, knocks, side tilt, deformation and the like, may result in fracturing when parts are in their chilled state.

2. Less force needed for fitting

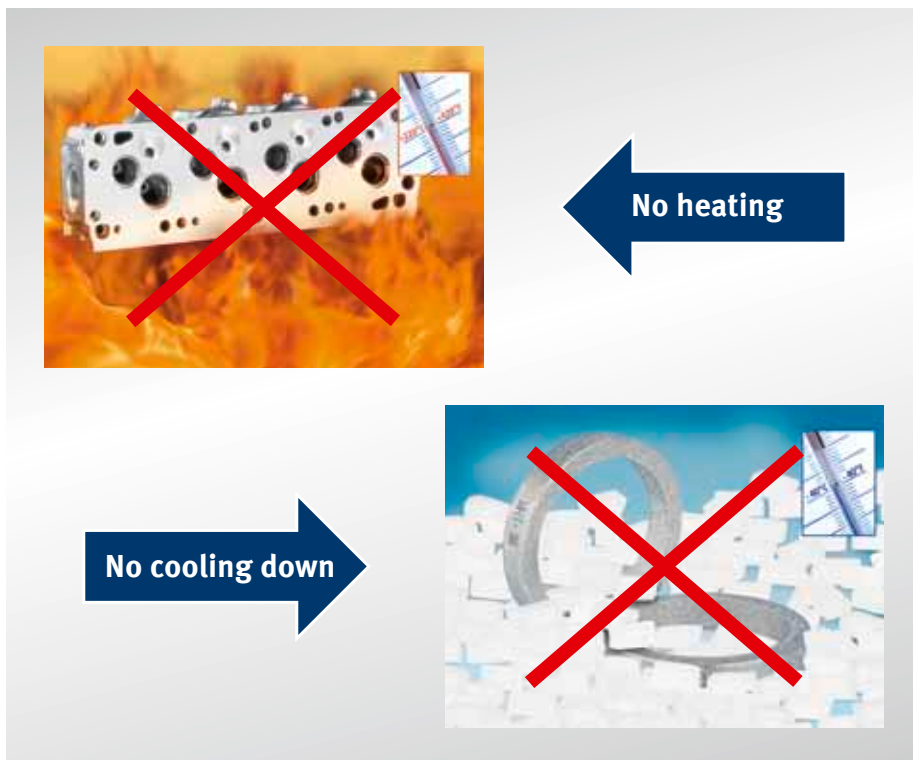
The unique structure and the "spring effect" of the sintered material ensure that less force is required when pressing the valve seat inserts into the seat insert bore. This consequently reduces the risk of damaging the cylinder head material.

3. Excellent fit in seat insert bore

Contrary to conventional valve seat materials, such as grey cast iron or steel, adverse conditions (frequent changes between hot and cold) will not cause any loosening of the seat inserts by spring effect when sintered seat inserts are used. The prerequisite for this is of course that the required overlap between bore and seat insert has been maintained.

4. Very high machinability

Small spherical tungsten carbides and special lubricant additives with lubricant components are produced using patented metallurgical processes. The HM series



has a very high machinability comparable with cast iron, though its hardness is greater by far. The HT series has been developed for dry fuels, such as LPG, and for highly tuned engines, where it still retains its excellent machining properties.

5. Increase in hardness

Valve seat inserts made of sintered metal continue to harden even after being mounted and during operation.

6. Longer service life

of the valves due to the self-lubricating function of the material.

7. Good thermal conductivity

8. Excellent corrosion resistance

9. Ideal for

veteran car engines that require leaded fuels for their valve seat lubrication. Also suitable for motorcycles and engine modifications within the scope of engine tuning.

10. Availability

Sintered KS seat inserts are available in more than 170 different sizes. Special sizes are available on request.

11. Application

Sintered seat inserts are equally suitable for grey cast and aluminium cylinder heads.



Microweldings

are caused by excessive temperatures on the valve head. Due to the high valve temperature, the two components are welded together at certain points while the valve is closed. When the valve reopens, the welded spots are torn apart by force. Since the crack points are no longer on their original contact area, microparticles are continually torn out of the valve seat. For this reason, the valve seat is worn out after only a few thousand kilometres. The valve hits the seat insert and is steadily shifted in the direction of the cam shaft or the rocker arm. Once the valve clearance or the setting range of the hydraulic valve clearance compensating elements (hydraulic valve tappet) is no longer there, the valve can no longer seal correctly. Hot combustion gases blow through and heat the valve and the seat insert even more. The valve burns through. At this point at the latest, the problem becomes perceptible as poor engine performance, uneven idling, high fuel consumption, and possibly even by noises from the valve train.

Deciding on a conversion

On normal engines from series production with low and medium engine performance, a remedy for the altogether inadequate lubrication situation would frequently be to replace the valve seat insert.

On high-performance engines, however, the higher combustion temperatures must also be taken into account. In addition to replacing the seat inserts, the use of valves with greater thermal stability should be considered.



Any replacement of valve seat inserts and valves when retrofitting to gas is always an intervention into the original engine specifications. Whether the new material combinations harmonise and the desired results will show up under the changed conditions, can only be estimated beforehand. Extreme operating conditions and specific engine loads must be taken into account, these are the sole responsibility of the engine reconditioner.

Further information

about the installation, various material qualities and scope of delivery of the sintered KS valve seat inserts are available in our brochure "Sintered valve seat inserts" or in the internet at www.ms-motor-service.com



Brochure

Sintered valve seat inserts in our Service Tips & Information series

Languages	KS No.
German	50 003 728-01
English	50 003 728-02
French	50 003 728-03
Spanish	50 003 728-04
Russian	50 003 728-09