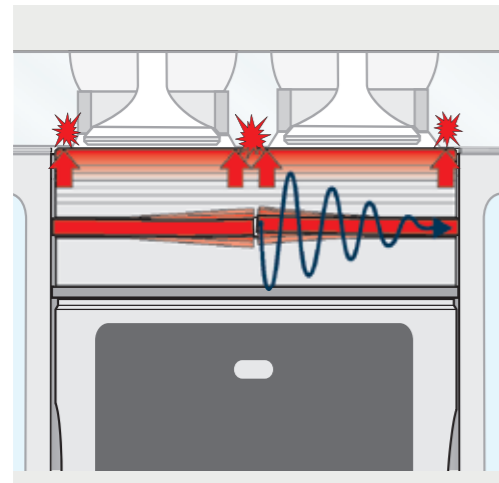


# Piston rings

## Function and design

### Incorrect reconditioning

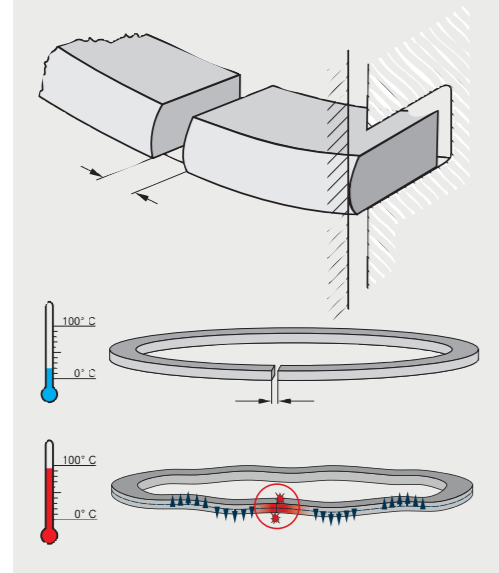


#### Piston impact on the cylinder head

If the sealing area of an engine block is reconditioned and a piston with standard compression height fitted, this may cause mechanical impact by the piston on the cylinder head in the case of diesel engines. The same occurs if cylinder head gaskets with the wrong thickness are fitted. Due to these hard impacts, the piston rings start to flutter and no longer seal properly.

**Consequence:** High oil consumption and high cylinder wear (see also "Fuel flooding")

**Remedy:** Compliance with the correct piston protrusion, use of the correct cylinder head gaskets

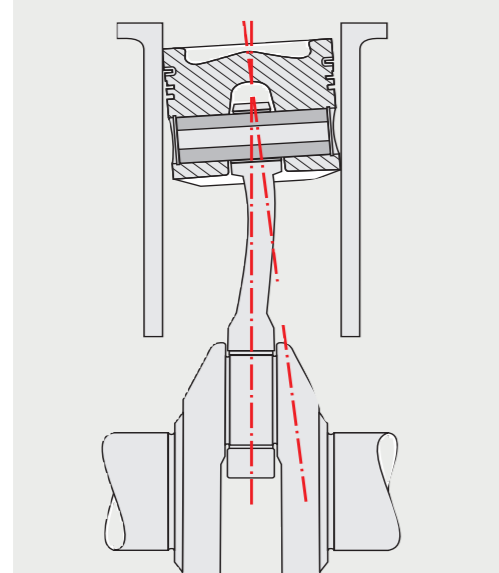


#### Piston ring joint clearance too small

The piston ring joint clearance is comparable to the valve clearance. Warming up the parts causes thermal expansion of the components and a change in length. The joint clearance when the machine is cold ensures that the piston rings in the cylinder will not get stuck when the machine is hot. If the joint clearance is too small when the machine is cold, there will be high piston ring wear, sealing problems and engine damage when the engine is hot.

**Consequence:** Premature piston ring wear, piston seizure and high oil consumption

**Remedy:** It is essential that the minimum joint clearances are complied with – a reduction of the joint clearance by the repair shop is not permitted



#### Asymmetric piston wear pattern

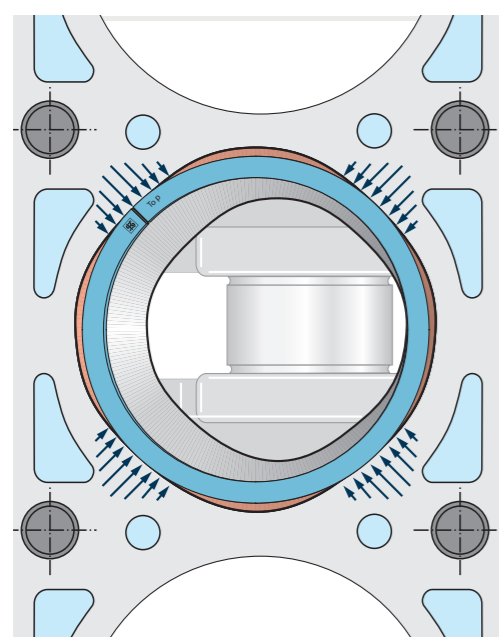
Bent connecting rods, which often occur as a result of engine damage, cause the piston to run at an angle in the cylinder. The piston rings consequently take on an elliptical form and no longer rotate in the piston. This results in uneven wear and ring flutter.

