

Installation of pistons

Step by step

Preparation

Checking, boring and honing cylinders

Fine-bore the cylinder bore with mounted main bearing caps. Ensure a honing allowance of approx. 0.08 mm (based on the diameter). Well-honed cylinder bores must have at least 20% open graphite veins. Always use the honing oil specified by the honing machine manufacturer. The honing angle should be between 40 and 80 degrees. So that the oil film adheres well to the cylinder surface, it must have a certain roughness: three measuring methods are used as outlined in the adjacent table.

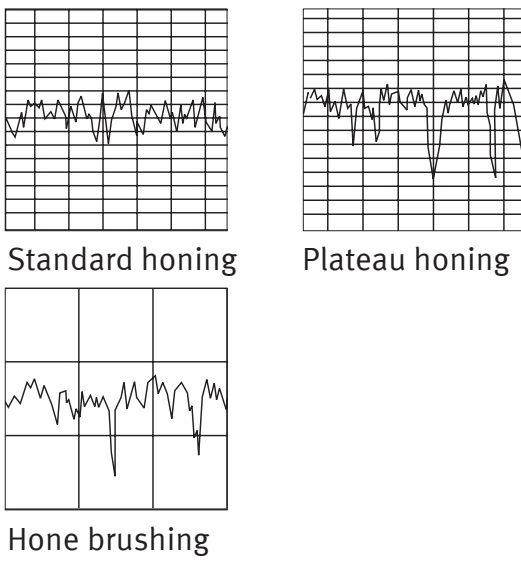
Surface roughness	Cylinder surface before running
R _a (value measured by instrument)	3 – 6 µm
R _a (value measured by instrument)	0.4 – 0.8 µm
R ₃₂ (diagram evaluation)	4 – 7 µm



Honing stones

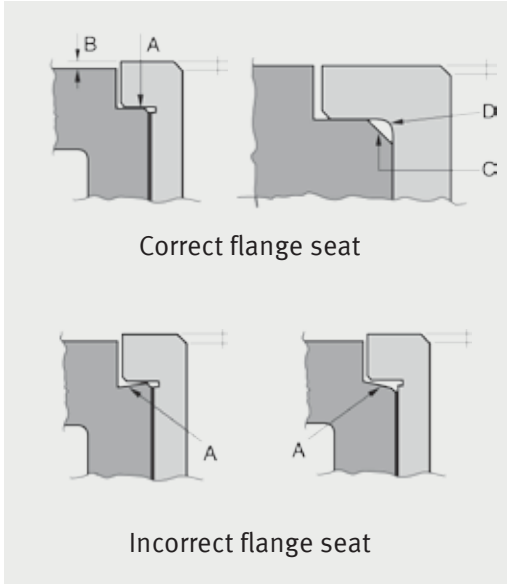
- Prehoning: grain size 150 (material removal of approx. 0.06 mm based on diameter)
- Finish honing: grain size 280 (material removal 0.02 mm based on diameter)
- Plateau honing: grain size 400–600 (remove profile peaks in a few strokes applying light contact pressure)
- Honing and brushing: use a honing stone of grain size 120, 150 and 180 for honing. For block engines (grey casting) bond 5–7, for cylinder liner (centrifugal casting) bond 5 max. The material removal is between 0.03 and 0.05 mm based on the diameter. Using honing brushes removes peaks that occur on the surface of the cylinder during the final honing procedure. This requires at least ten strokes and the use of honing oil. To achieve optimum results, the direction of rotation of the honing machine should be reversed after half of the processing time. The cylinder diameter is reduced by between 0.001 and max. 0.01 mm as a result of hone-brushing.
- Check the diameter of the cylinders at the top, middle and bottom, as well as in a longitudinal and transverse direction (at 90° to each other).

Attention: Clean the cylinder bore and cylinder blocks after honing (e.g. ultrasonic cleaning).



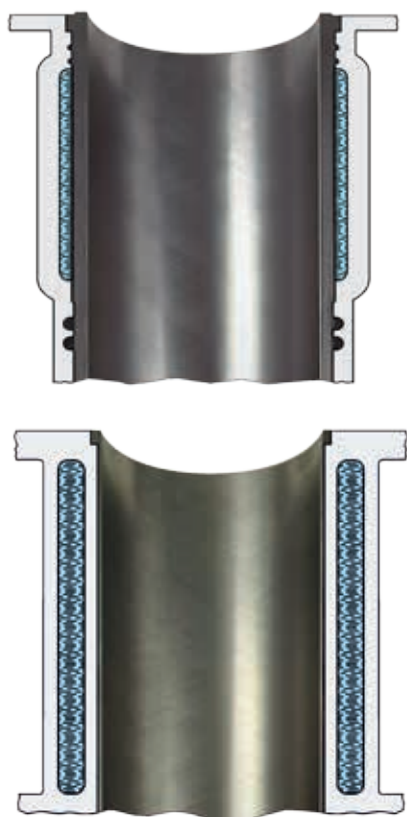
Nominal dimension range	Cylinder tolerance to be complied with
Ø 30 – 50 mm	0.011 mm
Ø 50 – 80 mm	0.013 mm
Ø 80 – 120 mm	0.015 mm
Ø 120 – 180 mm	0.018 mm

Only for engines with liners



Wet cylinder liner: Clean the surface of the liner flange seat in the crankcase carefully; do not use cutting tools. Flange seat A must be plane-parallel and free of dirt. Treat sealing rings carefully with assembly grease. It must be possible to insert the cylinder liner without great effort. Avoid hard impacts and back and forth movement of the liner. The liner protrusion B must correspond to the value specified by the engine manufacturer (e.g. 0.05–0.1 mm).

