



Brochure from the series
SERVICE TIPS & INFORMATION

Reconditioning of Aluminium Engine Blocks

POSTER
INSIDE



Recondition engine blocks? – No problem!

Aluminium engine blocks – The trend

Since they were first introduced, engines with aluminium engine blocks have continued to enjoy increasing popularity. The potential in the field of engine construction for passenger cars offered by the reduction in weight has by no means been exhausted. Especially in the case of diesel engines, because of their heavy, robust construction, there is still much potential for saving weight. Therefore the substitution of aluminium for grey cast iron in passenger car engine blocks will continue in the future with greater impetus.

With the machining concepts recently developed by MS Motor Service International GmbH, for the first time it is now possible to recondition aluminium engine blocks without exceptional effort or expense, and with the equipment already available, whilst achieving a machining quality superior to any ever attained in the past. This quantum leap was accomplished in co-operation with KS Aluminium Technology, the manufacturer of aluminium engine blocks of Kolbenschmidt Pierburg AG. The machining processes used in series production for machining cylinders were studied, adapted for engine reconditioners and developed further.



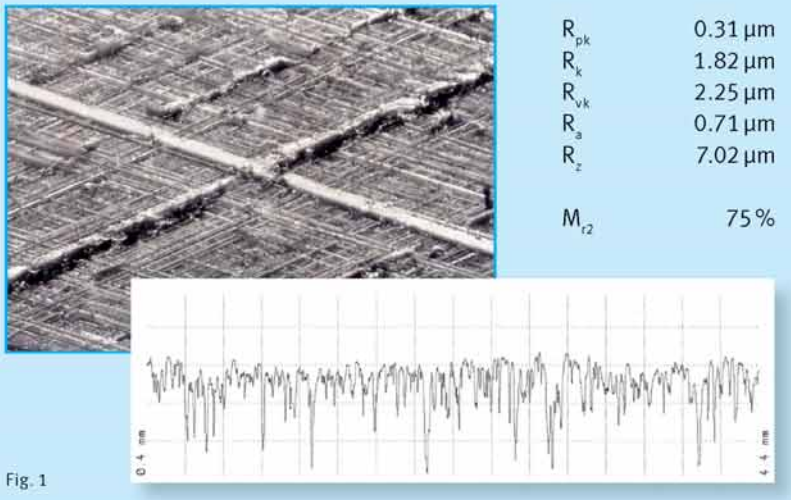
You will find a full description of the damages and their causes in our new brochure! It should provide you with a comprehensive source of information which will assist you in either your work or your studies.

Therefore, the pressure applied by the honing stone, the honing angle, the size of the grain and the honing speed are important parameters for obtaining the right surface topography.

Important!

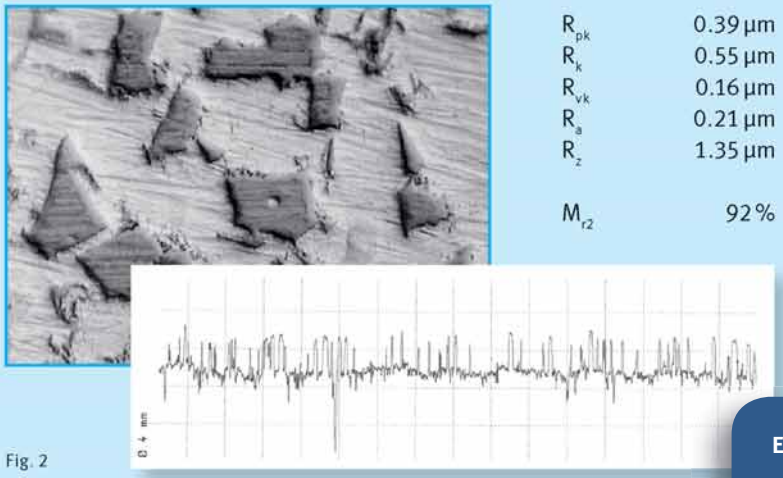
To obtain best machining results from honing ALUSIL® attention must be paid to the silicon, that the crystals are cut properly and are not torn out from the surface. This is achieved only by the appropriate honing stones and the correct machining parameters.

In the subsequent exposure of the silicon crystals, it is mainly the depth of the exposure that is of significance. In the mechanical exposure process, the silicon grains are still somewhat rounded, which has a positive impact on the sliding behaviour of the piston rings. In the case of etching, the sharp edges of the silicon crystals that are produced by cutting are not rounded, which produces a somewhat greater wear on the piston rings during the engine break-in.



R_{pk}	0.31 µm
R_k	1.82 µm
R_{vk}	2.25 µm
R_a	0.71 µm
R_z	7.02 µm
M_{r2}	75 %

Fig. 1



R_{pk}	0.39 µm
R_k	0.55 µm
R_{vk}	0.16 µm
R_a	0.21 µm
R_z	1.35 µm
M_{r2}	92 %

Fig. 2

Note

Because of the complexity of the subject, the honing of grey cast iron cylinder bores is not within the scope of this brochure. Therefore we recommend that you study our brochure entitled “Honing grey cast iron engine blocks”. Ordering information is given in the attachment to this brochure.

