

# IMPULSE

**MAHLE**

Mobility magazine  
for the  
workshop

02 // 2022  
**EURO 4.50**

## — HOW ARE YOU DOING, CELL?

MAHLE TechPRO® diagnostic tool  
with E-scan function

## — READING THE SIGNS

Practical tips for  
fitting pistons

## — TRULY SMART IDEAS

Sustainability in the  
automotive workshop

# — WORK. PERFECTLY DONE.

Supersize your business with us as your partner





From professional to professional,

Sustainability is one of the big issues of our time—and it affects all of us. As an international group, we assume responsibility toward people and the environment. Our production locations in Germany are already carbon-neutral, and we want to achieve this status globally by 2040. Our technologies, products, and solutions are also helping to make individual mobility more efficient, sustainable, and environmentally friendly. Not just on the road, but also at the racetrack and in the automotive workshop. Thank you most sincerely to everyone who is doing their bit for our future. You'll find several great examples in this issue.

New registration figures show that e-mobility is really gaining ground at the moment. But there are already a large number of electric vehicles in the repair market, too. That's precisely why we've integrated a new function into our diagnostic tool in the form of E-scan. This shows all the parameters relating to the condition of the high-voltage battery with just one click. With this function and our innovative collaborations, we're revealing the data that's hidden in the battery and future-proofing independent workshops in the process.

Automatic transmission flushing is another important topic covered in this issue. This is a service with enormous potential—and a number of challenges.

We hope you enjoy reading our latest issue!

Olaf Henning  
Corporate Executive Vice President and  
General Manager MAHLE Aftermarket



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# — TAKING RESPONSIBILITY

One word, many meanings: sustainability is tricky to define. It's easier to explain through examples. MAHLE, for instance, is committed to bringing sustainable development and technical progress into perfect alignment in the interest of efficient, environmentally friendly mobility. In doing so, we strive to reconcile the economic success of our company with the requirements of the environment, society, and our employees. The world of motorsports is also shouldering its responsibility as a trailblazer, while automotive workshops are already taking many steps aimed at protecting the climate and environment. Find out more on the following pages.



## » SUSTAINABILITY

# ELIMINATING OUR CARBON FOOTPRINT

**MAHLE is going climate-neutral. The company supports the objectives of the Paris Agreement and has committed itself to a Group-wide CO<sub>2</sub> strategy. By increasing energy efficiency, producing its own electricity from renewable sources, purchasing carbon-neutral power, and using carbon offsets, MAHLE will make its production activities climate-neutral by 2040.**

MAHLE plans to increase its energy efficiency by 2 percent each year in order to achieve this target. As one of the world's largest automotive suppliers, the company is aware of its responsibility. Although not an energy-intensive business by definition, a lot of energy is needed for smelting, machining, and brazing processes. Generating this energy from sustainable sources in the future is important for more reasons than just climate protection: from a business perspective, too, it makes sense to save energy and generate it ourselves.



## Maximum efficiency

To ensure its readiness in all other areas connected with climate neutrality as well, MAHLE has set up a dedicated Central Sustainability function, which will oversee all of the related projects. In addition to energy production, this will also include globally sustainable purchasing. The company is therefore using its own targets as a benchmark for its suppliers. The possibility of using recycled materials in MAHLE's own products is another aspect being investigated and implemented.

When it comes to developing products, MAHLE is placing greater emphasis on modern mobility, focusing on reducing fuel consumption and emissions from combustion engines and producing components for alternative drive types. The innovative MAHLE battery management system with integrated thermal management increases the fast charging capability of batteries in electric vehicles, for example. Faster charging means that smaller and lighter batteries can be installed. This improves the carbon footprint of the electric vehicle while lowering the demand for raw materials needed for battery production, which are becoming increasingly scarce worldwide.

