In the last 10 years, the development of the cylinder head gasket has essentially been characterized by the adaptation of the metal layer technology to the constantly increasing, diverse requirements of modern, high-performance engines. As the leader in this technology, ElringKlinger has repeatedly set new standards and further extended the limits of feasibility. With innovative sealing and production technology, we achieve even more economical solutions, while simultaneously increasing the functional potential. The development of the entirely new coined stopper is just one such milestone.

**The first Metaloflex™ generation: folded stopper layers.**

Without center layer

With center layer

**The second Metaloflex™ generation: laser**

Without center layer

With center layer
The third Metaloflex™ generation: coined stoppers.

**Serpentine stopper in functional layer**

The serpentine stopper enables the ideal utilization of the surface determined geometrically by the engine for the stopper. A “microbead” stamped in the serpentine form creates a thickening, which can substitute the laserwelded stopper used until now, with almost identical stiffness. The reason: The numerous windings caused by the serpentine geometry increase the stiffness of the stopper so that the latter is prevented from settling and exhibiting an undesired property of elasticity during engine operation; Such an elastic stopper would lead to an increase in the sealing gap oscillations under ignition pressure in the engine and thus adversely affect the durability of the system.

**Honeycomb stopper in center layer**

To compensate for engine production tolerances, different installation thicknesses achieved via variable carrier plate thicknesses are generally used in diesel engines. The advantage of this is that the behavior of the gasket is not affected by the different layer thicknesses. The stopper pattern in the carrier plate is in honeycomb geometry. The stiffness of these stoppers is comparable with that of welded stoppers. The stamping process developed by ElringKlinger enables both planar and topographical stoppers to be manufactured with a high degree of precision.
Segment stopper in functional layer
The segment stopper is mainly used in metal layer gaskets with an increased carrier plate thickness and
topographical stopper design. The segmentation of the stopper makes it possible to flange even the
highly resistant spring steels used for functional layers around the circumference of the combustion
chamber. The required effective stopper dimension is achieved by means of a stamping process of the
carrier. In addition to the required stopper thickness, this type of topographical stoppers can also be
achieved with almost any variance of the thickness profile. The special advantages of this concept in-
volve the extremely high stiffness of design, particularly in very narrow stoppers. Thus stable, minimum
stopper widths of 1 mm in part can also be easily implemented in diesel engines.

Topographically coined stoppers
With the design of the stopper, it is possible to selectively influence the distribution of sealing pressure
and thus the sealing gap oscillations since they cause an increase in pressure and elastic preload of the
sealing system. A thickness profiling of the stopper may be necessary if the adjacent engine compo-
nents have inhomogeneous stiffness ratios. Coined stoppers offer significant functional advantages in
this context: It is possible to achieve almost any topographical design required for the engine compo-
nents. The height profiling can be defined variably both for each cylinder as well as for other areas on
the gasket.

The topographical stopper allows compensa-
tion for inhomogeneous component stiff-
nesses. Areas with low stiffnesses can be
prestressed, and thus the application of a
uniform compressive load is ensured. In this
way, the available bolt force can be exactly
distributed and optimally utilized over the
required areas.

Comparison of distribution of sealing pressure:
Left: a stopper with constant thickness.
Right: the optimized stopper with variable thickness.
Backland support
The new high-performance engines stress the cylinder head gasket not only on the combustion cham-
ber but also increasingly in the area of media sealing (oil and coolants). Due to these increased re-
quirements, it is often necessary to provide a supporting element in the backland areas and on the com-
bustion chamber alike. The components are prestressed so that the dynamics are reduced and the reli-
able functionality of the gasket over the entire running time of the engine is ensured.

Coined stoppers (dimple and honeycomb
stoppers) are especially suitable to be used as
supporting elements since they enable maxi-
mum freedom of design.

The dimple stopper, which is coined in the
functional layers, is used in CHG designs
without carrier plate.

The honeycomb stopper is preferred in CHG
designs with a carrier plate.