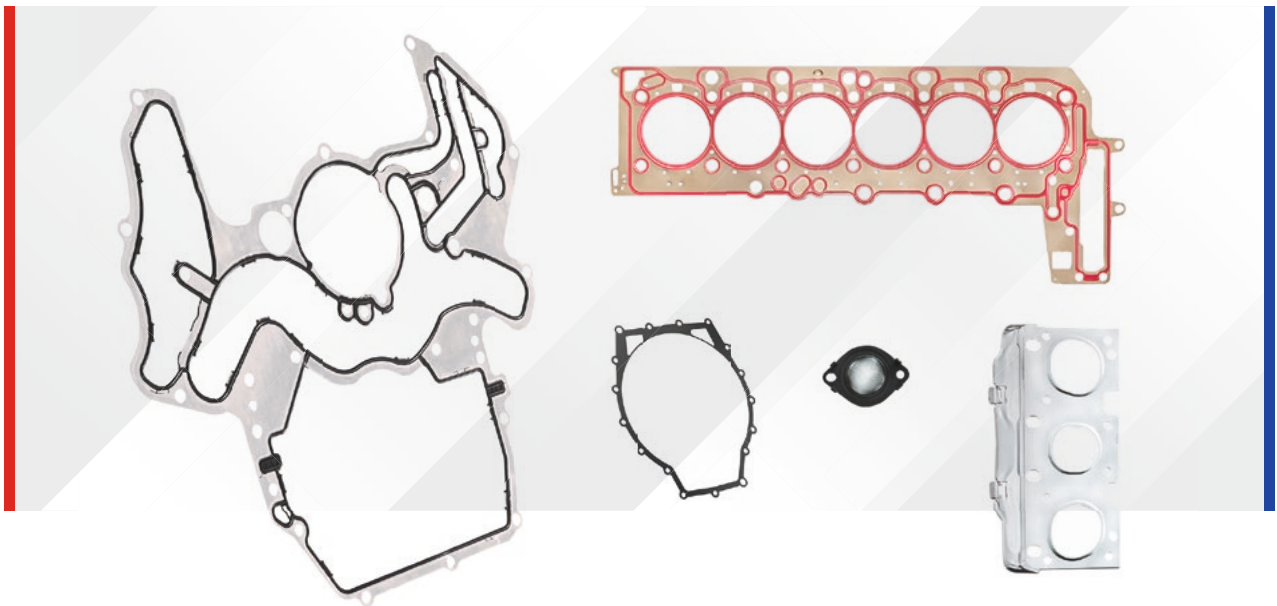


EXPERIENCE MOBILITY

# SEALING SYSTEMS.

TAILORED. INNOVATIVE. HIGHLY EFFECTIVE.



SYSTEM PARTNER. PROBLEM SOLVER. PIONEER.

## SHAPING THE FUTURE. WITH ELRINGKLINGER.

For us, system expertise means being a pioneer, creating space for development and reaching goals faster. With our portfolio, we offer groundbreaking solutions for all vehicles, whether traditional, hybrid or pure electric.

Proximity to the customer, developing visions, overcoming challenges and driving forward innovations: Those are our key strengths, that's what has made us what we are today.

YEARS LEADING THE WAY



# 140

Nothing can replace experience combined with innovative spirit. ElringKlinger has plenty of both. In 1879, Paul Lechler founded a trading company for technical products, which would later become ElringKlinger AG. Today, we are a global player offering future-proof solutions for all drive types in all product areas. We also demonstrate our strengths in other industrial sectors. Our customers benefit from ElringKlinger's combined materials, engineering, and manufacturing expertise. Thinking ahead, developing solutions, being the first to break new ground, taking responsibility. This is what sets us apart – and has done so for more than 140 years.

# 4

KEY STRATEGIC  
FIELDS

Alternative drive technologies, lightweight solutions, new forms of mobility, sustainability and climate protection: The transformation process in the automotive industry is in full swing. The agenda for the future is clear. We are also working every day to play our part and push the limits of what is possible. We are focusing on four strategic fields: e-mobility, lightweight technologies for all drive types, traditional mobility and non-automotive. Together with our customers, we are already finding answers to the questions of the future. And successfully driving forward innovations.

# 10,000

EMPLOYEES AS PARTNERS

For our customers, we are a strong and reliable development partner and series supplier with unique expertise. We are a pioneer and companion. From the idea to the finished product. Whether electro-mobility, lightweight solutions, sealing and shielding technology, tooling technology or engineering services – ElringKlinger impresses with the highest quality, reliability and performance. Around 10,000 employees are committed to achieving this at 44 sites worldwide.

SEALING TECHNOLOGY FROM ELRINGKLINGER

# THE OPTIMAL SEALING SYSTEM FOR EVERY APPLICATION

Whether passenger car or commercial vehicle, electric engine, hybrid technology or traditional drive: ElringKlinger covers the numerous sealing tasks in the engine, transmission, exhaust system, auxiliary units and in the bodywork and chassis area with specifically coordinated, efficient sealing systems. We set standards with our unique development and production expertise and more than 140 years of experience.

