

# IMPULSE

**MAHLE**

Mobility  
magazine  
for the  
workshop

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## SAY HI TO HYDROGEN

One of the keys  
to powering our  
future mobility

## WOMEN ON A MISSION

Strong women in the  
automotive industry

## TIME TO GET MEASURING!

The new PMU 400  
particle counter

# FIT FOR THE SEASON?

How to check your motorcycle before hitting the road







From professional to professional,

None of us can say with certainty what form the mobility of the future will take. But one thing we're guaranteed is diversity. New registrations of electric and hybrid vehicles are rising sharply, and even more technologies are in the starting blocks. We're motivated by the pursuit of sustainable, environmentally friendly mobility. That's why MAHLE, as a development and technology partner, is working tirelessly on efficient, clean, and economical drives. These include electric motors, fuel cells, and internal combustion engines that run on nonfossil fuels.

With its comprehensive package of quality replacement parts and future-oriented workshop equipment, strong services and support, not forgetting professional technical training—as a partner to workshops, MAHLE Aftermarket is there for you as you face the challenges ahead.

As usual, you'll find lots of interesting topics from the MAHLE world and beyond in this issue. We've also got a great prize to give away in connection with our reader survey. You could be the lucky winner, and you'll also be helping us to make the magazine even better.

Good luck and enjoy the read!

Olaf Henning  
Corporate Executive Vice President and  
General Manager MAHLE Aftermarket



22

NO MORE  
MIX-UPS



36

THE DAMAGE  
DETECTIVES



18

THERMAL MANAGEMENT  
MADE BY MAHLE



34

CHAMPIONS  
WITH MAHLE



26

FASHION MEETS  
NEW E-MOBILITY

## CONTENTS

### MAHLE INSIDE

**04** EVERY SITUATION COVERED  
Solutions for all current and future powertrain technologies

**10** RELIABLE AND FUTURE-ORIENTED  
Workshop solutions delivering maximum support

**18** THERMAL MANAGEMENT MADE BY MAHLE  
If it says MAHLE on the outside, it's got OE quality on the inside

**24** ALTERNATIVE WITH FITNESS BENEFITS  
E-bikes as courtesy vehicles

**26** FASHION MEETS NEW E-MOBILITY  
The world's first 3D-printed luxury e-bike

**30** WOMEN ON A MISSION  
Strong women in the automotive industry

### SWEAT & GASOLINE

**34** CHAMPIONS WITH MAHLE  
Victory in the Polish Rally Championship

### DO IT & GET IT

**28** FIT FOR THE SEASON?  
How to check your motor-cycle before hitting the road

**36** THE DAMAGE DETECTIVES  
Eleven damage appraisers rise to the challenge

### NEW ON THE MARKET

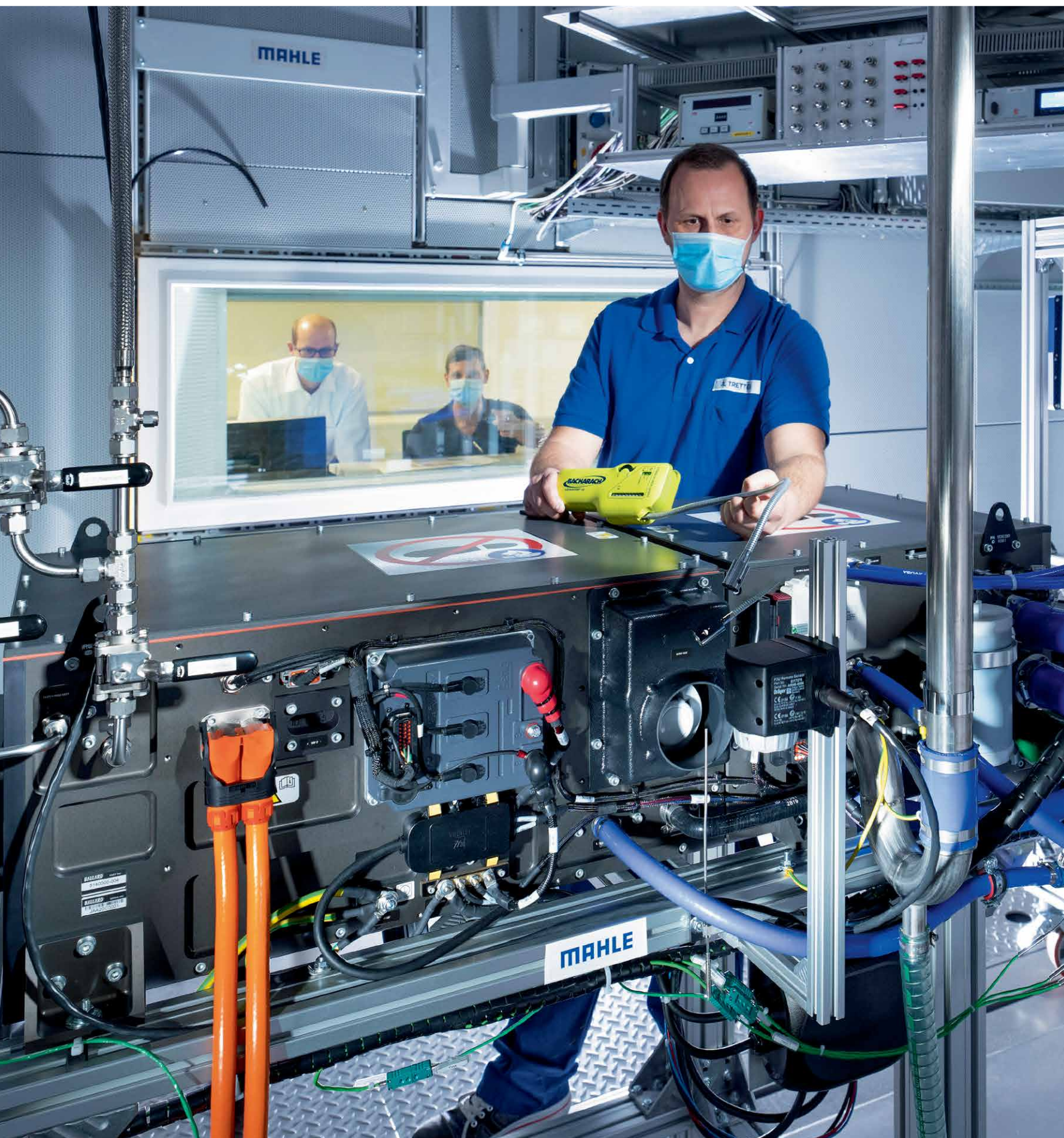
**40** NEW ON THE MARKET  
More choice, more quality, more efficiency

**42** AFTERBURNER  
Hot topics and latest news



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# — EVERY SITUATION COVERED —

Our world is diverse—in so many different ways. For example, from continent to continent, country to country, and region to region, various approaches are being taken to manage the demands of mobility, sustainability, and environmental protection. These range from purely battery-powered solutions, battery/combustion engine hybrids, and hydrogen-based systems to e-fuels. As a global company, this variety is reason enough for us at MAHLE to offer our customers—including you—solutions for all current and future powertrain technologies.





## »POWERTRAIN TECHNOLOGY

# SAY HI TO HYDROGEN

**Although infinitesimally small, as old as can be, simple in structure, colorless, odorless, tasteless, lighter than air, nontoxic, noncorrosive, nonirritating, and nonradioactive, the potential of this element is enormous. There's no doubt that H<sub>2</sub> will play a role in powering our mobility in the future.**

Some 14 or 15 billion years ago, there was a powerful explosion. Referred to as the big bang, this event left one thing above all in its wake: hydrogen. Other elements only formed billions of years later. It's still the most common chemical element found in the entire universe. On Earth, too, hydrogen gas is available in abundance, although almost exclusively in chemical compounds such as water.

