



# Cylinder chamfers during engine reconditioning work

## Situation:

The piston ring heights in passenger car and truck pistons have been continuously reduced in the course of recent years. This is the consequence of consistent efforts to minimise the friction inside the engine which directly influences fuel consumption and related emissions.

## Problem:

On passenger car engine blocks in which the cylinder bores have been reconditioned (by boring and honing), pistons are often damaged during installation due to the fact that the cylinder bore chamfer in the top dead centre is too large. Narrow piston rings rebound in the oversized chamfer when the piston is inserted. In such a case, it is common practice to drive sluggish piston completely into the cylinder bore using a hammer handle (Fig. 1). If the ring has rebounded in the oversized chamfer, any "gentle force" exerted by the hammer handle may cause damage to the piston rings (molybdenum brake-out, incipient fractures or ruptures). Top lands and ring lands of the pistons are frequently not capable of coping with such stresses. If they do not break through immediately, a fracture will possibly occur at a later date while the engine is in operation (Fig. 4 and 5). Although the broken piece does not normally cause a piston seizure, inadequate compression, poor engine performance and the high oil consumption of the engine will make a further engine repair necessary within a short period of time.

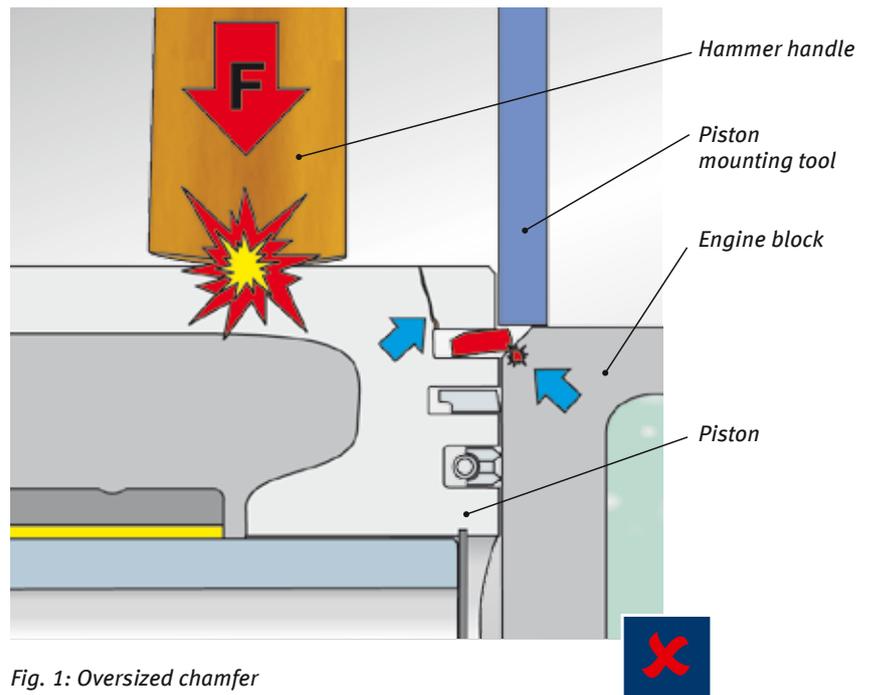


Fig. 1: Oversized chamfer

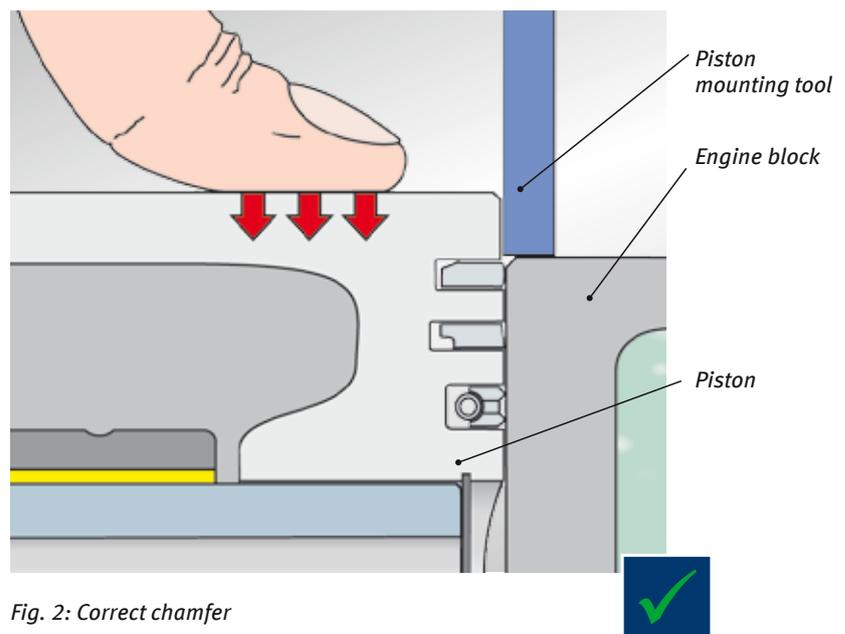


Fig. 2: Correct chamfer

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**Purpose of chamfer:**

The chamfer at the upper end of the cylinder bore is not intended to facilitate the insertion of the piston, since the angle, normally 45°, is too flat. The real purpose of the chamfer is the removal of the burr formed during the cylinder bore machining process. The removal of less than 1/10 mm is normally sufficient to rectify the burr.

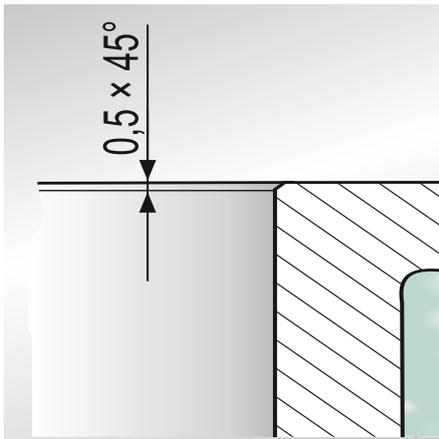


Fig. 3



Fig. 4

**Remedy:**

The rule of thumb for the depth of the chamfer is to calculate about a third, or at most half the piston ring height of the smallest piston ring. However, the height of the chamfer should not exceed 0.5 mm for any engine (Fig. 3).

Any larger chamfer has mere aesthetic reasons, complicates the piston installation and results in the problems and damage described above. More importantly, compression is reduced by an oversized chamfer. This becomes noticeable on diesel engines by poor starting performance and reduced engine power. On gasoline/petrol engines the dead space formed causes increased emissions of unburnt hydrocarbons, which has an adverse effect on fuel consumption and emissions.



Fig. 5