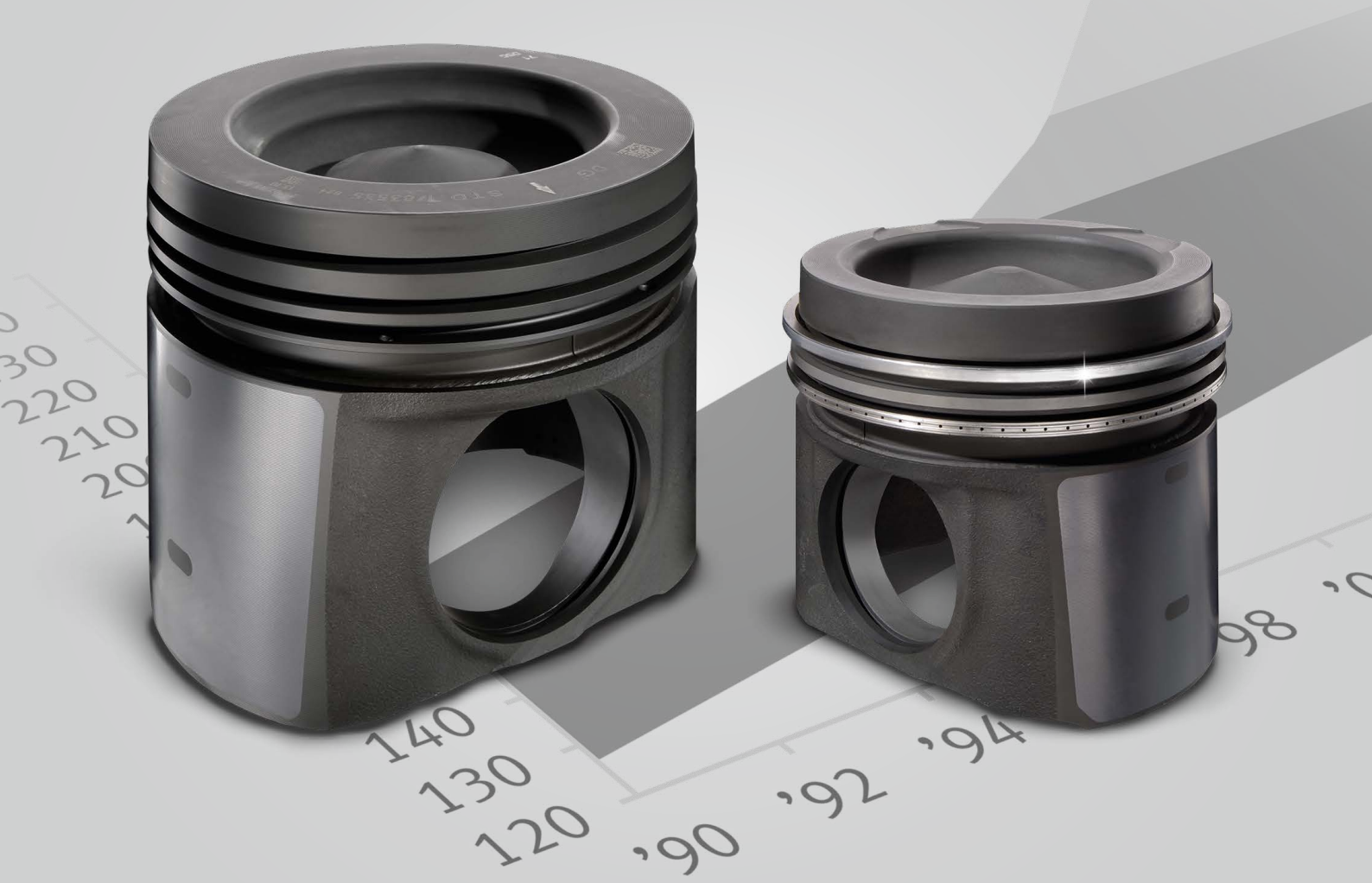
KOLBENSCHMIDT



PRODUCT KNOWLEDGE

STEEL PISTONS – THE PRESSURE RISES

PASSION FOR **TECHNOLOGY.**

RHEINMETALL

KOLBENSCHMIDT STEEL PISTONS – QUALITY THAT HOLDS ITS OWN.