Researchers and developers recognized hydrogen's potential early on. That's why the fuel cell was invented even before the internal combustion engine. Hydrogen can be produced using electrolysis. During this process, pure water is split into its constituent parts of hydrogen and oxygen using electricity. The electrical energy used is thus stored in the hydrogen. What takes place inside a vehicle fuel cell is electrolysis in reverse: hydrogen combined with oxygen transforms back into electricity and water. The electricity drives the motor, and the water leaves the vehicle through the tailpipe. And there are no other emissions. Aside from its use in fuel cells, hydrogen can also be combusted directly in a reciprocating piston engine (see box). And MAHLE is already working on that too.

## » Interest is booming

So there's no shortage of hydrogen. What's more, it's an efficient energy storage medium. Whatever the time of day or night, hydrogen can be produced cost-effectively on a decentralized basis using renewable electricity from wind, solar, or hydropower. It can then be stored flexibly and transported, so that it can be converted back into energy elsewhere later. These are all promising factors that point to a climate-neutral energy supply in the future. That's why there are many hydrogen infrastructure development programs currently underway worldwide.



## COMBUSTION-DRIVEN CARBON-NEUTRAL VEHICLE

» Your eyes aren't deceiving you—this is exactly what MAHLE is currently working on as part of a subsidy program. The goal is to run commercial vehicles with internal combustion engines on hydrogen. The benefit is that there would be zero carbon emissions. MAHLE is responsible for developing and producing the prototype engine and valve train components for the hydrogen-powered engine with direct injection. It has commissioned a new hydrogen test center at its Stuttgart/Germany location, which is focusing on developing drive systems for heavy-duty commercial vehicles.

## » Large vehicles are first to take advantage

There are already thousands of hydrogen buses and vans in use in China today. And this is precisely the market segment that MAHLE is targeting in its extensive embrace of this technology. After all, purely battery-powered drives are not an option for heavy-duty trucks engaged in long-haul transportation. The excessively large and heavy batteries required would limit the payload capacity considerably and take too long to charge. What would be the commercial sense in that? Hydrogen storage systems, however, are “comparatively” light and simply have to be refilled, like the tank of a combustion engine vehicle. MAHLE therefore considers fuel cells and batteries to be complementary, not competing, technologies. So H<sub>2</sub> has good prospects.

## » We keep fuel cells running

MAHLE already has around ten years of experience with hydrogen and is able to make full use of its expertise in filtration, thermal and air management, and power electronics. After all, spare parts and diagnostics solutions will be needed here in the future as well. Visit [mpulse.mahle.com](https://mpulse.mahle.com) to read about the role MAHLE products play along the air pathway.





## »»POWERTRAIN TECHNOLOGY

# FURTHER OPTIMIZED

Although the number of electric vehicles on our roads is increasing, further optimizations can still be made to the technology to improve acceptance, sustainability, and efficiency. MAHLE is playing a key role in this.



## E-FUELS HAVE STRONG POTENTIAL

MAHLE also considers the climate-neutral combustion engine, which is powered by nonfossil fuels, to be one of the key future technologies for a sustainable powertrain mix. And the good news for you is that many MAHLE components, such as filters and engine parts, are "e-fuel ready" right now. Over several test runs, MAHLE has worked with Porsche to determine how much e-fuel can be admixed without having to modify the motor, software, or the various filters. The findings show that up to 20 percent is feasible. No measurable difference in the combustion process was found up to this limit. Emissions behavior was actually even better than for purely fossil fuels in large areas of the operating map.

### > Magnet-free electric motor

MAHLE has developed a magnet-free electric motor that doesn't require rare earth elements, making it more sustainable and environmentally friendly to manufacture. It may sound unbelievable, but the level of efficiency is over 95 percent in the most common driving conditions! This puts it on par with a Formula E race car. The key to this is the inductive power transmission, which allows the motor to operate without wear and highly efficiently, particularly at high speeds.

### > Faster charging

In addition to cruising range, charging speed is a pivotal factor in the adoption of e-mobility. With chargeBIG POWER, MAHLE is taking a major step toward fast charging with outputs of up to 750 kW. This charging management system can be integrated at low cost into existing infrastructure, which is particularly important along long-distance routes. Thanks to the intelligent control of the load distribution in the power grid, the charging system enables as many electric vehicles as possible to be charged from the available power supply at the same time.

### > Improved cooling

MAHLE applies the physical principle of immersion to battery cooling. Ultimately, the temperature of the energy storage device is critical to achieving fast charging speeds. In immersion cooling, an electrically nonconductive coolant flows around the cells. This keeps the temperature much lower during charging and makes sure that heat is distributed more evenly in the battery. The result? Considerably shorter charging times for electric vehicles. Traction batteries can also be designed to be smaller, making electric cars cheaper and more resource-efficient.



# — RELIABLE AND FUTURE-ORIENTED —

If you run an automotive workshop these days, you have to invest: in expertise and new equipment. You'll get both from MAHLE. And you can be confident that you're spending your money wisely, because the technology in our solutions is not only market-leading, but also designed with the future in mind. To make sure that you receive the best possible support, we offer a service hotline manned by our highly specialized and knowledgeable experts — and that's in addition to sales, repairs, maintenance, and the calibration of equipment and diagnostic tools. Just call us if you need assistance.





# LIGHTNING FAST

**MAHLE's Digital ADAS 2.0 combines efficiency and effectiveness with extreme precision and is currently the fastest calibration tool on the market.**

A heroic performance: now there's time to start work on the next customer's job—or enjoy a coffee break.

In comparison with competitors' products, Digital ADAS 2.0 reduces preparation time by 80 percent. That's because the digital calibration panel aligns fully automatically to the car, which doesn't need to be moved. Our digital calibration system gives you absolutely reliable results.

**1** Place the Digital ADAS unit in front of the vehicle.

**2** Plug the VCI into the OBD port and select the vehicle. In countries with VIN lookup, vehicle identification via the license plate is fully automated if the optional webcam is installed.

**3** Attach wheel clamps to the front wheels and align them. Move the laser rangefinders into position. That's all your prep done!

**4** The laser rangefinders automatically measure the distances to the wheel clamps and transmit the data to the diagnostic tool via Bluetooth. This enables the Digital ADAS unit to calculate the exact position of the vehicle in front of the calibration panel. In a virtual and automatic process, the Keystone function adjusts the target image to the vehicle's position.

**5** At the touch of a button, the calibration panel moves into the correct position in front of the camera or sensor fully automatically. Additional steps are also fully automated, such as height measurement at the wheel well. And that's it: calibration is complete!

## CALIBRATION PROCESS REDUCED TO LESS THAN FIVE MINUTES

» With its new functions, the Digital ADAS 2.0 halves the time spent on the task compared with the previous model.

Interested in getting a Digital ADAS 2.0 for your workshop? Or considering upgrading your current tool to 2.0? No problem! Take a look at the options online: [mpulse.mahle.com](http://mpulse.mahle.com).





## »SERVICE SOLUTIONS

# TIME TO GET MEASURING!

Starting January 1, 2023, workshops in Germany will need to measure the number of particles in the exhaust gas from diesel vehicles (cars, vans, trucks, and buses) that have to meet the Euro 6 emissions standards or higher. In Belgium and the Netherlands, this requirement will come into action as early as July 1, 2022, and all other countries in the EU will also have to follow suit. But don't worry — MAHLE already has a future-proof solution for you: the PMU 400.