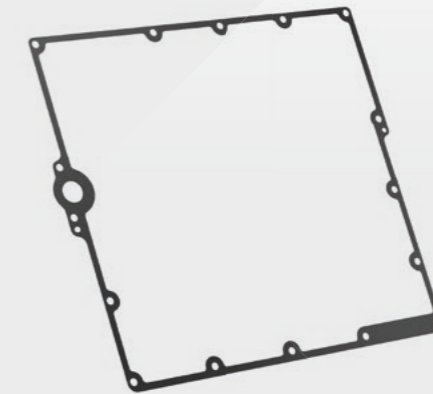
## HIGH PERFORMANCE INSTALLED – FOR ALL DRIVE TYPES

A lot is expected of modern vehicles: they must be efficient and sustainable, yet also high performance, long-lasting, robust, safe and comfortable. As partner to the automotive industry, ElringKlinger makes a valuable contribution in the form of intelligent, innovative product solutions for all drive technologies, including both internal combustion engines and electric vehicles.

Gaskets are used at all locations in motor vehicles where components are connected or meet. They reliably seal off the various media – oil, coolant, fuels and combustion gases – with respect to both the atmosphere and one another and prevent the ingress of dirt. Gaskets also act as power transmission elements between components and can assume various additional functions.

### GOOD TO KNOW

Our tailor-made sealing systems are just as varied as their possible usage locations. Materials and designs are perfectly matched to the particular requirements involved. What's more, it is possible to integrate additional functions such as heat shields, filters, sensors and pre-assembly elements. The benefits: fewer individual components, less installation work, reduced weight, lower costs and optimized operation.



**SEALING TECHNOLOGY FROM ELRINGKLINGER OFFERS A HIGH LEVEL OF SAFETY, PERFORMANCE AND ECONOMIC EFFICIENCY – EVEN UNDER THE HARSHTEST CONDITIONS**



We produce our sealing systems worldwide close to our customers. At state-of-the-art facilities with outstanding efficiency and in the highest quality.

#### DEVELOPMENT AND PRODUCTION

## INNOVATIVE SYSTEM EXPERTISE

We want to give our customers space for development so they can reach their goals faster and drive forward sustainable mobility. This is why we always consider the entire system and use our know-how and our innovative strength in a targeted way to achieve optimal product solutions.

#### UNCOMPROMISING RELIABILITY

Short development cycles, the complex interaction of the individual components, and exacting demands in terms of both cost-effectiveness and sustainability, all make a comprehensive approach essential. That is the particular strength of ElringKlinger. The basis for this is our innovative strength, the unique material expertise and the extensive production know-how in the fields of high-precision metalworking (stamping, embossing and forming processes) and coating methods.

For innovative production concepts, we place great importance on in-house process development and the associated buildup of know-how. The close links between development, prototype construction and series production enable us to achieve an optimal quality level directly at the start of production.

In production, all work steps are fully linked and automated, including the 100 percent quality monitoring system or the End-of-Line test. Any time, anywhere: ElringKlinger offers the same top quality, maximum flexibility and an excellent delivery performance. Global standards guarantee identical quality of the produced products all over the world.

In close cooperation with our customers, we develop high-performance, safe and efficient sealing solutions for all application areas.

#### HIGHLY ELASTIC WITH MINIMUM ASSEMBLY FORCES

## METAL-BEAD GASKETS METALOSEAL™

This highly effective sealing system is based on metallic carrier materials in combination with elastomer function coatings. One of the biggest advantages: Different metals can be combined with different elastomer function coatings and thus be tailored precisely to the relevant requirements.

#### VARIED, ROBUST, ADAPTABLE

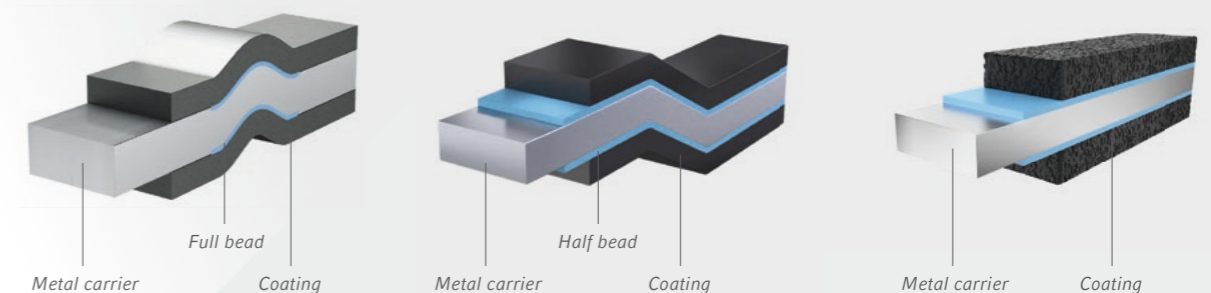
With Metaloseal™ gaskets, metal beads reduce the surface pressure to a line pressure. This focuses the sealing force where it is required. A wide range of requirements can be met thanks to the combination options of metal carriers and elastomer function coatings. This includes in particular the resistance against a wide range of media, such as gas, oils, fuels and coolants. Added to this is the special adaptability of Metaloseal™ sealing systems in the event of significant warping or sealing gap vibrations and an increased friction value for force transmission, or a reduced friction value that enables thermal expansion.