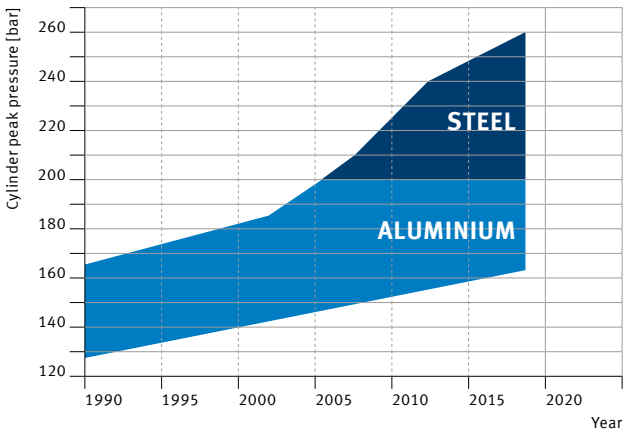
There has been an astounding upwards trend in the field of diesel engines over the past 20 years – with regard to applications in both utility vehicles and in passenger cars. This was only possible with constant innovations in the fields of materials technology, component design and the manufacturing processes. As one of the leading development partners for the vehicle industry for pistons and piston systems, Kolbenschmidt is also constantly redefining the limits of performance for these components.

Steel pistons can only be manufactured with a wide range of patented technologies. Motorservice, the sales organisation of Rheinmetall Automotive AG, offers this know-how of a premium manufacturer for the worldwide aftermarket.

RISING PRESSURES, INCREASING TEMPERATURES – HIGH REQUIREMENTS

Service life is always longest in the truck and transport sector. Alongside the reliability necessary to meet this requirement, additional objectives include low emissions, efficiency and low fuel consumption.

The requirements of the emission legislation are met with a combination of measures inside and outside the engine. These measures include increasing cylinder pressures and temperatures, which place significant demands on the heart of the combustion engine – the piston. The required combustion chamber peak pressures have now risen to significantly over 200 bar.



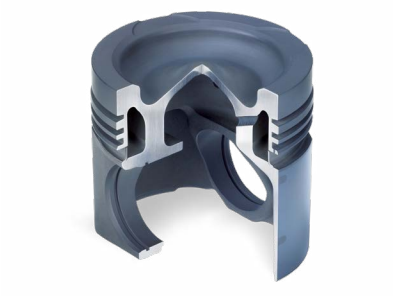
STAGES OF DEVELOPMENT



ARTICULATED PISTONS

On the articulated piston, the upper section, which has to withstand the combustion pressures and temperatures, is made from steel.
The skirt for guiding into the cylinder is made from aluminium. This offered a good compromise to the aluminium piston, but can only be regarded as an intermediate step in the development process.

The constantly increasing requirements with regard to mileage and safety led to the use of pistons made completely from steel in engine development.



MONOBLOCK STEEL PISTONS

In simple terms, the monoblock steel piston developed by KS Kolbenschmidt consists of two forged parts: The upper section with the bowl and ring zone and the bottom section with the pin hub and skirt. These sections are made as forged parts and then premachined. The parts are connected to the monoblock steel piston via friction welding. After the heat treatment, the finish machining of the one-piece piston takes place. The cooling channel, which is partially still open to the outside diameter, is closed using two specially formed plates above the skirt.



MONOBLOCK STEEL PISTONS WITH INNER COOLING CHAMBER

Design combustion pressures over 230 bar have led to the further development of the monoblock steel piston with double friction welding. This results in an even better structural rigidity, i.e. reduced deformation of the piston, particularly in the ring zone. The piston temperatures were lowered by over 20 °C thanks to the improved shape of the cooling chamber on the edge of bowl. Introducing an intermediate base creates a second cooling cavity, which significantly reduces the surface temperature of the combustion bowl.

COMPARISON BETWEEN ALUMINIUM – STEEL



ALUMINIUM

- Good thermal conductivity
- Lower specific weight
- Easy to cast and machine

With complex detailed technical solutions, such as the ring carrier, cooling channel, piston pin bush and anodised piston crown, aluminium pistons achieve the required performance characteristics of many modern diesel engines.

Combustion pressures of over 200 bar require a different material to be used, however. Switching the material to steel achieves better operational safety and mileage thanks to its better integrity and temperature resistance.



STEEL

- High strength
- High temperature resistance
- Low thermal expansion

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