Euro 6 diesel vehicles have been on the market since September 2015. The good news is that their tailpipe emissions are minimal if the technology and particulate filter are working properly. However, the problem is that the customary opacity measuring instruments used up to now can't measure such low concentrations of tiny particles. This means that you'll have to invest in new measurement technology if you want to continue offering emissions testing (PTI) for these vehicles.

## Designed with the future in mind

An investment in MAHLE's new PMU 400 particle counter will pay off. After all, the measurement technology used will probably also be needed for gasoline direct-injection engines. MAHLE's high-tech process—using what is known as condensation particle counter technology—satisfies the tougher limit values and higher measurement accuracy required. The PMU 400 is available as a stand-alone unit or as an add-on to the MAHLE EmissionPRO® and BRAIN BEE Emission Line equipment series.

## Highly accurate and reliable

The MAHLE condensation particle counter (CPC) counts the particles using a method called scattered light measurement, which guarantees high measurement accuracy even at low concentrations. If necessary, the unit can also be easily updated—for example, if particle counting is introduced for gasoline vehicles as well. Thanks to the CPC method, the PMU 400 is particularly reliable and low-maintenance. The flexible software structure developed by MAHLE means that the device can be operated intuitively and readily adapted to meet new requirements, making it extremely economical over its entire service life.

## LIMIT VALUES UNDER CONTROL

► An exhaust gas recirculation cooler from MAHLE is a key component when it comes to complying with the strict Euro 6 limit values. It sits between the exhaust manifold and the turbocharger and decreases the combustion temperature in the engine, thereby reducing the formation of nitrogen oxides.

## New test procedure

The maximum value for the new emissions test regulation is 250,000 particles per cubic centimeter. There are six phases to the measurement process: After a 15-second idling phase, the rotational speed is increased by at least 1,000 revolutions for 2 seconds. This causes the EGR valve to open, which means you no longer need to rev the engine until it reaches the limit. Then there's a 30-second rest phase, followed by three 30-second measuring phases. If the mean value of the first of these three test phases is already below 50,000 particles per cubic centimeter, the vehicle has passed the exhaust gas measurement test. Just to give you an idea of the figures involved: a Euro 6 diesel with an intact particulate filter will emit far fewer than 10,000 particles per cubic centimeter. If the filter's defective, this number quickly rises to between 1,000,000 and 5,000,000 particles.

## Everything included

MAHLE is working on a service package tailored to customer needs that will include regular maintenance of the entire emissions measuring station. The service concept will take country-specific requirements into account. As a result, missed test deadlines and unnecessary follow-up costs for repairs and consumables will be a thing of the past.

**Available in the MAHLE and BRAIN BEE brands.**

For more information, please visit  
[servicesolutions.mahle.com/emissionpro](https://servicesolutions.mahle.com/emissionpro).

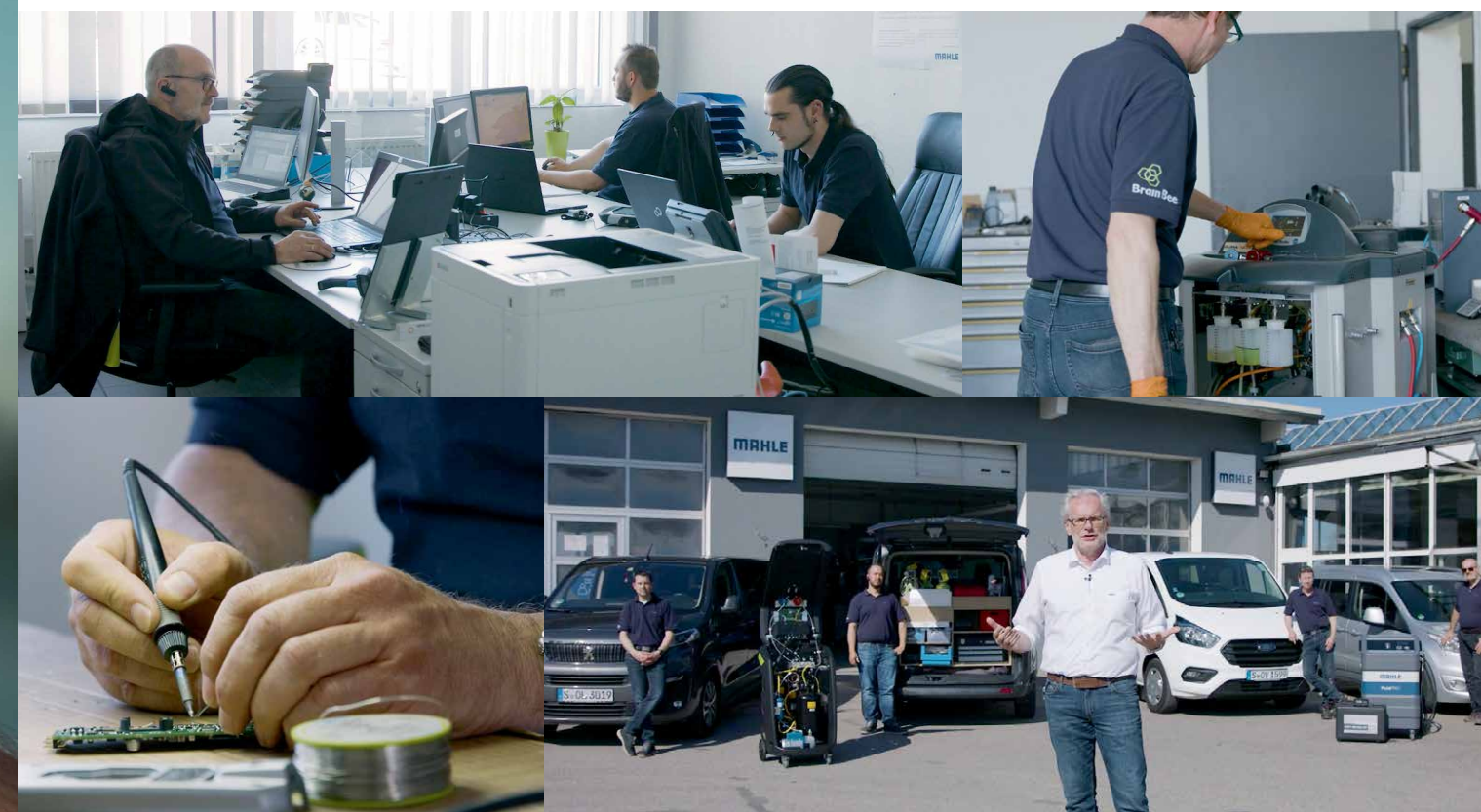




## »SERVICE SOLUTIONS

# ALWAYS READY TO HELP

**Modern, customer-friendly, competent, and professional—welcome to MAHLE in Donaueschingen! In addition to service equipment, the team at the location offers related support services.**



Since 2019, some 16 employees at our location in Germany's southern Black Forest have been taking care of purchasing, sales, repairs, a hotline, maintenance, and the calibration of workshop equipment and diagnostic tools. MAHLE made a further substantial investment in the Donaueschingen location in spring 2021 and restructured its operations expressly to meet our customers' needs and requirements.