In the case of ALUSIL® cylinder sliding surfaces, the shape and size of the silicon crystals embedded in the aluminium produce the plateaus on which the pistons and piston rings run. The distance between the silicon crystals determines the width and the shape of the profile valleys, while the depth of the exposure corresponds to the depth of the profile valley.

Excerpt of the brochure

»Reconditioning of Aluminium Engine Blocks«

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More information...

...will be supplied by your local
MS Motor Service distributor or via
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MS Motor Service International
Quality and Service from one source

MS Motor Service International GmbH (MSI) is the sales organisation for the worldwide aftermarket activities of Kolbenschmidt Pierburg AG. We are a leading supplier of engine components for the independent aftermarket, featuring the premium brands KOLBENSCHMIDT, TRW Engine Components and PIERBURG.
The MSI product range is both broad and deep, enabling customers to procure all engine components from one source. As a problem solver in the marketplace and in the workshop, MSI offers extensive services and the technical expertise that you would expect from the subsidiary of one of the largest automotive suppliers.



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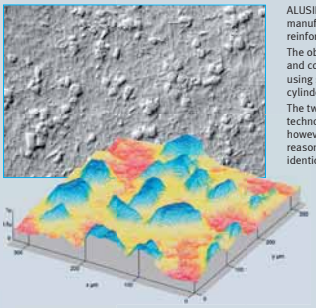
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Reconditioning of Aluminium Engine Blocks

ALUSIL® & LOKASIL® Cylinder Surfaces

What are ALUSIL® und LOKASIL®?



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

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.

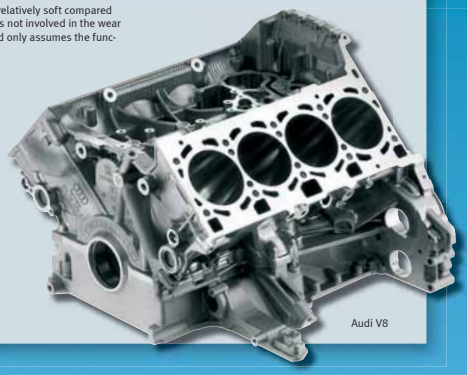
The two processes differ considerably in the casting technologies used. On finished cylinder surfaces, however, these differences are insignificant. For this reason, the cylinder finishing processes used are identical for both methods.

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.

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

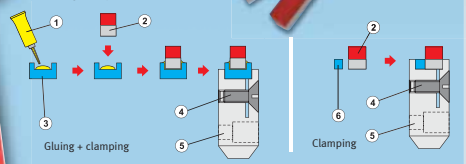
Tools

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



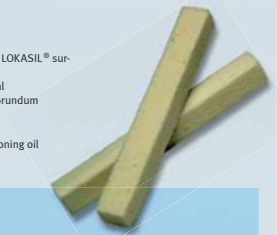
Fastening example:



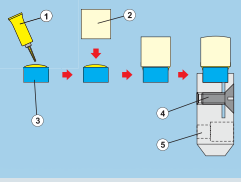
1. Glue
2. Diamond honing stone
3. Mounting plate with groove
4. Clamping screw
5. Honing stone holder with clamp
6. Spacer

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:

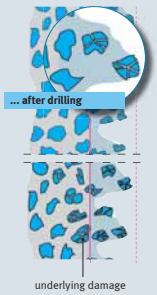


Gluing the exposing stones and subsequent clamping

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

Machining Steps

Finish-drilling of the Cylinder Bores



Objectives and Requirements:

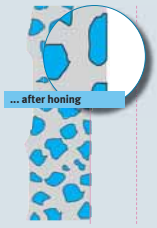
- Preparing the cylinder bore for the honing process
- Establishing the desired cylinder bore dimension
- Elimination of geometrical faults inside the bore
- It is essential that the machining parameters (speed, advance, material removal) are observed during the drilling process as well as during honing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



PCD cutters (Walter AG)

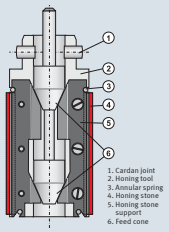
⚠ Any underlying damage to the silicon crystals caused by inappropriate cutting tools and incorrect machining parameters cannot be removed by a subsequent honing process.

Honing the Cylinder Bores



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.



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

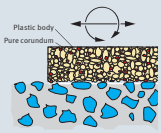
⚠ Ceramic honing stones made of silicon carbide, boron nitride or pure corundum result in the destruction of the crystals and should not be used.

Exposing Silicon Crystals - Mechanical Exposure Process



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



⚠ 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.

Quantum Leap in Engine Reconditioning



With the new machining techniques, the new machining 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 a machining quality that is almost as perfect as in series production. These new techniques have not only significantly 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.

MS Motor Service International GmbH is the sales organisation for the global aftermarket activities of Kolbenschmidt Pierburg AG. Under the premium brands KOLBENSCHMIDT, PIERBURG and TRW Engine Components, we supply a comprehensive range of requirement-oriented products in and on the engine.

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

Further information will be supplied directly by your local Motor Service distributor or via www.ms-motor-service.com



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