Different functions can be integrated in Metaloseal™ gaskets. Pre-assembly elements thus enable secure fixing of the gasket even overhead, and Poka-Yoke solutions enable high-quality assembly in series production. Other elements, such as heat shields or fabric filters can also be integrated so that the number of parts is reduced and assembly processes are simplified at the customer.

Metaloseal™ sealing systems are used in temperature ranges from - 40 °C to + 800 °C and in pressures up to 200 bar. Because they are installed in the main line of force, they enable a simplified sealing flange design without a groove.

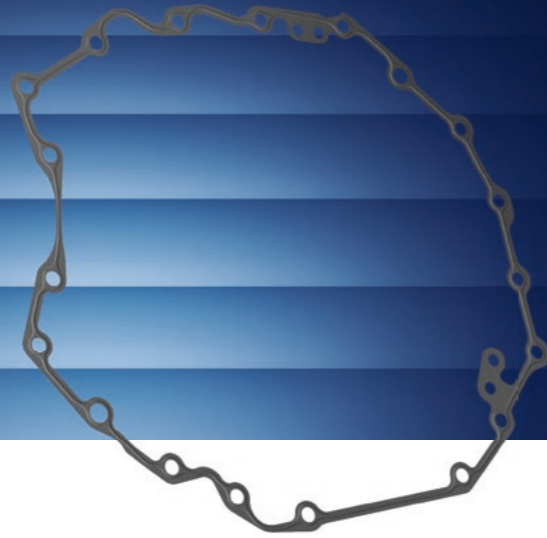


Metaloseal™ gaskets are tailored specifically to the relevant requirements. Additional function or pre-assembly elements can be integrated and thus reduce the assembly work, among other things.



**METALOSEAL™ HOUSING GASKET**

Gearbox gasket with optimized bolt force distribution



Exhaust gas recirculation (EGR) gasket with integrated rescue filter



The sealing systems used for low-pressure exhaust gas recirculation in diesel and gasoline engines have to be able to withstand high temperatures of more than 800 °C and corrosive media. The compressor components in the turbocharger also need a rescue filter to protect them against mechanical damage from solid particles. ElringKlinger specializes in integrating gaskets into complex EGR systems and in managing the module as a whole.

Metallic form rings Metaloseal™



Metallic form rings are mainly used in turbocharger systems. At application temperatures up to 800 °C, nickel-based alloys are used to withstand the extreme conditions. These materials have a sufficient mechanical strength even in temperatures over 750 °C and offer protection from hot gas corrosion that would destroy normal metallic sealing materials. The unique production process of ElringKlinger enables these extremely cost-intensive materials to be used with practically no material waste. Thanks to the special elastomer coatings, even cold leakage tests can be passed easily on the assembly line of the turbocharger systems.

FOR HIGHLY STRESSED COMPONENTS

# ELASTOMER AND METAL-ELASTOMER SEALING SYSTEMS

Whether with or without metal carrier material, both gasket designs stand for optimal function reliability and efficiency. The special feature: ElringKlinger develops the elastomer materials used in-house.

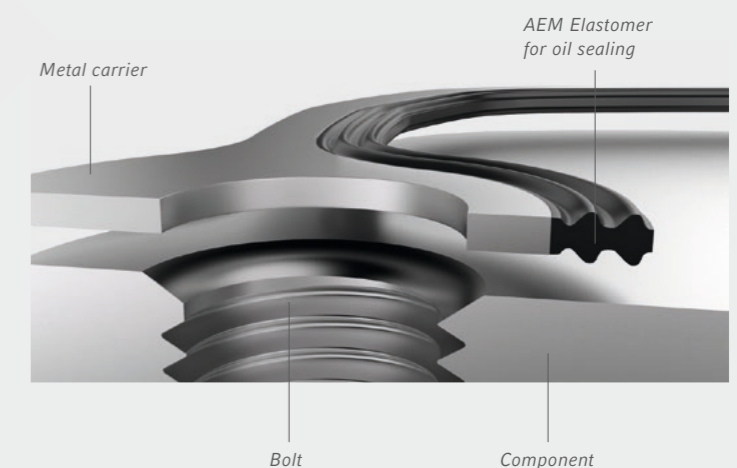
## METAL-ELASTOMER SEALING SYSTEMS

Metal-elastomer gaskets are used for highly stressed components such as electric drive units (EDU), battery storage systems or engine and transmission components. They consist of a metal carrier with vulcanized elastomer profiles. The elastomer materials used are developed in-house by ElringKlinger and tailored to the relevant requirements. Thanks to state-of-the-art process and injection molding technologies, different materials can be joined to a metal or plastic carrier. This enables the optimal material to be used for every medium to be sealed.