The sales team in Donaueschingen covers Germany, Austria, Switzerland, and the Netherlands. To maintain supply capacity even during peak season and in periods of high demand, MAHLE has extended the Donaueschingen warehouse by 200 square meters. It's responsible for dispatching various pieces of equipment, such as camera calibration systems, A/C service tools, and exhaust gas measuring instruments.

As vehicle technologies become more and more complex, the demands on service and maintenance are also increasing. In order to perform maintenance work both safely and professionally, workshops need not only the right service units but also the expertise to use them. That's why our Donaueschingen location has dedicated facilities where we can train you to get the best out of your equipment.

Our highly specialized and knowledgeable experts have many years of practical experience and are happy to help customers

with their inquiries. Problems both big and small can be dealt with over the phone via our service hotline. Our experts can also connect directly to your equipment using our Remote Service function. "You can rely on our technical employees to find the right solution for any situation," promises location manager Helmut Häussermann.

In the workshop, the Donaueschingen team carries out calibrations, maintenance, official verifications, and repairs on service equipment. The facilities are already designed to handle high capacities. To assist customers in emergencies, MAHLE Service Solutions can also offer equipment rental. Customers don't even have to bring their equipment to the location: our technicians can also come to your workshop to perform any service work. Our experienced team can help you with trade fairs and presentations or train you to use your equipment and give you the support you need during initial operation. Exhaust gas measuring instruments can also be calibrated on site. Häussermann sums up the service team's approach with the motto, "Always ready to help."

You're welcome to look around MAHLE Service Solutions in Donaueschingen for yourself if you'd like. "We'd be delighted to have you visit us in person," says Helmut Häussermann. There are certainly plenty of interesting things to discover in the redesigned showroom.



# THERMAL MANAGEMENT MADE BY MAHLE

If it says MAHLE on the outside, it's guaranteed to have OE quality on the inside. This also holds for A/C compressors, the key element of any A/C system. Join us as we take a look at our Hungarian plant in Balassagyarmat. This is where MAHLE produces belt-driven A/C compressors for almost all widely known automobile manufacturers. Since 2019, the location has also supplied electric compressors, which are installed in all electric cars and most hybrid vehicles. There are a few things you need to bear in mind when servicing the A/C systems in these types of vehicles, especially when it comes to compressor oil. We'll give you the lowdown.





## » THERMAL MANAGEMENT

# SPOTLIGHT ON: THE MAHLE A/C COMPRESSOR



**Not every supplier of A/C compressors on the aftermarket is an original equipment manufacturer. But we are, which means we can draw on development and production expertise and offer OE quality from our own plants.**

Quality is probably the most important criterion when it comes to replacement parts. We never compromise on this at MAHLE, so you can be sure you've always got a quality item in your hands. Vehicle manufacturers have extremely tough requirements for the air conditioning compressors that are at the heart of any air conditioning system. With the shift toward e-mobility, the importance of the air conditioning circuit also continues to grow, as it not only cools the vehicle cabin but also keeps the high-voltage battery within the right temperature window. Being an original equipment supplier in this field is a real mark of quality for any manufacturer.

## » More than two decades of experience

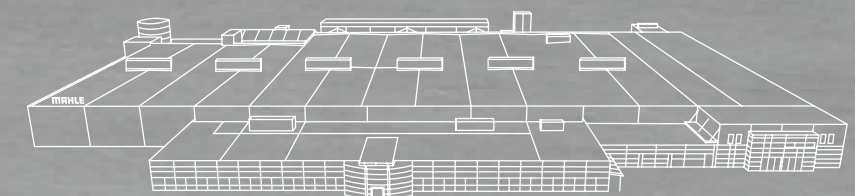
MAHLE produces air conditioning compressors for almost all well-known automobile manufacturers—not only at plants in Mexico, Brazil, and China, but also at its site in the northwest of Hungary, close to the border with Slovakia. Thanks to its central location, Balassagyarmat supplies vehicle production lines all over Europe and further abroad. The plant was established more than 20 years ago, quickly obtained original equipment orders, and knows how to satisfy the needs of its demanding clientele when it comes to air conditioning compressors. MAHLE took over the Delphi site in 2015 and integrated it into its development and production network. Because of this original equipment competence and our more than 100 years of experience all told, we now count many European vehicle manufacturers in the passenger car and commercial vehicle segments among our customers.

## » A technology leader

MAHLE opened the world's first production line for electric compressors in Balassagyarmat in 2019. The plant is of major strategic importance, as the e-compressor is central to the thermal management of the electric powertrain. Thanks to efforts spanning various time zones and languages, the e-compressor was quickly brought into successful series production. Current customers primarily include international manufacturers in the premium and sports car segments. MAHLE is therefore able to build on its position as a complete systems provider in the field of air conditioning for electric vehicles too.

## BALASSAGYARMAT IN FIGURES

- » 18,000 m<sup>2</sup>
- » 12,500 m<sup>2</sup> of this is production space
- » 651 employees
- » 2,000,000 A/C compressors per year
- » 90% of these for cars and 10% for commercial vehicles





## » THERMAL MANAGEMENT

# NO MORE MIX-UPS

**An A/C service is a lucrative and routine task. But when choosing compressor oil from all the different options available, there are a few things to bear in mind—especially for hybrid and electric vehicles. MAHLE has a smart solution to give you a helping hand.**

Out with belts, in with electricity: all electric cars and most hybrid vehicles have electrically driven A/C compressors. That's not a problem in and of itself, provided that there's no water involved. As we all know: electricity plus water is a recipe for a short circuit!

## No mixing

Because of this concern, vehicle manufacturers use nonconductive POE oil in vehicles with electric air conditioning compressors (+200 volt) ex works. After all, the compressor oil comes into contact with various components, including the coil of the air conditioning compressor's electric motor. The disadvantage of using POE oils is that they're hygroscopic, which means that they absorb moisture from the ambient air. As a result, the compressor oil can become an electrical conductor if the drier cartridge in the air conditioning system isn't replaced regularly.

Another problem occurs when different compressor oils mix in A/C service units. Standard SAE J 2843 H stipulates a maximum permissible oil cross contamination level of 0.1 percent.

That's why the other oil types have to be completely removed from the service unit hose and internal lines when performing an oil change. If this isn't done, the result is an oil with reduced insulation capacity, which can cause a short circuit in an electrically driven compressor. There's also a risk of the blended oil degrading and losing its lubricating properties.

In MAHLE A/C service units, the air that's drawn in passes through a desiccant before entering the oil tank, so it's completely dry. A special flushing process uses refrigerant to clean all internal and external hoses. These measures stop moisture from getting into the A/C service units and prevent cross contamination.

## TECHNICAL TIP: GET THE OIL FILLING QUANTITY RIGHT WHEN REPLACING AN A/C COMPRESSOR

When fitting a new A/C compressor, it's imperative that you flush the entire A/C system beforehand and replace all consumables and nonflushable components (filter-drier and expansion or throttle valve). As one A/C compressor may be used for different vehicle models, you must check—and, if necessary, adjust—the compressor's oil filling quantity before installation:

- 1) Use the drain screw to drain off the oil into a clean container and measure the quantity of oil
- 2) Top off with fresh oil or reduce according to the manufacturer's guidelines (follow the oil specification!)
- 3) Fill the air conditioning compressor with the quantity of oil specified (system oil volume)
- 4) Fit the drain screw using a new seal
- 5) Belt-driven compressor: stand the compressor vertically for three minutes (belt pulley facing downward)
- 6) Belt-driven compressor: with the compressor horizontal, manually rotate the belt pulley ten times

You can find more details in our Technical Messenger issues **Ensuring Correct A/C Compressor Oil Filling Quantities** and **Oil Quantity Distribution in Air Conditioning Circuits** available from [mahle-aftermarket.com/services](http://mahle-aftermarket.com/services).