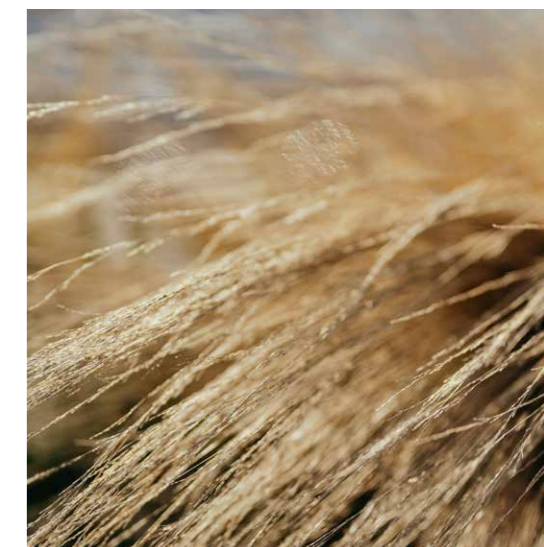
## Parma lighthouse project

All MAHLE locations in Germany have been carbon-neutral since 2021. And MAHLE has even gone a step further in Parma/Italy. The Service Solutions center headquarters, which opened in 2020, is practically emission-free thanks to state-of-the-art technology. It's MAHLE's first energy-efficient and carbon-neutral plant, with an energy efficiency rating of A+++ . Among other things, the location develops, produces, and markets equipment for driver assistance system diagnostics and calibration as well as for air conditioning and transmissions maintenance.



The electricity required is generated by the building itself. The photovoltaic array installed on the roof meets up to 70 percent of the location's energy needs on sunny days. The PV system will be extended in 2022 to make the Service Solutions Center self-sufficient, even at peak production times and when additional heating or cooling is needed. Further measures for opti-

mizing energy consumption include state-of-the-art materials and construction methods, LED lights with motion sensors, and sophisticated components for air conditioning and heating. All of this is not only good for the climate, but is also reflected in the bottom line: by the eighth year of operation, the extended photovoltaic system will have already paid for itself.



## Pioneering role

MAHLE's efforts have triggered a huge positive response from customers. Volvo presented its Green Energy Award to its supplier Chengdu MAHLE Automotive Thermal Systems for its use of electricity from renewables. And the plant in St. Michael ob Bleiburg was recognized last year by the Austrian Ministry for the Environment for its portfolio of measures aimed at climate and environmental protection. MAHLE's plants in Austria have been powered exclusively by electricity from renewable energy sources for many years now.



»SUSTAINABILITY

# TRULY SMART IDEAS

Do automotive workshops have a role to play in protecting the climate and environment? Of course they do! In fact, their actions can make a positive difference quickly: to their carbon footprint, bottom line, and image. For its Climate Winners campaign, run throughout Germany together with online platform FabuCar and workshop magazine KRAFTHAND, MAHLE Aftermarket asked automotive workshops to reveal the smartest ways they were going green—and great ideas flooded in.

Rome wasn't built in a day. Even small steps can have an impact and spur us on to achieve more. Automotive workshops have had to take climate and environmental protection into consideration for quite some time now. After all, there are legal requirements in many countries covering aspects including the disposal of used parts, packaging, and fluids. However, many workshops are also actively developing their own initiatives, such as generating their own power.

The MAHLE Climate Winners campaign received over 50 submissions. Many centered on installing photovoltaics, switching to renewable heating systems, lighting, using rainwater to wash tires, floors, and vehicles, choosing battery-powered rather than pneumatic tools, insulating, and no longer using disposable paper towels. What all of the initiatives have in common is that they're better for the environment and improve

the workshops' carbon footprint. The jury had a tough job selecting the best ideas!

#### Climate-friendly A/C service

The MAHLE air conditioning service units in the ACX series are both climate-friendly and economical. The E<sup>3</sup> technology is based on three elements: With the patented E<sup>3</sup> fill process, the air conditioning system can be filled regardless of vehicle and ambient temperature. With the E<sup>3</sup> pump, the internal cleansing process for the vacuum pump, oil change intervals can be extended to up to 1,000 operating hours, and the annual oil change is no longer necessary. In addition, the E<sup>3</sup> connect couplings allow the refrigerant to be fully recovered from hoses and service fittings. This ensures that no environmentally harmful refrigerant is released, reducing costs.

## JÜRGEN HACHTEL



Jürgen Hachtel, owner of KFZ-Hachtel in Leuzendorf in Baden-Württemberg, connected his workshop to the district heating system of the nearby biogas power plant. This has resulted in annual savings of around 8,000 liters of heating oil. To further reduce energy consumption, he installed a 15 kW photovoltaic system on the roof of his new, fully insulated workshop. By switching from pneumatic to battery-powered tools, he has also been able to retire his power-guzzling compressor. As there's lots of groundwater in his area, he has sunk his own well to cover some of his workshop's water requirements. Instead of disposable towels, his team now uses reusable cloths for cleaning.



Proud winners of the MAHLE A/C service units: Jürgen Hachtel, top, and Florian Wimmer, bottom. The runners-up in third through sixth places didn't go empty-handed either. They each received a MAHLE OzonePRO device for the hygienic cleaning of vehicle cabins.



