

Reconditioning of Aluminium Engine Blocks



ALUSIL® & LOKASIL® Cylinder Surfaces

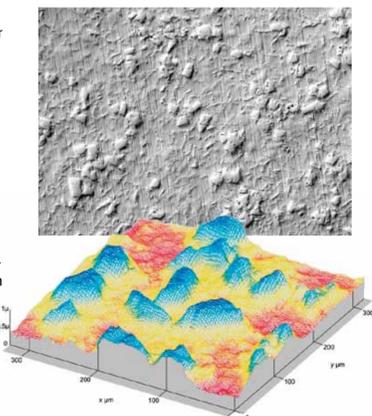
What are ALUSIL® und LOKASIL® ?

ALUSIL® and LOKASIL® are processes for manufacturing aluminium engine blocks with silicon-reinforced cylinder sliding surfaces.

The objective of these processes is to produce hard and consequently wear-resistant cylinder surfaces by using suitable casting and finishing processes for the cylinder sliding surfaces.

The two processes differ considerably in the casting technologies used. On finished cylinder surfaces, however, these differences are insignificant. For this reason, the cylinder finishing processes used are identical for both methods.

To avoid any direct contact between the aluminium and the pistons and piston rings, it is essential that the adjacent aluminium matrix is only exposed a few 1/1000 mm during the cylinder finishing process. This procedure is called silicon exposure. The resulting cavities between the silicon crystals are intended as oil-retaining capacities in this process.



3-D roughness record of a finished ALUSIL® cylinder sliding surface

Principle of the Sliding Surface

The high wear resistance of the cylinder surface is achieved by silicon crystals embedded in the aluminium matrix. When in operation, the pistons and the piston rings only slide on these specially machined, extremely hard crystal surfaces.

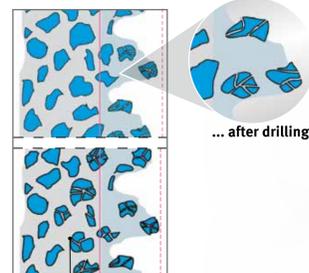
The aluminium matrix is relatively soft compared to the silicon crystals. It is not involved in the wear process and in this regard only assumes the function of a carrier material.



Audi V8

Machining Steps

Finish-drilling of the Cylinder Bores



underlying damage



PCD cutters (Walter AG)

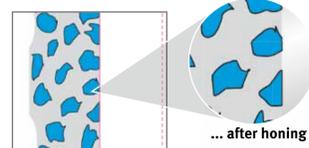
Objectives and Requirements:

- Preparing the cylinder bore for the honing process
- Establishing the desired cylinder bore dimension
- Elimination of geometrical faults inside the bore
- It is essential that the machining parameters (speed, advance, material removal) are observed during the drilling process as well as during honing and exposing.
- Diamond tipped drilling tools (PCD) must be used to minimise the damage zone of the Si crystals.

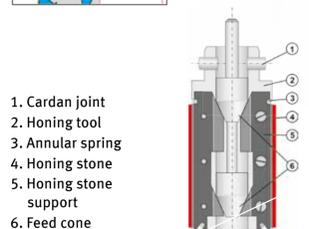
Attention

Any underlying damage to the silicon crystals caused by inappropriate cutting tools and incorrect machining parameters cannot be removed by a subsequent honing process. Increased contact pressure at the joint ends counteracts the tendency to flutter.

Honing the Cylinder Bores



... after honing



1. Cardan joint
2. Honing tool
3. Annular spring
4. Honing stone
5. Honing stone support
6. Feed cone

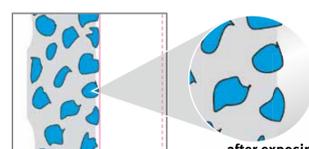
Objectives and Requirements:

- Fine machining the cylinder surface.
- Establishing the nominal dimension of the cylinder.
- Removing the silicon crystal damage zone caused as a result of the drilling process.
- Elimination of geometrical faults inside the bore.
- The required surface qualities can only be achieved by using KS diamond honing tools.