## Many requirements, one solution

We recommend reaching straightaway for MAHLE multigrade oils. You can use the AA1 version of our PAO 68 oil (without leak detecting agent) in almost all air conditioning systems in vehicles with a combustion engine or an electric or hybrid drive, whether these are driven by conventional piston or electric compressors. The PAO 68 AA3 version is available for vane compressors.

Both oils are suitable for refrigerants R134a and R1234yf. Another big advantage is that our PAO oil is nonhygroscopic. This makes it not only practical but also more economical to use and store. Our multigrade oils have been tested by manufacturers and independent institutes, meet the highest standards, and have absolutely no negative effects on components in either the automotive air conditioning system or the air conditioning service unit.



You'll find information on filling quantities for the most common vehicle types in our current filling quantities manual for refrigerant and A/C compressor oil: [mahle-aftermarket.com/filling-quantities](http://mahle-aftermarket.com/filling-quantities).



# ALTERNATIVE WITH FITNESS BENEFITS

**We're all familiar with courtesy cars, but have you thought about using e-bikes instead? It's worth considering the benefits.**

Two instead of four for 24? That doesn't sound like good business. But actually, it is, as these figures represent a smart approach for workshops who want to present their customers with an alternative means of getting around. They can offer the option of switching from four wheels to two—for 24 hours.

Offering a suitable replacement vehicle to workshop customers may be standard practice for many authorized dealers, but it's quite a headache for independent workshops. Acquiring, taxing, and insuring the vehicle, the running costs and, above all, the time needed for cleaning and maintenance are factors that cannot be overlooked. And then the vehicle often takes up valuable space in the yard or garage when not in use.

## › E-bikes offer opportunities

It's a different story with e-bikes, which are much cheaper to buy, incur far lower running and maintenance costs, and take up less space, while offering what is a new mobility experience for many people. But are e-bikes the answer for all workshop customers? Demand for bikes as replacement vehicles might initially be limited in rural areas, where many customers rely on their cars. But they are still worth considering even here, as they can comfortably cover more than 50 kilometers on a full charge. At a speed of 25 km/h, commuting to a place of work located 10 kilometers away takes less than half an hour.

## › Less cost, more enjoyment

The picture is generally different in built-up areas. Given the short distances, lengthy traffic jams, and the frustration of searching for parking spaces, e-bikes are a stress-free and healthy alternative in urban settings—offering real mobility benefits for city dwellers. And that's not all. Whether in the country or city, courtesy bikes have yet another unbeatable advantage: they can really help you stand out when it comes to marketing your workshop and building your image. For instance, you might want to run a campaign with the slogan: "Car and driver tune-ups!" And if you also have helmets and high-visibility vests on hand for customers, then your offer of two wheels instead of four for 24 hours is all set for success.



"When interest in e-bikes really took off, we dived straight in. The bike arrived in our yard in 2016 and quickly attracted the attention of our customers. We now even have customers calling us up and specifically asking to book the bike. When the weather's good, 30 percent of our workshop customers opt for a two-wheeled courtesy vehicle."

Markus Schmid, Schmid car workshop, Deizisau/Germany

"It all began around two years ago when we acquired four pedelecs as courtesy vehicles. Our customers went crazy for the idea. Our bikes were fully booked over the summer, and customers even asked if they could rent them at week-ends. This has led to a new sideline servicing electric bikes. It's small-scale now, but I definitely believe it's a service offering with future potential."

Markus Krautter, Autohaus Krautter GmbH, Stuttgart/Germany



Tell us what you think and win an e-bike for your workshop! Find out more on the back cover of this edition or visit [mpulse.mahle.com](http://mpulse.mahle.com).



# FASHION MEETS NEW E-MOBILITY

**Urwahn Bikes, a bicycle manufacturer based in Magdeburg/Germany, has launched the world's first 3D-printed luxury e-bike. And it's MAHLE's X35+ drive system that gives this head-turning creation its power. Why? Because exceptional design calls for equally exceptional technology.**

So far, e-bikes have lacked the cool factor. Bicycle manufacturer Urwahn is now changing all that, combining style and innovative strength in a powerful e-bike that's unparalleled in form, color, and function. Together with exclusive brand MCM, Urwahn has created the world's first luxury e-bike with a specially shaped, 3D-printed steel frame. The striking result unites two worlds that couldn't be more different. True to the motto "High fashion meets disruptive mobility," the company has succeeded in creating a unique e-bike in a strictly limited edition of only 50 pieces.

Even in this high-tech product segment, a stylish design can only truly shine if there's groundbreaking technology behind it. Integrated almost invisibly into the steel skeleton, MAHLE's electric drive with its wheel hub motor, battery, and control unit propels this lightweight (14-kg) bike forward with 40 newton meters of torque on the rear wheel. The long-lasting battery, with its range of up to 80 kilometers, is incorporated out of sight in the down tube and can be removed via an opening on the bottom bracket in order to carry out maintenance. In keeping with the times, the exclusive MCM Edition is controlled digitally via an app, while the bright LED headlights bring upcoming hazards directly into view.

A number of the bikes in the limited series have been on show at selected MCM flagship stores around the globe since September 2021. For more information, visit [urwahnbikes.com](https://www.urwahnbikes.com).





# FIT FOR THE SEASON?

**Eager to dig your bike out of the garage after the winter break and take it for a spin straightaway? That’s not a good way to start the new season. Think about it—are you and the bike in good shape? Peter Riedmayer has some tips.**

Before hitting the road again, it’s essential that you inspect your technology and safety equipment carefully. You can avoid significant follow-up costs by checking fluids and wear parts regularly. Keeping your motorcycle maintained will also ensure it retains its value and fun factor. So carry out a quick technical check prior to heading out: inspect the entire machine for damage and wear. Look for leaks too, especially around the engine, fork, and brakes. If in doubt, always take your motorcycle to a workshop.

### Filters

› Filter changes are a critical maintenance step for motorcycles. The rule of thumb for two-wheelers is that the higher the power output per liter, the more important it is to change the filters within the replacement interval set by the manufacturer. So you should replace the oil, air, and fuel filters every 6,000 to 10,000 kilometers, but definitely at least once a year.

### Fluids

› Check the coolant and engine oil levels—and top off as required. Follow the manufacturer’s specifications.

### Chain

› Clean the chain regularly and lubricate it with chain spray. You should always check the drive chain slack when the rear wheel is unloaded (on the center stand) and at several points on the lower part of the chain. Make sure that the slack is even. If it’s not, the chain will have to be tightened at the point with the least slack.

## PETER RIEDMAYER

Peter Riedmayer is Classic Line Project Manager with MAHLE Aftermarket and an enthusiastic motorcyclist. He has been riding motorized two-wheelers on and off road since he was 16 and has also been known to put them through their paces on the racetrack.

As a volunteer in Vaihingen an der Enz with German road safety organization the DVW, he has trained thousands of eager riders to be safe and confident on their motorcycles over recent decades.

He urgently stresses: “It’s not enough for your bike to be in top condition. As a rider, you also have to be in great shape, both mentally and physically. And don’t forget—riding your motorbike with a smile is much safer and more relaxed.” Riedmayer also recommends two books by Bernt Spiegel. For the theory: The Upper Half of the Motorcycle. For the practical side: Motorcycle training every day, currently only available in German.