**Consequence:** High level of wear, ring fractures and excessive oil consumption

**Remedy:** Check the connecting rod for distortion and twisting before installing it



### Installing worn parts



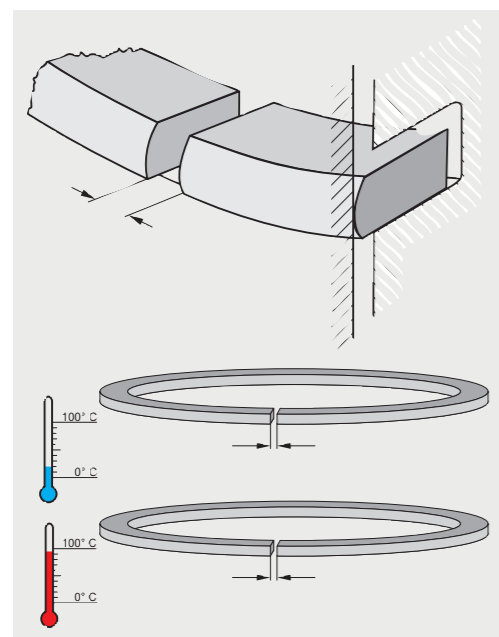
#### Out-of-round cylinders

When machining the cylinder bores, it is essential to make sure that the geometry is perfect. Piston rings can still seal slightly oval cylinders. However, sealing becomes difficult for 3rd and 4th order out-of-roundness. These often occur due to tensile stresses from the cylinder head bolts. The crescent-shaped gaps caused by out-of-roundness between the piston ring and cylinder will result in leaks.

**Consequence:** Poor performance, excessive oil consumption and engine damage

**Remedy:** Observe cylinder head tightening specifications or eliminate out-of-roundness during cylinder machining

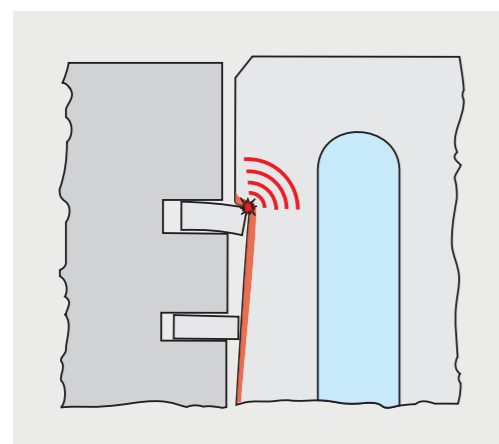
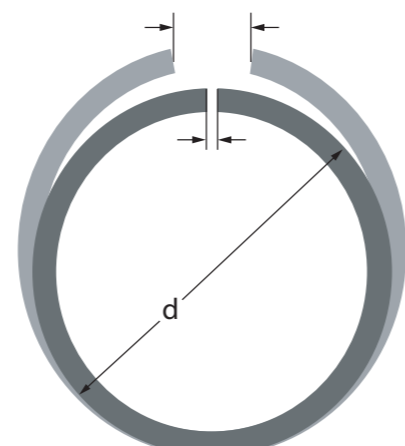
Out-of-roundness:



#### Piston ring joint clearance too great

An excessive joint clearance on the piston rings appears after a long service life and high wear on the cylinders and piston rings. The joint clearance is too great if it has doubled its size compared to its new condition. Increases in clearance of up to 0.3 mm are negligible. They contribute neither to a notable loss of engine power nor to high oil consumption. The significance of a slightly enlarged piston ring joint clearance is often over-estimated. See also "Piston ring joint clearance too small".

**Remedy:** Replace worn pistons and cylinders

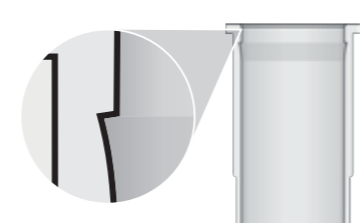


#### Worn cylinders

If new pistons and piston rings are installed in a worn cylinder, the piston rings often hit the upper wear edge of the cylinder. As a result, the piston rings start to flutter and no longer seal properly.

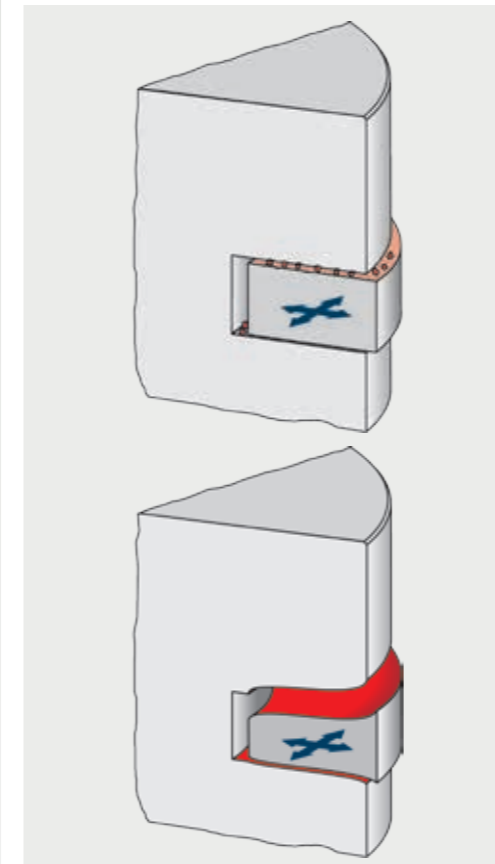
**Consequence:** High oil consumption and premature wear