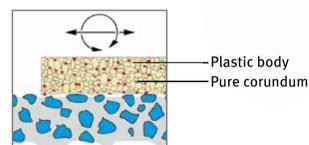
Attention

Ceramic honing stones made of silicon carbide, boron nitride or pure corundum result in the destruction of the crystals and should not be used.

Exposing Silicon Crystals - Mechanical Exposure Process



... after exposing



Objectives and Requirements:

- Exposing silicon crystals from the adjacent aluminium matrix to a certain exposure depth.
- Rounding the sharp edges of the silicone crystal edges
- Generation of an oil-retaining volume for lubricating the interacting sliding parts - cylinder bore and piston/piston rings
- Using the highly porous KS exposing stones
- Reversal of the direction of rotation during machining to achieve exposure on all sides
- Use of normal honing oil

Attention

Thanks to the new, much simpler mechanical exposure process, not only has the lapping exposure process used to date been completely replaced but exposure has also been improved to a significant extent.

Tools

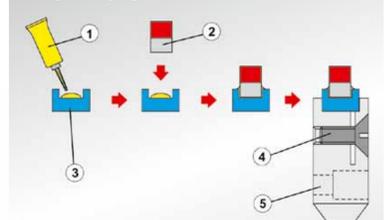
KS Diamond Honing Stones:

- Abrasive grains of synthetic diamonds
- Soft resin bond with metal carrier
- Fastening by clamping or gluing
- High endurance
- Optimal machining results
- Cooling lubricant: Conventional honing oil

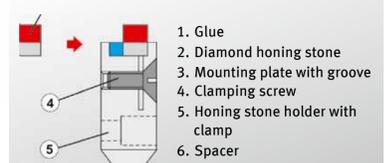


Fastening example:

Gluing + clamping



Clamping



1. Glue
2. Diamond honing stone
3. Mounting plate with groove
4. Clamping screw
5. Honing stone holder with clamp
6. Spacer

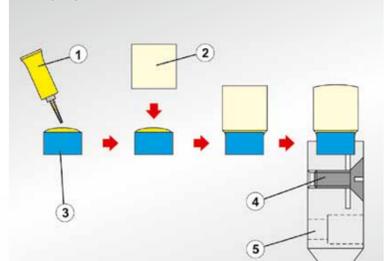
KS Exposing Stones:

- Specially adapted to ALUSIL® and LOKASIL® surfaces
- Highly porous resin-based material
- Ceramic abrasive grains of pure corundum
- Optimum exposing results
- Long tool service life
- Cooling lubricant: Conventional honing oil



Fastening example:

Gluing the exposing stones and subsequent clamping



1. Glue
2. Exposing stone
3. Mounting plate
4. Clamping screw
5. Honing stone holder with clamp

Quantum Leap in Engine Reconditioning

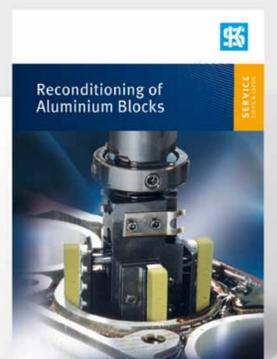
With the new machining techniques, the new tools and the know-how provided in the "Reconditioning of Aluminium Blocks" brochure, the professional engine reconditioner now has all means at his disposal for carrying out the reconditioning of aluminium silicon surfaces in highest quality. These new techniques have not only improved the reliability of the process, but have also simplified it considerably.

The manufacture of perfect, extremely wear-resistant and quasi already run-in cylinder surfaces has consequently achieved a state-of-the-art series production level in the reconditioning sector.



Details on this subject can be found in our brochure "Reconditioning of Aluminium Blocks".

Further information can be obtained directly from your local Motor Service partner or at www.ms-motor-service.com



The Motor Service Group is the sales organisation for the worldwide aftermarket activities of Kolbenschmidt Pierburg. Under the premium brands KOLBENSCHMIDT, PIERBURG and TRW Engine Components, we supply a comprehensive and tailored range of products for inside and outside the engine.



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