### Lights

› Given a motorcycle’s narrow silhouette, being seen is vital to a rider’s survival. That’s why the law requires motorcyclists to use dipped headlights even during daylight hours. So check that your low and high beams, brake lights, and turn signals are working properly. If you find a blown bulb, you can usually change it yourself.

### Tires

› Motorcycle tires must have a minimum tread depth of 1.6 millimeters. But it’s worth changing the tires in good time before this limit is reached. Watch out for cracks or other damage (and remove any small stones). Check that your tire pressures are correct (every three to four weeks).

### Brakes

› Make sure your brake pads and brake disks meet the required minimum thicknesses. Refer to the manufacturer’s specifications for details. If you see grooves in the disks or uneven wear on parts, take your motorcycle to a workshop. Also check the brake fluid level. Important: inspect the entire brake system (calipers, lines, brake cylinders) for leaks and the lines in particular for cracks!

**MAHLE is also the number one choice when it comes to two-wheelers. After all, we’re a development partner to well-known vehicle and engine manufacturers. Take BMW, for example—when it comes to original equipment, the market leader in the two-wheeler segment relies on engine components and oil, fuel, and air filters from MAHLE: [catalog.mahle-aftermarket.com](https://catalog.mahle-aftermarket.com).**



# — WOMEN ON A MISSION —

**“Whatever women do, they must do twice as well as men to be thought half as good. Luckily, this is not difficult.” This admittedly somewhat provocative quote is from Charlotte Whitton, who became the first female mayor of a major Canadian city in the early 1950s. The sentiment often still rings true today, especially in the male-dominated automotive sector. Meet three female professionals with stories to tell about their experiences in the world of grease monkeys and car enthusiasts.**

#usethebestparts



Anna Matuschek

## “OF COURSE I’VE HAD TO COMBAT PREJUDICE. BUT I CAN EASILY HOLD MY OWN IN A WORKSHOP.”

Anna Matuschek is passionate about automobiles—both professionally and privately. As an automotive mechanic, she loves nothing more than working under the hood of a classic or vintage car, and then writing about it in her journalistic articles. As a specialist, she also gives workshops to teach women basic vehicle maintenance skills. Even in her leisure time, the 38-year-old from Stuttgart can’t keep away from the roar of engines: she’s a regular on the rally scene.

### Why did you choose this career?

Anna: I realized early on that I wanted a career that I could get stuck into and would also be useful to my friends. I inherited my love of cars from my father. He was a photographer for the Motor Presse Stuttgart media company and would take me along with him on jobs. So I trained to become an automotive mechanic at VW Hahn in Stuttgart-Wangen and capped that off with a journalism internship with a tuning magazine. Now I’m often the one behind the wheel on race days.

### Have you had to combat prejudice?

Anna: I’m a 5-foot 3-inch woman weighing 105 lbs. Of course I’ve had to combat prejudice. But I can easily hold my own in a workshop. When I started my training, the men would sometimes just leave me standing alone by the coffee machine. But I quickly proved to my colleagues that I’m more interested in cars than nail polish.

### Do you have any advice for young women interested in a career in the vehicle trade?

Anna: Be prepared to work really hard. As a woman, you’ve got to be on top of your game in this male-dominated profession. I’d advise young women to start by defining their goals in life: Where do they want to end up? And if an apprenticeship in the automotive industry will get them closer to this, then girls should use the opportunity to learn as much as possible. One thing is clear: if you expect to act like a princess or you can’t handle the occasional harsh word, then a workshop is no place for you.

### You almost have cult status in the industry. How have you managed that?

Anna: As a journalist, I regularly write for trade magazines. I even have my own series in some of them. A network and a certain level of awareness have simply grown over the years. These days, I even have the opportunity to appear on screen from time to time, I get asked to do TV shows, and I give radio and newspaper interviews. I enjoy the variety of my work. Ultimately, everything revolves around my favorite topic—automotive mechanics.

### How would you describe yourself?

Anna: I’m a real bundle of energy. As well as tinkering with cars and writing, I’ve discovered in recent years that I love sharing my skills too. In my basic workshops encouraging women to put on their overalls, participants learn how to do things like check the oil level, tell if the V-belt is about to break, and change an air filter. Proving that women really can do it for themselves.





Iwona Kornatko

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**“IF WOMEN WANT TO MAKE IT IN THIS INDUSTRY, THEY NEED STAYING POWER.”**

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A woman enters a workshop ... so begins a sexist joke that Iwona Kornatko posted on her garage's website. She opened her own automotive workshop on the outskirts of the Polish capital, Warsaw, almost 25 years ago. Women can get help there without having to put up with the kind of dumb comments featured in the joke. At the end of the day, she's heard them all herself. As author of the automotive blog Warsztat-NaObcasach, the 45-year-old explains the workings of cars in a way that can be easily understood.

**You have a Master's degree in accounting and finance. How did you end up in the automotive sector?**

Iwona: Actually, I've always been interested in cars. I finally opened a little workshop with my then husband, an electronics technician. He initially installed alarm systems in the vehicles and repaired their electrics. Business was booming. But unfortunately our marriage fell apart. Nevertheless, we've managed to keep running our beloved workshop together. We each have our own responsibilities. My ex-husband coordinates the work on the floor, while I take care of the promotional side of things. We share the customer service duties.

**Did you make a deliberate decision to focus on female customers?**

Iwona: Obviously, we always welcome male customers as well. But women should feel supported when they come to us. We want to distance ourselves from the usual clichés linked to automotive workshops. My blog makes our website stand out. It's called WarsztatNaObcasach, which translates as “workshop in high heels.” I deliberately chose a sassy name. It's important to me that our female customers feel they're taken seriously and understand why something has to be repaired or replaced in their car—both on the website and here in person.

**You're known and respected in the industry for your blog. Has it always been this way?**

Iwona: Not at all! At one time, if people saw a woman in the workshop, they assumed it was the owner's wife. At most, she might have been trusted with the bookkeeping. It took a long time for suppliers, industry colleagues, and parts manufacturers to take me seriously as a workshop owner. But I persevered. These days, nobody questions anymore whether I, a woman, know the difference between a transmission and an engine. If women want to make it in this industry, they need staying power.



Irma Gutiérrez

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**“50 PERCENT OF THE PEOPLE IN OUR COMPANY ARE WOMEN. THAT'S NOT BECAUSE I'M A WOMAN—THOSE WOMEN HAVE DONE IT FOR THEMSELVES.”**

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Irma Gutiérrez grew up in the automotive industry. She comes from a family that sells spare parts for vehicles, trucks, and machines in the Mexican state of Jalisco. After marrying, she and her husband of more than 30 years, Jorge, decided to set up a spare parts distribution business together in Durango. Since then, they've also taken over other companies in the region and established a distribution network with Irma's brothers. It's called GM TRUCKS and operates in seven cities in Mexico and the USA.

**The spare parts market is still a man's world. Did that put you off?**

Irma: I've always considered it an advantage to be a woman in this industry. However, the way you deal with prejudice is important. My positive attitude and work ethic drive me on. But this industry fascinated me even from a young age because it's very dynamic, constantly changing, and keeps you on your toes. I'm proud of my success in the spare parts market. After all, we've achieved a lot over the decades.

**How do you manage to juggle everything?**

Irma: My approach is simple—I always concentrate on whichever part I'm playing at the time. When I'm in the office, I'm focused on the business. I work in a team and make use of my resources. That's essential, because I have a lot of responsibilities and many decisions cross my desk. But when I'm with my family, I leave work at the door and enjoy the time with my loved ones.

