

EFFECTIVE SHIELDING



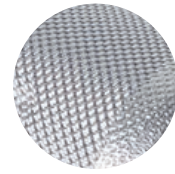
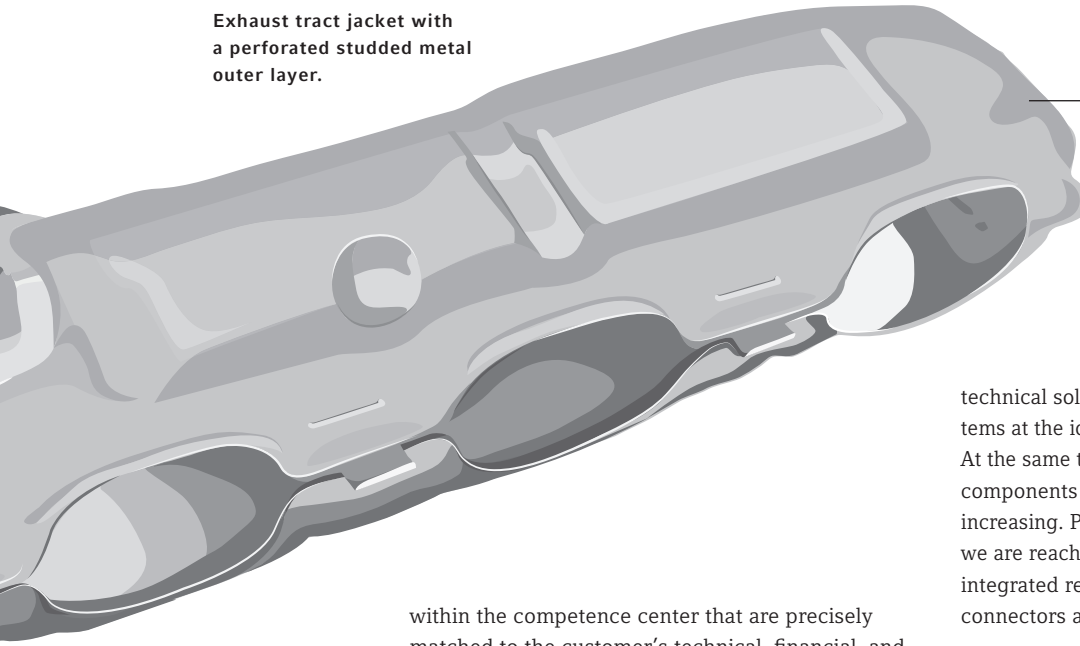
If you want to control heat and noise effectively in a vehicle, you have to understand the whole “car system.”
Peter Walker, Head of the Shielding Technology division, explains how effective shielding works and what challenges ElringKlinger is solving for current vehicle generations.

It hasn't really been that long since automobiles consisted almost entirely of mechanical components, the exhaust tract was just a simple pipe, and you could usually repair a vehicle using a few basic hand tools. Take a closer look at a modern vehicle, however, and you'll see that it now contains a large number of electronic components and lightweight materials. The exhaust tract resembles a small chemical factory, and the mechanic will often need to perform a series of checks with a diagnostic tool before undertaking any repairs. It is obvious that technological progress is greatly increasing the complexity of modern vehicles and that previously dispensable components are now essential. That includes, for example, many of ElringKlinger's shielding systems, which insulate heat-sensitive components and absorb sound in different areas of the vehicle.

Customized design

Development cycles are getting shorter and shorter, and the pace of innovation is rapid. What's more, there is simply less and less time for the industrialization of new developments. The development team in the Shielding Technology division is fully aware that increasingly complex relationships demand holistic thinking and a thorough understanding of the underlying systems, especially when you are dealing with mature technologies, such as combustion engines, and are tasked, for example, with important issues like the reduction of emissions. With this in mind, they bring together all the available experience of thermal and acoustic shielding and benefit from the wide-ranging expertise built up within the ElringKlinger Group. This makes it possible – in record time – to devise integrated system solutions

Exhaust tract jacket with a perforated studded metal outer layer.



