

## Issue no. 06/2024

### Impact of the graphite coating on the diameter of steel pistons

*All MAHLE steel pistons are coated with graphite to improve their running-in characteristics. This is why the measured diameter of new steel pistons is slightly larger than indicated on the piston crown.*

All MAHLE steel pistons have a graphite coating and are always delivered ready-to-assemble with mounted piston rings. There seems to be a lot of confusion regarding the coating and the diameter of the pistons.

#### Invisible protection

The running surface coating primarily serves to run in the engine smoothly, and it adapts to the cylinder diameter during this phase. That's why all steel pistons from MAHLE have such a coating. Compared to aluminum pistons, however, the graphite coating, which is only a few hundredths of a millimeter thick, is not visible to the naked eye on the black steel pistons. In addition, the thickness of the coating on steel pistons is generally thinner and the

fitting clearance smaller than with aluminum pistons of the same diameter.

#### The correct dimensions

Since the piston coating is partially worn into the cylinder wall and thus reduced during engine run-in, its thickness of approx. 0.015–0.020 mm is not included in the diameter specification on the piston crown. The diameter of a new piston will thus be approximately 0.030–0.040 mm greater than the specified value. However, when determining the correct cylinder diameter, only the value specified on the piston crown should be used. The cylinder diameter is determined by this value together with the fitting clearance.

#### Example based on figure 1:

Piston Ø	75.475 mm
+ Fitting Clearance	+ 0.035 mm
= Cylinder	= 76.510 mm



Figure 1: Piston dimensions, fitting clearance, and installation direction are specified on the piston crown



Figure 2: The coating adds approximately 0.03–0.04 mm to the specified diameter



Figure 3: The dark coating is not visible on the black steel pistons

#### Important!

Pistons should always be coated with fresh engine oil before mounting and must be installed with a suitable tool (e.g., tightening strap and mounting sleeve) to avoid damage to the piston rings.