### BENEFITS

- + Reliable sealing even with low sealing pressures
- + Compensation of high component tolerances
- + Three-dimensional shaping
- + Reduction of the bolt force and number of bolts
- + Acoustic component isolation

## METAL-ELASTOMER GASKET



**Timing case gasket**

Metal-elastomer gasket for the timing case for sealing against oil and coolant; low installation thickness of 1.0 mm; quick assembly



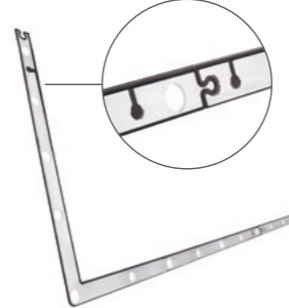
**Cam cover gasket**

Metal-elastomer gasket for the cam cover with integrated cable routing



**Puzzle design for large flanges**

Effective sealing solution for large flanges, for example for battery storage housings; quick and easy assembly thanks to individual components that fit into each other



“Highly stressed components, such as electric drive systems, battery storage systems or transmission and engine components are sealed optimally with metal-elastomer and elastomer gaskets from ElringKlinger.”



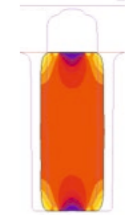
**ELASTOMER GASKETS**

In principal, elastomer gaskets with specifically coordinated profile geometries can be used on all sealing joints in the drive train or in battery systems. In load-carrying joints a pressure boundary flanged connection has to be created, e.g. using grooves on the part or limiters under the bolts. Specifically matched profile geometries ensure maximum functionality at very low sealing pressures.

**Elastomer gaskets for the intake manifold and the spark plug sealing**  
Elastomer gaskets with specific profile geometries adapted precisely to the relevant application and the available installation space



I-profile, pressed in groove



H-profile, pressed in groove



**TOPSEAL HOUSING PARTS**

With the Topseal sealing system from ElringKlinger, the cover and gasket are combined in one function unit. Compression limiters are stamped in the metal housing cover to protect the elastomer gasket from excessive pressing. Large bolt spacings can be achieved through the use of an extremely soft and adaptable elastomer material. The special design prevents narrow gaps and thus reduces the contact corrosion and infiltration of the gasket. The deformation limiters enable constant metal contact between the cover and housing. Topseal thus achieves optimal shielding against electromagnetic radiation and is in particularly high demand in the field of E-mobility.

**Topseal inverter cover (top) and service cover**  
Housing parts with topographic support of the integrated gasket



**GOOD TO KNOW**

The fixed elastomer gasket enables easy assembly at the customer. The combination of elastomer gaskets and compression limiters means that Topseal elements can even be removed and reused during reworking on the customer system.

EXTREMELY DURABLE

# VOLUMESOFTSEAL HOT GAS GASKETS

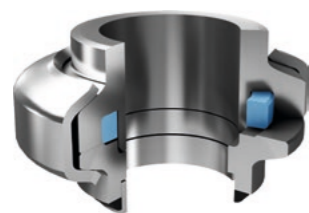
The combination of soft materials (mica, graphite) and selected steels makes it possible to create reliable sealing solutions that satisfy the most stringent leakage standards even in highly demanding applications.

## USAGE TEMPERATURES UP TO 1,100 °C

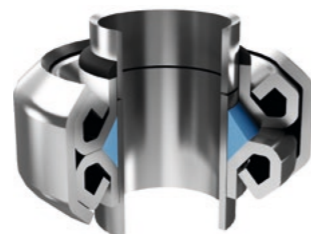
Our Volumesoftseal mica and graphite-based volume sealing rings offer excellent performance and thermal stability. They are used on all sealing points along the exhaust train in operating temperatures up to 1,100 °C. Requiring only a low bolt force, they are a great alternative to the sealing systems normally used, such as spiral-wound gaskets for example.

Volumesoftseal is installed in structures with pressure boundary flanged connections or similar. All conceivable types of flange are possible – from a bolted flanged connection right through to a compact, easy to fit, V-band clamp. Special pre-assembly elements enable one-person assembly, for example during overhead assembly on the vehicle floor.

Volumesoftseal solid flange design for high pressures and temperatures

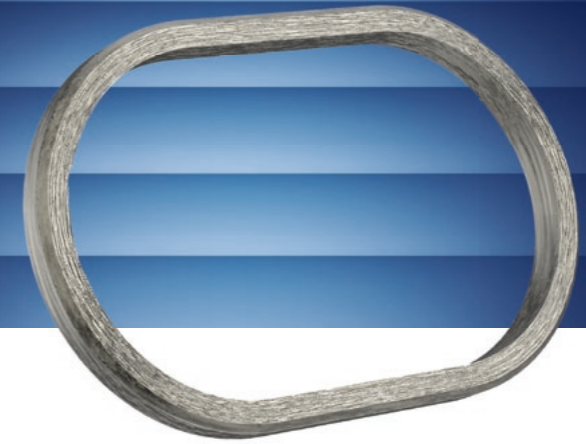


Volumeseal lightweight design



## VOLUMESOFTSEAL SEALING RING

Volumesoftseal flat gaskets and volume sealing rings from ElringKlinger set new standards in terms of thermal stability, service life and adaptability.