**What drives you?**

Irma: My family. They give me the motivation to be a successful businesswoman.

**What would you say to women who want to succeed in the spare parts market?**

Irma: Set clear goals. And be persistent. Don't be fobbed off with prejudice or excuses about how you supposedly can't do something because you're a woman. It's really important to maintain a positive attitude, because that will keep you going. And it does work, because 50 percent of the people in our company are women. That's not because I'm a woman—those women have done it for themselves.

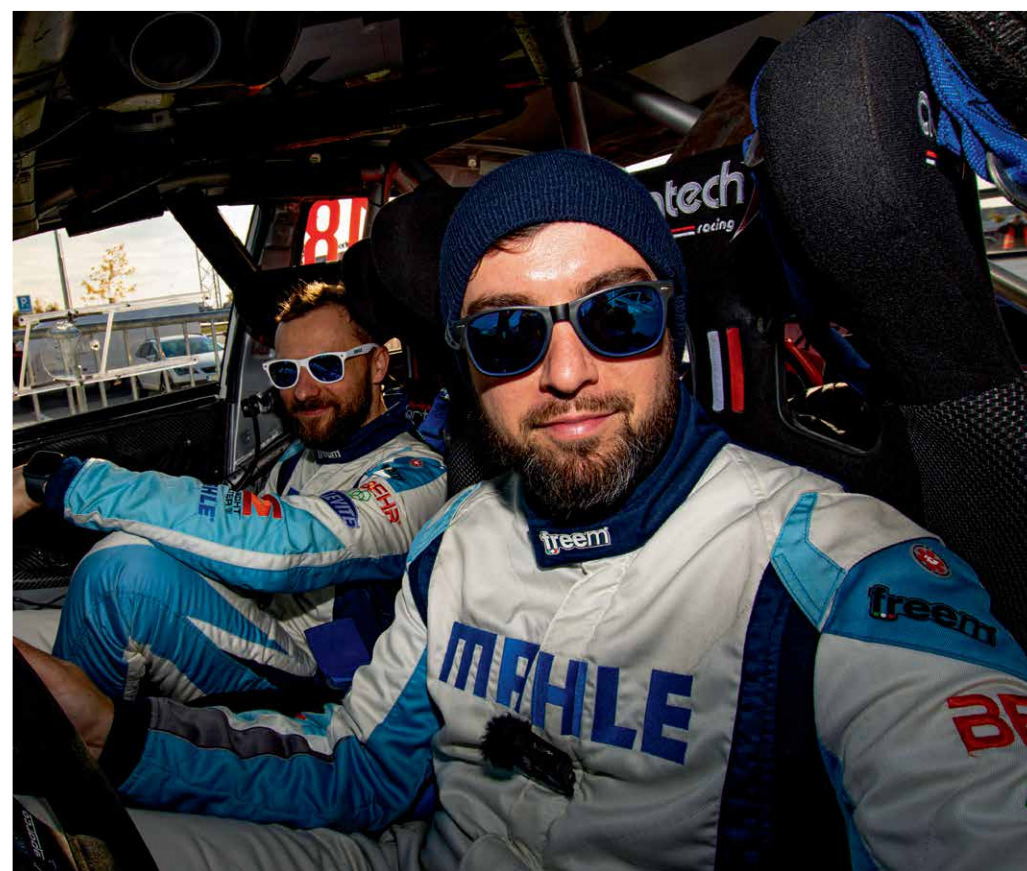


# CHAMPIONS WITH MAHLE

**MAHLE Aftermarket Polska has been a sponsor and supporter of the Revolution Rally team under driver Marcin Kowal and co-driver Sebastian Lenkowski since 2020. The team drove to victory in the Open 4WD class of the Polish Rally Championship (RSMP) in 2021. Congratulations!**

In only its second season in Poland's most prestigious rally competition, the Revolution Rally team was able to claim the title. The season consisted of one race in Lithuania, five in Poland, and one in Slovakia. These challenging rallies took place between June and October on sometimes extremely tricky asphalt, gravel, and mud surfaces. These were true tests of people, materials, and technology—and the Revolution Rally team passed with flying colors. Kowal and Lenkowski's Mitsubishi Lancer Evolution was equipped with MAHLE bearings, pistons, and filters.

The Rajdowe Samochodowe Mistrzostwa Polski (RSMP) is Poland's oldest rally and was first run in 1928. Only the Monte Carlo Rally is older, dating back to 1911.



*"2021 was a difficult season for us. We started our first full season of the Polish Rally Championship with a new car and a new setup. But everything worked perfectly. Everybody on our crew gave it their all. We're ecstatic with our results and our first rally title. We couldn't have done this without the support of our partner MAHLE. Thank you so much!" Marcin Kowal*



# THE DAMAGE DETECTIVES

Eleven damage appraisers rose to the challenge posed by three MAHLE Aftermarket technical experts, who set engine damage trails and sent the appraisers on an exciting mission to track down the causes. Let's see how they got on.

"Damage prevention: engine environment & turbochargers"—that was the topic for a two-day training course provided by MAHLE in Schorndorf, in the Swabian region of Germany. But you'd be seriously mistaken to think this involved the eleven appraisers simply attending two days filled with lectures. On the first day of training, they had to analyze ten damage scenarios based on defective parts from the engine environment. In addition to broken pistons, corroded cylinder liners, bent valves, jammed thermostats, and deformed oil filters, they were also given a brief description including key information about the damage scenario.



(Left to right) Christoph Dutschke, Manuel Diaz-Diaz, and Jan Reichenbach laid the trail that took the participants on a fascinating journey into the world of damage scenarios.







**From frowns to knowing grins**

With the trail laid, the hunt for the causes could begin. The appraisers moved from case to case, working in small groups. At one station, for instance, they explored what might have led a valve to collide with an engine's piston crown. Moments of deep thought gave way to animated discussion.



**A short quiz before the solutions are revealed**

The time went by in a flash, and the culprits would be unmasked in the afternoon. First, though, it was quiz time. Before the causes of the individual damage scenarios were explained, each participant had to use the calculator-sized orange keypads on their desks. They could choose from four answers and offer their theory about each example. It quickly became clear that the appraisers were true professionals, as their suspicions mostly proved to be correct. Christoph Dutschke is a fan of the workshop format: "We present the participants with real workshop situations, and they actually find it exciting to work on practical examples. This isn't your typical training course."



And that was just day 1. Day 2 saw the detectives shift their attention to the causes of ten turbocharger damage scenarios.



Interested? If you too would like to attend a MAHLE course with your team, please check out our training program at [mahle-aftermarket.com/trainings](https://mahle-aftermarket.com/trainings).





**Abdulsamed Ersöz, TÜV Rheinland Schaden- und Wertgutachten GmbH**  
"I'm really impressed by this workshop format. Inspection, discussion, analysis—this is exactly how we need to appraise damage."



**Thomas Wörle, Ingenieurbüro Wörle**  
"That was really challenging, given how the trainers initially tried to throw us off the scent. This showed us how important it is to pay attention to even the most unremarkable details in a damage scenario."



**Uwe Raber, SV-Büro Raber**  
"Getting to discuss and ponder the details with colleagues gave me lots of new ideas that I can apply to my own work. What more could you want?"



# NEW ON THE MARKET

#usethebestparts

We're constantly expanding our extensive offering for workshops. Here's a small selection of our new products.