The surface structure is designed to absorb noise.

within the competence center that are precisely matched to the customer's technical, financial, and environmental specifications. "We feel perfectly at home in places where it's either too hot or too noisy for others," explains Peter Walker, pointing to a table full of system variants, in many different shapes and sizes, all of which have one thing in common: they offer maximum insulation against extreme temperatures and noises, and can even reduce vehicle emissions, depending on where they are located.

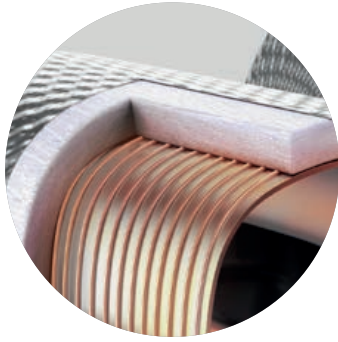
Protective shield against heat and sound

Demand for shielding systems has been growing continuously for many years. The need is great, and the explanation is simple. Tightly packed power units, more compact engines, ever-increasing levels of turbocharging, minimal cooling air flows, and new operating strategies, such as automated start-stop systems, keep pushing up temperatures in the engine compartment, underbody area, and exhaust tract, thus creating a demand for customized

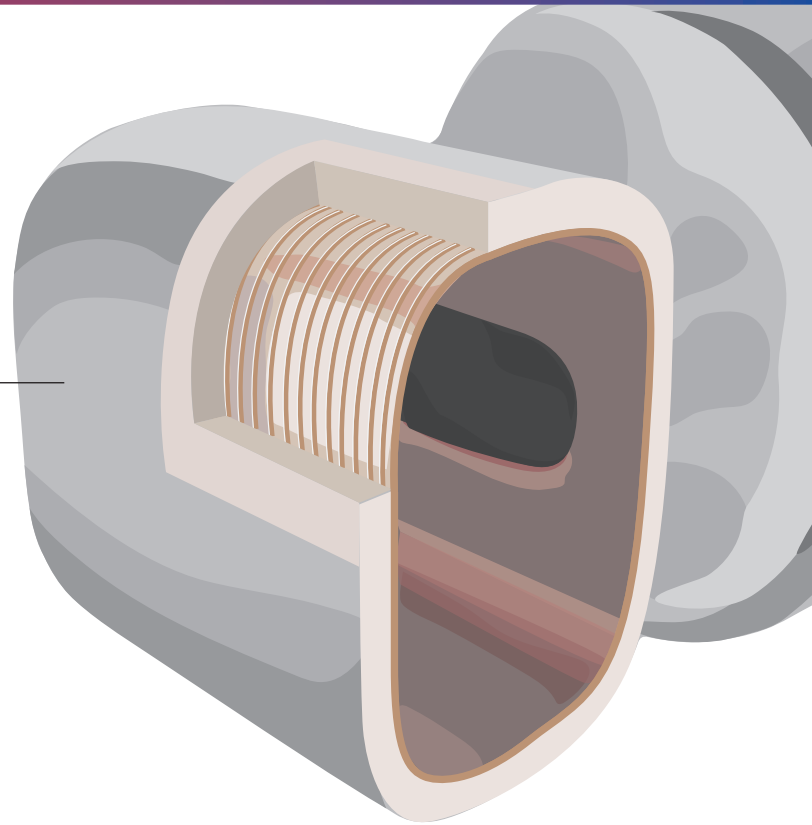
technical solutions, to maintain components and systems at the ideal operating temperature, for example. At the same time, the number of temperature-sensitive components that need to be protected from heat is increasing. Power units are now so tightly packed that we are reaching a limit in many vehicle models, and integrated retainers, seals, cable clips, fasteners, and connectors are already standard.