Sealing rings

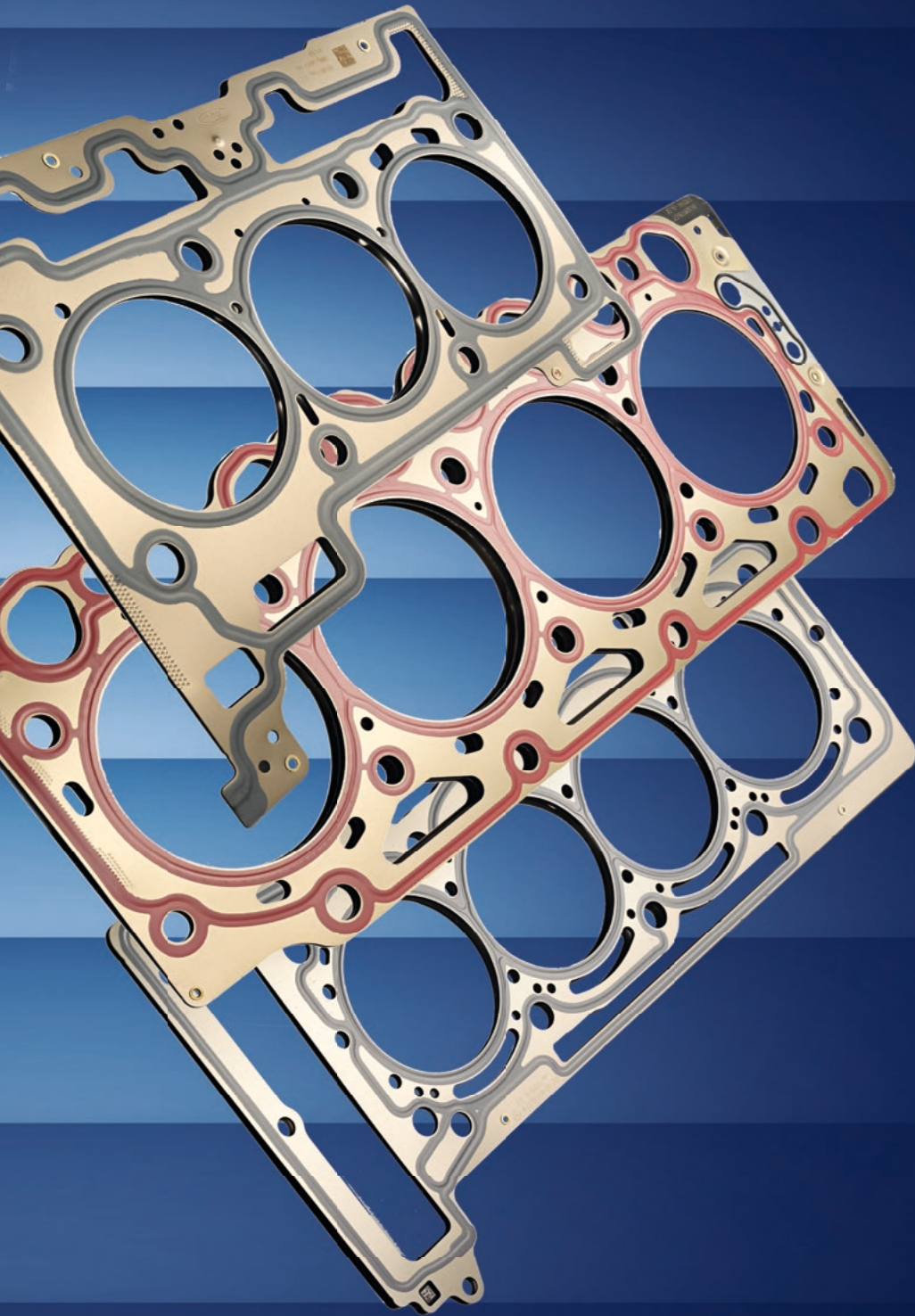


Mica-based volume sealing ring for use close to the turbocharger in particularly high temperatures up to 1,100 °C. Graphite-based volume sealing ring preferably used in lightweight flanges or on particularly uneven sheet metal manifolds. On both designs, a stainless steel carrier provides dimensional stability.

Cup springs



Cup springs made from nickel-based alloys are used for noise reduction and wear minimization on turbocharger valves under extreme conditions. Through special heat treatment processes, these preload elements can reliably withstand temperatures of up to 1,080 °C in direct exhaust gas contact.



**SAFETY AND OPTIMAL FUNCTION  
EVEN UNDER EXTREME CONDITIONS**

Cylinder-head gaskets ensure reliable sealing from fuel gas, coolant and oil. As the load transmission element between the crankcase and cylinder head, they also have a significant impact on the force distribution within the entire tensioning system and the resulting elastic component deformations. Whether passenger cars, commercial vehicles or large engines – ElringKlinger offers the suitable sealing system for every engine concept.

RELIABLE FUNCTION EVEN UNDER HIGH PRESSURE

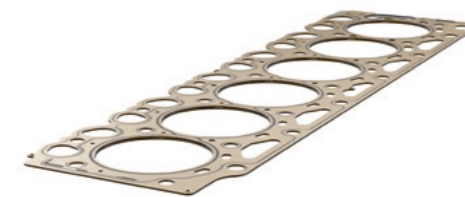
# CYLINDER-HEAD GASKETS

As key components in modern combustion engines, cylinder-head gaskets contribute to an efficient, safe and economical engine operation.