## » CONNECTING ROD BEARING SET

**Vehicle type:**

Passenger cars

**Manufacturer:**

Fiat

**Vehicle models:**

Ducato 2.3 D, Iveco Daily

**Engines:**

F1AE0481, F1AGL411

**Part no.:**

007 PS 21958 000

007 PS 21958 025

007 PS 21958 050


**MAHLE®**

## » RING SET

**Vehicle type:**

Passenger cars

**Manufacturer:**

Toyota

**Vehicle models:**

Auris, Avensis, Corolla, Isis

**Engines:**

1ZR, 2ZR, 3ZR

**Part no.:**

607 RS 10102


**MAHLE®**

## » THERMOSTAT

**Vehicle type:**

Commercial vehicles

**Manufacturer:**

MAN

**Vehicle models:**

TGA, TGL, TGM

**Engines:**

D0834, D0836

**Part no.:**

TX 259 83D


**BEHR®**

## » CHARGE AIR COOLER

**Vehicle type:**

Passenger cars

**Manufacturer:**

Audi

**Vehicle models:**

Q7

**Part no.:**

CI 640 000P

**PREMIUM  
LINE**

**BEHR®**

## » OIL FILTER

**Vehicle type:**

Passenger cars, vans

**Manufacturer:**

Ford

**Vehicle models:**

Focus IV, Tourneo Connect,

Transit Connect

**Engines:**

1.5 L EcoBlue diesel

**Characteristic features:**

For vehicles with automatic transmission

**Part no.:**

OX 1267D


**MAHLE®**

## » AIR FILTER

**Vehicle type:**

Passenger cars

**Manufacturer:**

VW, SEAT

**Vehicle models:**

Polo, up!, Ibiza

**Engines:**

DFNB, CHYC, CHYB, DSGC

**Part no.:**

LX 4632


**MAHLE®**

## » EXHAUST GAS RECIRCULATION COOLER

**Vehicle type:**

Commercial vehicles

**Manufacturer:**

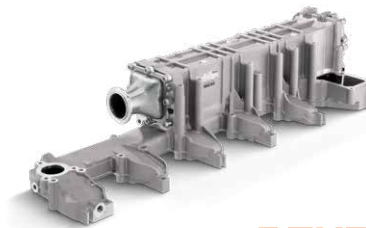
Mercedes-Benz

**Vehicle models:**

Actros MP4

**Part no.:**

CE 37 000P

**PREMIUM  
LINE**

**BEHR®**

## » CLASSIC LINE PISTON

**Vehicle type:**

Passenger cars

**Manufacturer:**

Mercedes-Benz

**Vehicle models:**

560 SE, SEL, SEC, SL

**Engines:**

M 117. 967/968

**Characteristic features:**

Returning to the range

**Part no.:**

002 85 02


**MAHLE®**

## » TRANSMISSION OIL FILTER

**Vehicle type:**

Passenger cars

**Manufacturer:**

Peugeot, Citroën

**Vehicle models:**

406, 407, 607, C5

**Engines:**

DW12TED4, ES9J4S, EW10J4

**Characteristic features:**

Includes seal

**Part no.:**

HX 238D


**MAHLE®**

## » ALTERNATOR

**Vehicle type:**

NRMM (nonroad mobile machinery)

**Manufacturer:**

John Deere

**Vehicle models:**

316GR, 317G, 325G, 320G,

324G, 318G

**Engines:**

4TNV86CHT, 4TNV98CT

**Part no.:**

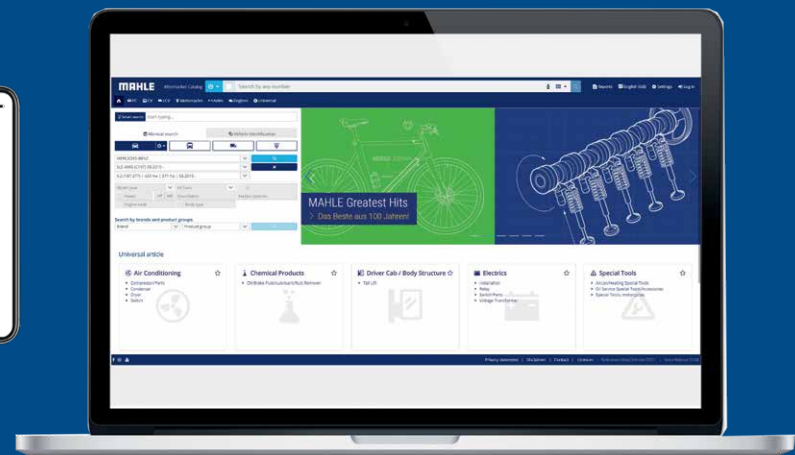
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# AFTERBURNER

Latest reports, hot topics, and electrifying news.



## MAHLE: technology partner to DTM Electric

As an official series partner to DTM Electric, MAHLE is making a significant technological contribution to the sustainable racing series. The company is currently developing and supplying the thermal management components for the traction motors, transmissions, and power electronics for the championship. It also has plans to incorporate its new immersion cooling technology, which offers a highly efficient way of cooling battery cells evenly. This is vital given the high power demands in motorsports and also means that race cars can be fully recharged in just a few minutes.

MAHLE has been active in motorsports for many decades and has brought its know-how to bear in all of the world’s major racing series. In its partnership with DTM Electric, the Group is now combining this wealth of experience with its holistic systems competence in thermal management. For example, MAHLE has been a series producer in the battery cooling segment for more than a decade.

In the future, the DTM Electric racing series will run alongside the successful DTM. It will be an additional series for fully electric high-performance race cars with over 1,000 hp under the hood, offering green, innovative, and at the same time thrilling motor-sports entertainment.

### BECOME A MAHLE INSIDER TODAY!

With our compact and concise MAHLE Insider, we'll update you each month on new products, technical information, promotions, and other MAHLE Aftermarket topics.

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**MPULSE ONLINE:**  
[mpulse.mahle.com](https://mpulse.mahle.com)

## Combined expertise

MAHLE Aftermarket and Schaeffler REPXPERT want to make sure workshops are well prepared: their training cooperation launched in Germany in 2018 aims to share both companies’ know-how with workshops and dealerships. This has resulted in a training series with programs entitled “Timing chain/valves/pistons—from error code to mechanics” and “Double clutch systems/transmission flushing—maintenance & repair instead of replacement.” The offering has also been expanded to include a “Thermal management in the combustion engine” webinar. The training has been available in Poland too since 2021. Preparations are underway to roll it out to other countries. Interested? Contact us directly at [ma.training@mahle.com](mailto:ma.training@mahle.com).



## All around the cylinder

You need a lot of experience and expertise to overhaul or repair an engine block. MAHLE Aftermarket has now combined both in its new brochure, All About the Cylinder—Technical Information, with content aimed at workshops, engine reconditioners, developers, and design engineers. It’s available to purchase from [fanshop.mahle.com](https://fanshop.mahle.com), but MAHLE customers can order the brochure free of charge at [customer-care.mahle-aftermarket.com](https://customer-care.mahle-aftermarket.com). All About the Cylinder is available in German and English.



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# HAVE YOUR SAY AND WIN!

MPULSE is your magazine for everything related to MAHLE Aftermarket and other cool topics besides. So we'd love you to tell us what you like and don't like about it—as well as what more we could cover. Your feedback will help us to make the magazine even more interesting, informative, and enjoyable for you.

All that we ask is that you take five minutes to complete our reader survey. Everybody who participates will be in with a chance to win one of two e-bikes featuring our MAHLE X35+ drive.

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Good luck!



Get involved now and win a high-quality  
Orbea Vibe H30 EQ e-bike!