**Remedy:** Replace worn cylinders or rebore cylinders



See also "Piston impact on the cylinder head" and "Dirt in the intake air"

### Maintenance faults

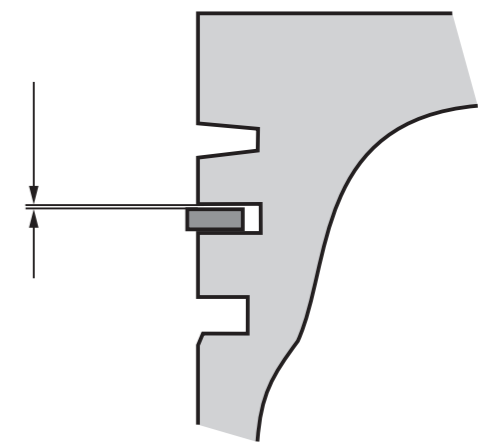


#### Dirt in the intake air

Dirt that reaches the combustion chamber settles in the ring grooves where it causes abrasive wear in the ring grooves and at the piston ring flanks. This results in excessive ring height clearance and consequently to a deterioration of the guidance of the piston rings in the ring grooves. The rings will become bent during use and start to flutter. If the rings are severely worn at the sides, they can break.

**Consequence:** High oil consumption and poor performance

**Remedy:** Regular air filter maintenance, particularly in dusty areas



#### Blocked piston rings

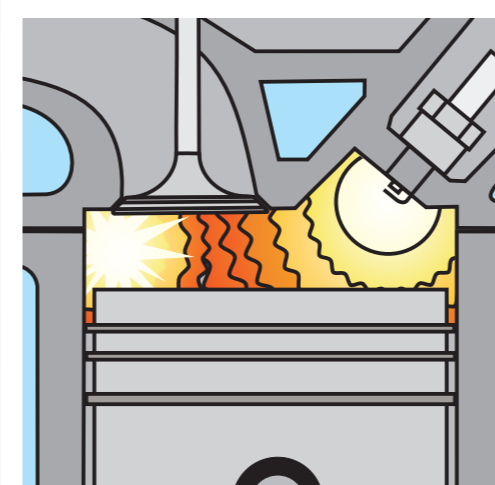
Piston rings must be able to rotate freely in their ring grooves during operation (exception: two-stroke engines). If the piston rings are blocked by carbon deposits or dirt in the ring grooves, they are no longer able to seal properly and will not wear uniformly. If the rings get stuck in the grooves, the sealing effect is no longer guaranteed. This causes a blow-by of combustion gases on compression rings, and results in the passage of oil into the combustion chamber on oil rings.

**Consequence:** Piston seizure, high wear and high oil consumption

**Remedy:** Regular air filter maintenance and use of engine oil with the right oil specification for the engine



### Combustion defaults

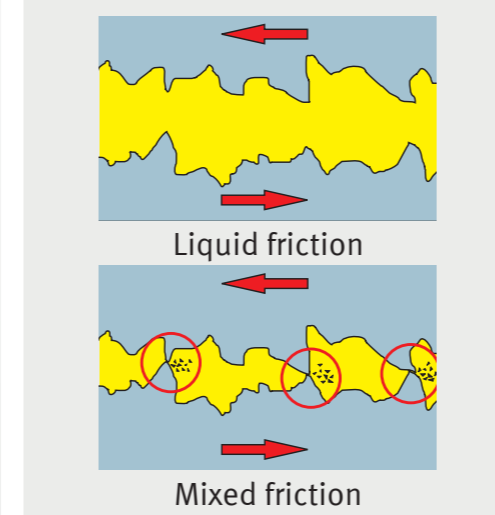


#### Knocking combustion and glow ignition

Knocking combustion and glow ignition causes excessive pressure peaks in the cylinder and high mechanical stress on the parts. The piston rings start to flutter and can break. With molybdenum-coated rings, the molybdenum layer can break away.

**Consequence:** Piston seizure, loss of engine power and/or high oil consumption

**Remedy:** Use of high-grade fuels



#### Fuel flooding

The oil film is washed off due to incomplete combustion of the injected fuel or too much injected fuel. This causes mixed or dry friction of the piston in the cylinder. The metal parts rub against one another.

**Consequence:** High ring and cylinder wear, high oil consumption

**Remedy:** Correct function and adjustment of the fuel system



Further details on this subject can be found in our brochure "Piston Rings for Combustion Engines". Or ask your local Motorservice partner. We have also provided a lot more information for you at [www.ms-motorservice.com](http://www.ms-motorservice.com) and on our Technipedia at [www.technipedia.info](http://www.technipedia.info).

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