## METALOFLEX™ METAL LAYER CYLINDER-HEAD GASKETS

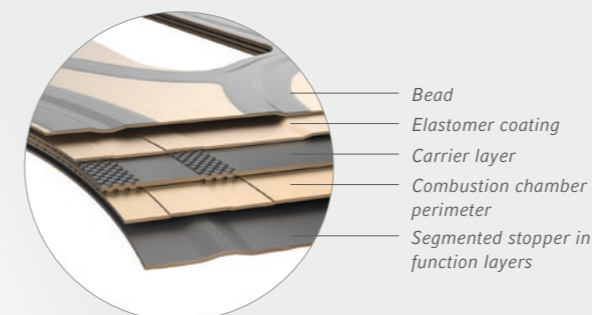
In modern petrol and diesel engines in passenger cars, transporters and commercial vehicles, as well as in electric vehicles with range extenders, Metaloflex™ metal layer cylinder-head gaskets show what they are made of. Engine downsizing, lightweight constructions, selective cylinder deactivation and hybrid technology result in reduced wall thicknesses, a lower rigidity of the components, higher temperatures and increasing ignition pressures, which require highly efficient, tailored sealing concepts.

With the metal layer sealing system, the engine components are elastically pre-stressed around the combustion chamber via a compression limiter (stopper). This reduces the sealing gap oscillations caused by the ignition pressure and also prevents excessive deformation of the full beads. ElringKlinger offers all technologies for compression limiters: coined (embossed) stoppers, where we differentiate between stamps in the function layers (serpentine, dimple) and in the carrier plate (honeycomb). There are also laser-welded stoppers, folded stopper layers and segmented stoppers. For maximum functional reliability.

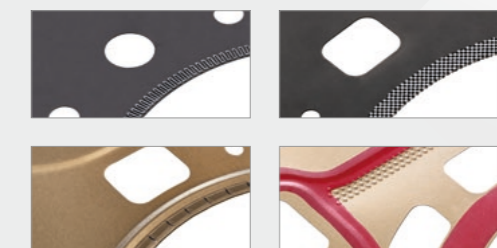


Metaloflex™ cylinder-head gaskets from ElringKlinger are made from beaded, elastomer-coated spring steel layers (single or multi-layer depending on the application). The modular design with the function elements coating, bead and stopper enables the gaskets to be tailored precisely to the relevant engine.

Perfect interplay between the different layers



Flexible solutions from ElringKlinger: serpentine, honeycomb, segmented, and dimpled stoppers





METAL-ELASTOMER CYLINDER-HEAD GASKETS



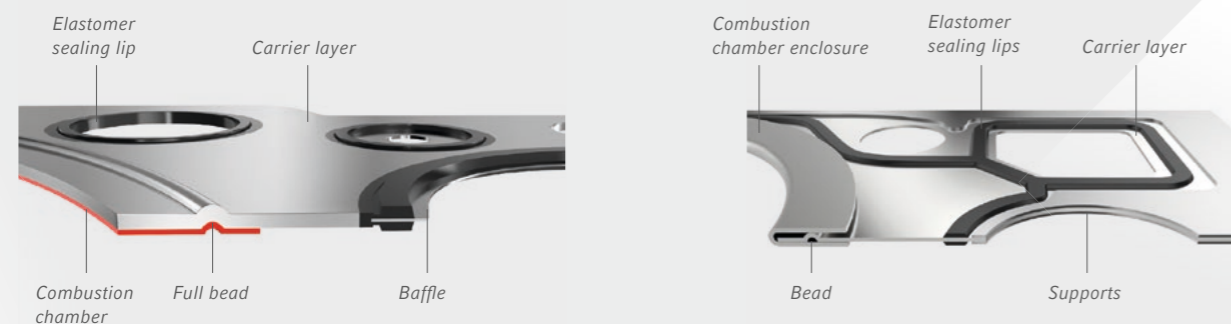
Metal-elastomer cylinder-head gaskets from ElringKlinger are mainly used in commercial vehicle engines and large engines (power plants, ships ...). Innovative drive concepts require innovative sealing technology, as the challenges are varied. These include in particular higher combustion pressures, compression homogenization, higher thermal loads and more stringent emissions standards. Our metal-elastomer system provides completely reliable sealing even at ignition pressures up to 290 bar, engines rated at more than 2,000 kW and mileages of 1.5 million kilometers.

The high ignition pressure in engines without bushings or with slip-fit bushings, low bolt forces and a low number of bolts can be managed reliably with compression homogenization, for example. The sealing pressure distribution between the combustion chamber and fluid area can thus be pushed further and further towards the combustion chamber. For gas sealing, special steel-bead structures are used to achieve a uniformly high sealing pressure. Liquid sealing takes place via elastomer sealing lips, which can achieve reliable media sealing with a significantly lower sealing pressure level.

GOOD TO KNOW

Metal-elastomer cylinder-head gaskets are made from metal carriers with vulcanized elastomer profiles. The basis for the outstanding performance is the specific distribution of sealing pressure in the area of the engine block/cylinder head: High sealing pressure in the combustion chamber area – low sealing pressure in the fluid area.

The flexible design enables all sealing tasks to be managed completely reliably



MAXIMUM EFFICIENCY AND RELIABILITY

TRANSMISSION APPLICATIONS

ElringKlinger solves the complex sealing tasks in the transmission area with high-performance, tailored systems – in hydraulic transmission controls with oil pressures of up to 80 bar or directly in the shift pistons of automatic transmissions at high circumferential speed and millions of switching operations over the service life.