Dry cylinder liner: Dry liners are usually larger than the cylinder block and must be pressed in (press fitting). The bevelled edge C in the housing must correspond to the rounding D on the cylinder liner.



Installation

General

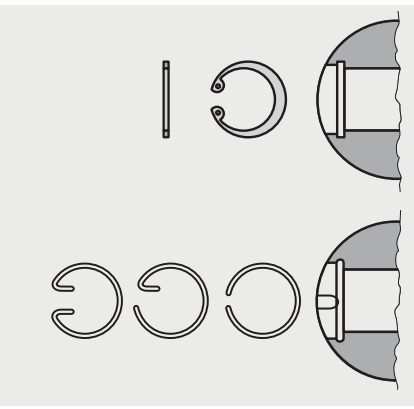
Kolbenschmidt uses preservatives that do not affect the engine oil. Therefore, it is not necessary to clean the pistons. The piston diameter, clearance and direction of installation (e.g. arrow) are indicated on the piston crown. Please note that the cylinder diameter comprises the piston diameter plus clearance. For pistons with a graphite layer, 0.015–0.02 mm of layer thickness still needs to be deducted from the measurement to get the stamped skirt dimension. For pistons graphitised according to the screen printing process, measure the skirt diameter only at the specified measuring points – small areas without graphite layer.



Assembly of piston and connecting rod

Before installing the connecting rods they need to be checked for distortion and twisting with a suitable testing instrument. The deviation must not exceed 0.02 mm per 100 mm. Position the piston and the connecting rod according to the direction of installation. The connecting rod eye can then receive the piston pin. The oiled pin is carefully inserted into the pin bores of the piston and into the connecting rod eye of the connecting rod. Avoid jerky movements.

For floating pins: The pin is fixed in place using the circlips provided, which can only be mounted using special pliers. Do not reuse circlips and avoid pressing together excessively, otherwise permanent deformation may occur. Turn the rings slightly to make sure that they have safely engaged in the grooves. Always position the joint of the circlips in the direction of stroke of the piston.



Mounting a connecting rod with fixed pin: The bore in the connecting rod eye must have a pressfit to the pin of 0.02 – 0.04 mm. Heat the connecting rod to 280 – 320°C (no bare flame!). After oiling the pin and allowing it to cool, insert it quickly into the connecting rod eye using a device.



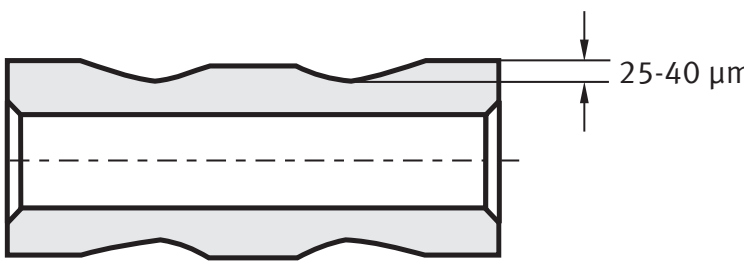
Inserting the piston into the cylinder bore

Clean the cylinder block carefully. Make sure that all sliding surfaces are free from dirt and well oiled. Press the piston rings together with a squeezer to enable the piston to glide into the cylinder bore without resistance. For diesel engines, measure the gap dimension and always adhere to the manufacturer's instructions.



For anodised pistons: For pistons with an anodised piston crown, the crown must not be turned to adjust the gap dimension. The pistons can be recognised by the black colour of the crown surface. As well as the standard piston, some piston types with anodized crowns also have pistons with reduced compression height for adjustment of the gap dimension. In most cases, the compression piston dimension is graduated from 0.2 to 0.6 mm.

Attention: If shaped pins are available, please use them.



Mounting piston rings

Kolbenschmidt pistons come ready to install. It is not necessary to mount the rings, which could lead to excessive strain. If you want to install a Kolbenschmidt ring set on a used piston, please use special pliers. Also note that the direction of installation of the rings is indicated with "TOP" ("TOP" must face the piston crown). Napier rings and oil control rings must be installed in such a way that the scraping action is directed towards the bottom skirt end. Make sure that the joint ends of the spiral expander in the oil control ring are always positioned opposite the ring joint.



Engine test run

Do not start the newly reconditioned engine until it is completely assembled with all add-on assemblies and filled with oil and coolant. Ensure that the engine starts on the first attempt, as the first few revolutions are subject to critical lubricating conditions and decisive for the subsequent operating behaviour of the engine. After warm running of the engine, check it again for tightness, ignition, valve clearance, etc. Then start running the engine in on the test rig or in the vehicle. Operate the engine at a maximum of two-thirds of the engine speed and with moderate load changes. The engine speed can be gradually increased later.



After running-in

The fast-flowing hot oil cleans the engine of all foreign bodies that may still be stuck to it from reconditioning. These particles collect in the engine oil and oil filter. A distance of 50 km is sufficient for most of all dirt particles to accumulate. The engine should not be operated for more than 500 km with the first oil fill.



Information on the product range can be found in our catalogue "Pistons and Components". Further information can be obtained directly from your local Motorservice partner or at www.ms-motorservice.com

The Motorservice Group is the sales organisation for the worldwide aftermarket activities of Rheinmetall Automotive. It is a leading supplier of engine components for the independent aftermarket. With the premium brands Kolbenschmidt, Pierburg, TRW Engine Components and the BF brand, Motorservice offers its customers a wide and comprehensive range of top quality products from a single source.