In order to be able to withstand operating temperatures of up to 1,000°C, the development team uses different material compositions, usually consisting of several layers. To illustrate the point, Peter Walker holds up an ElroShield D. The components made of one layer of stainless steel and a second layer of fiber material are assembled around various heat-conducting components, from the exhaust manifold and the turbocharger through to the catalytic converter. Besides insulating components from high temperatures along the exhaust tract, the technology has other advantages. For one, it reduces exhaust emissions because the cold start phase can be significantly shortened so that the catalyst reaches its optimal operating temperature more quickly. At the same time, ElroShield D also reduces noise from the exhaust system by a considerable margin.



**ELROACTIVE™**

ElroActive™ – a multi-layer shielding component with integrated heating elements for active thermal conditioning of exhaust systems.

**Overcoming technological boundaries**

It's perfectly clear that the automotive industry is currently under pressure from all sides. Although policymakers and industry are working together to drive change, demand for electric vehicles is stalling in many countries. Peter Walker stresses the huge challenges involved in meeting the average fleet emission levels prescribed in legislation within the specified time frame. He also notes that driving bans in urban areas are becoming increasingly problematic for many motorists. That makes it essential to further optimize existing technologies in combustion engine vehicles in order to deliver short- to medium-term solutions.

For Peter Walker, one solution that could be deployed relatively quickly involves actively controlling operating temperatures in the exhaust tract in order to minimize emissions of unburned hydrocarbons and nitrogen oxides during cold starts. Conventional catalysts are most efficient with a starting temperature of approx. 200°C. It can take some time before this temperature is reached. Meanwhile, exhaust gases enter the environment untreated. The goal is to keep this time to a minimum. Active electrical heating of the exhaust

tract shortens the time needed for the vehicle's exhaust gas purification systems to start cleaning and filtering out harmful emissions. The new system also promises to deliver major benefits in the commercial vehicle sector, where diesel engines tend to produce higher emissions, especially in slow-moving traffic. Here, an integrated electric heating system ensures that urea injection can start much earlier, converting nitrogen oxides into harmless nitrogen and water more quickly. And that's not all: the system can also be used to great advantage in hybrid vehicles. Whenever the internal combustion engine switches off, the electric heating wire ensures that the catalyst does not cool down and can therefore spring back into purification mode immediately if the driver suddenly accelerates.

In technological terms, the newly developed solution consists of a one-sided insulating material with heating elements on the exhaust gas component side; they are operated in output classes between one kilowatt and five kilowatts. A metal layer is attached on the outside to protect the material from mechanical or environmental damage.

900 °C

ElroActive™ can operate in temperatures up to 900° Celsius.

Depending on the vehicle model, the shielding system can be adapted to fit almost any location on the exhaust tract. It can even be retrofitted to existing exhaust tracts to achieve better emission ratings. This solution is particularly cost-effective if it puts the vehicle in a lower emissions category so that it can be driven, for example, in city centers that have introduced a ban on those vehicles that do not meet certain Euro standards.

The many advantages of this newly developed system have been confirmed in recent bench tests performed in collaboration with universities and car manufacturers. According to measurements recorded during these tests, installing the system can reduce nitrogen oxide emissions by more than 50%.

Peter Walker is absolutely convinced of the system's potential – so much so, he says, that he and his team are now doing everything possible to ensure that this innovation can further reduce emissions from existing and future generations of vehicles.

A clear focus on the future

When asked how he sees the future of his division, Peter Walker responds without a moment's hesitation. He is aware of the scale of the changes needed and has already analyzed potential new applications together with his team. That includes many areas of research related to battery technology, shedding more light, for example, on the impact behavior of battery housings.

He is certain that technologically sophisticated shielding systems will also be needed in electric vehicles, perhaps more in order to deal with electromagnetic radiation rather than extreme temperatures. Magnetic fields are created wherever electricity flows in large quantities, and this can affect radio signals and mobile phone communications. The first prototypes for electric vehicles have already been developed.

The shift towards electromobility opens up completely new applications for us. Above all, we see a lot of potential in combining different functions, such as thermal and electromagnetic shielding. «

Peter Walker, Vice President Shielding Technology, ElringKlinger AG