COMPOSITE PISTONS FOR TRANSMISSIONS

Automatic transmissions with a high number of gears are increasingly requiring the use of composite pistons. The special feature of ElringKlinger composite pistons is the extremely smooth surface. This ensures that the transmission controller works particularly smoothly. The switching operations take place extremely precisely and offer optimal driving comfort. Here too, we offer system expertise from a single source: Material development, simulation, design, surface treatment and rubber injection molding.

**Composite pistons**  
The composite pistons from ElringKlinger are characterized by innovative design, an optimal hysteresis behavior and maximum reliability



TRANSMISSION CONTROL PLATES

In hydraulic control units of automatic and dual-clutch transmission systems, different designs from ElringKlinger are used depending on the requirement profile: Metaloseal™, Metaloprint™ and metal-soft material transmission control plates.

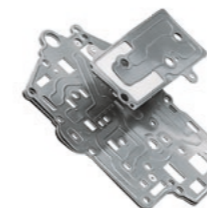
Transmission control plates seal the individual oil ducts of the controls against each other at pressures of up to 80 bar. Integrated function elements, such as ball seats for check valves, stamped flow screens or residual dirt screens help to direct the oil flows safely and precisely. Optimally sealed transmission control plates help to minimize leakage losses and improve switching and response times.



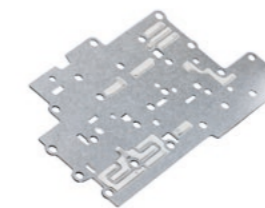
GOOD TO KNOW

ElringKlinger impresses in the transmission area too with reliable, durable, economical and innovative sealing solutions.

**Metaloseal™ transmission control plate**  
Reliable for maximum requirements and the highest operating pressures; with integrated filter function



**Metal-soft material transmission control plate**  
With 3D stainless steel screen structure; reliable and low-cost



**Metaloprint™ transmission control plate**  
With partial elastomer coating; complete and ready to install





MILLIONS OF AUTOMOTIVE COMPONENTS FROM OUR SUBSIDIARY ELRINGKLINGER ENGINEERED PLASTICS ARE USED IN SERIES PRODUCTION ALL OVER THE WORLD

PLASTICS ON TOP FORM

## GASKETS MADE OF HIGH-PERFORMANCE PLASTICS

The transformation in the automotive industry is creating new challenges for gaskets and construction parts made of high-performance plastics. Our subsidiary ElringKlinger Engineered Plastics benefits from over 50 years of experience here.

### RELIABLE AND EFFICIENT, EVEN UNDER EXTREME CONDITIONS

Our subsidiary ElringKlinger Engineered Plastics supplies innovative gaskets and engineered parts made of PTFE, PTFE compounds, PEEK, Moldflon™ and other high-performance plastics that are precisely adapted to each particular application. They can effortlessly withstand high pressures, friction, corrosive media, chemicals and other loads, whilst at the same time helping to achieve greater efficiency and reduce the environmental impact.

Our products, such as ElroSeal™ rotary shaft seals, spring-energized seals, support rings, piston rings and guide elements, as well as multi-component injection molded parts, provide greater design freedom and a more economical solution in all sorts of usage locations. These include in particular electric drive systems, units with a combustion engine, thermal management and the chassis area.

Detailed information can be found in the automotive specialist brochure from ElringKlinger Engineered Plastics.

#### ElroSeal™ rotary shaft seal

A specific solution for rotating shafts, e.g. in electric engines and actuators; for circumferential speeds from 20 m/s up to max. 100 m/s



#### ElroSeal™ SP rotary shaft seal

Made from PTFE special compound specifically for turbochargers and other fast rotating engine charging systems



EXPERTISE FOR THE TRANSFORMATION

# E-MOBILITY SEALING TECHNOLOGY

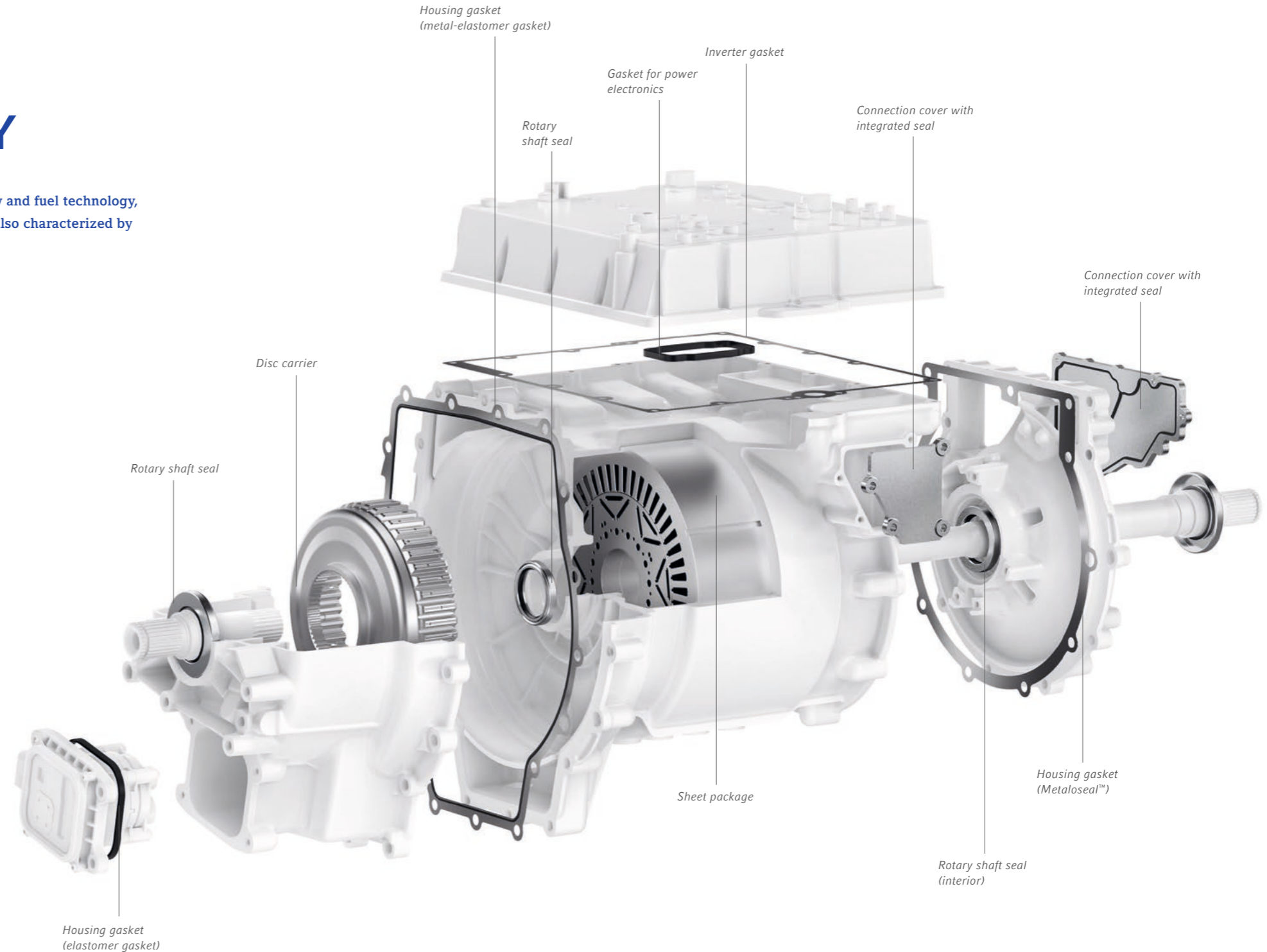
ElringKlinger offers fully developed products suitable for series production in battery and fuel technology, as well as for electric drive units (EDU). Our sealing systems for electromobility are also characterized by outstanding performance, reliability and efficiency.

## FOR ALL SEALING TASKS

Overcoming challenges, driving forward innovations and helping to shape the technology transformation with high-performance products in top quality – ElringKlinger has high expectations with regard to electromobility. In sealing technology too, we use our core expertise in materials, engineering, tool making, processes and production processes in a targeted way and offer an extensive portfolio for all sealing tasks and applications.

The Metaloseal™ gasket design is used in numerous applications in the EDU (inverter, housing, ...), and is also used as cover or flange seals in drive axles and in electrically powered components such as air conditioning compressors and water pumps. Pure elastomer gaskets can also be used in practically all sealing points of the EDU, such as power electronics, on the transmission or on other housing parts. In addition to the EDU, metal-elastomer sealing systems can also be used for sealing large flanges on battery storage housings, their cooling circuits or power connection.

Our E-mobility sealing technology made of high-performance plastics includes ElroSeal™ rotary shaft seals, e.g. for the e-axle or compressors for air compression, as well as spring-energized seals, e.g. for valve sealing, as well as in the transmission and e-axle area. Added to this are memory packings for compressors, scroll compressor gaskets, as well as Moldflon™ systems for valve sealing in the field of thermal management.



The design and materials of all our sealing solutions are tailored precisely to the relevant requirements – for maximum design freedom and functional reliability.

ElringKlinger supplies numerous components for electric drives, including metal-elastomer and Metaloseal™ gaskets, as well as rotary shaft seals and housing covers.

Whether passenger car or commercial vehicle, electric engine, hybrid technology or traditional drive: ElringKlinger covers the numerous sealing tasks in the engine, transmission, exhaust system, auxiliary units and in the bodywork and chassis area with specifically coordinated, efficient sealing systems.



**OUR PORTFOLIO.  
FOR YOUR SUCCESS:**

- + Battery technology
- + Fuel cell technology
- + Electric drive units
- + E-mobility components
- + Lightweighting and elastomer technology
- + Sealing systems
- + Shielding systems
- + Components made of high-performance plastics
- + Dynamic precision parts
- + Tooling technology
- + Engine development services
- + Elring™ spare parts



**ElringKlinger AG**

Max-Eyth-Straße 2  
72581 Dettingen/Erms  
Germany  
Phone +49 7123 724-0  
E-mail [info@elringklinger.com](mailto:info@elringklinger.com)

[www.elringklinger.com](http://www.elringklinger.com)

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