## FLORIAN WIMMER



Florian Wimmer from Auto Wimmer in Tacherting, Bavaria, wanted to move away from oil. As the owner of a small woodland, he decided to switch to a wood chip heating system. He generates his own electricity through the photovoltaic system installed on the roof of his new workshop, while his 6,000-liter rainwater cistern collects all of the water needed for washing tires, floors, and vehicles.



## »SUSTAINABILITY

# THINKING AND ACTING SUSTAINABLY

**Interview with Kathrin Apel, Global Head Sustainability & HSE at MAHLE. In this role, she is responsible for the company's sustainability management system, which covers occupational health and safety and environmental management in addition to climate protection.**

**Ms. Apel, who or what is driving the company on the issue of sustainability?**

MAHLE has extensive experience in sustainability matters. Most of the momentum comes from within the company itself. But we're also motivated by the demands and expectations of our business partners—especially those of our customers. And working for a company that operates sustainably is important to our employees. That motivates us to continue to set ambitious targets.

**What are they?**

Our ideas and objectives set standards when it comes to sustainability. Firstly, our technical developments target efficiency and sustainability, and are particularly aimed at protecting resources and the climate. Secondly, we operate in a way that ensures the measures support our economic stability. Climate protection is also a top priority: we want to reduce our CO<sub>2</sub> emissions by at least 55 percent compared with 2018 levels by 2030 and make our production locations worldwide climate-neutral by 2040. This is already the case for our German plants today.

**How is MAHLE hoping to achieve this?**

As an industrial company, generating our own electricity is an important measure. We carried out two reference projects with photovoltaics in Parma/Italy and Montblanc/Spain in 2021. We want to build another ten PV systems by the end of this year. This will not only reduce our emissions, but also increase our independence from the energy market. Furthermore, we're working intensively on improving the energy efficiency of our locations as well as on purchasing carbon-neutral electricity.

**Sustainability is about more than climate protection alone. What are MAHLE's other areas of focus?**

We're implementing a system for our suppliers that will allow us to monitor sustainable purchasing and respect for human rights worldwide. Because our employees are important to us, we want to make further improvements to occupational safety as well. We're also committed to increasing the proportion of recycled materials that we use. When we think and act sustainably at MAHLE, synergies are created. This means that the initiatives are mutually reinforcing, which benefits us as a company and our employees just as much as it does our customers and the environment. That's why I believe sustainability is all-encompassing.



## Three great energy-saving ideas for workshops

# 1

Turning down the workshop thermostat by 1 degree Celsius can reduce your heating bill by around 6 to 8 percent. Setting the temperature 5 or so degrees lower at night cuts heating energy use by 10 to 15 percent.

# 2

In pneumatic systems, a pressure increase of 1 bar increases the power demand by 7 to 10 percent, so leaks in compressed-air lines can rack up costs quickly. Fifty percent of compressed air is often lost this way, so there's enormous potential to make savings by eliminating leaks or switching to battery-powered tools.

# 3

LED bulbs use approximately 85 to 90 percent less energy than a conventional bulb and 80 to 85 percent less than a halogen bulb to provide the same brightness. Significant electricity savings can be made by using lighting zones and motion sensors that switch different lights on and off as needed.



## A CLIMATE-NEUTRAL READ

We're also doing our bit to increase sustainability with our workshop magazine. After all, the print version of MPULSE is a climate-neutral product. For example, we offset the 8,258 kilograms of CO<sub>2</sub> generated producing the last issue. The money we pay to offset these emissions benefits worldwide marine protection projects. Ten kilograms of plastic waste are removed from our oceans for every metric ton of CO<sub>2</sub> that we offset. Details about these offsetting measures and the projects that we support can always be found on page 2 of the magazine: simply scan the QR code to learn more.



» SUSTAINABILITY

# ON THE RIGHT TRACK

The first ever motor race took place in 1894 and featured vehicles with 20 different types of drive. Motorsports have enjoyed mass appeal ever since. After all, racing is about much more than speed—it's about emotion and passion as well as cutting-edge technology and engineering. As sustainability and issues concerning environmental and climate protection are key challenges of our time, motorsports are also called upon to shoulder their responsibility given their prominence. And they're doing so. From MAHLE's perspective, too, motorsports are helping to drive the mobility of the future in terms of both the electrification of the powertrain and the further development of the conventional combustion engine.



TV audiences of billions, millions at the track: people around the world are passionate about motorsports, which also puts them in the public spotlight. In terms of sustainability, too, motorsports have always blazed a trail. In December 2020, the FIA (the governing body of world motorsports and the international federation of leading motoring organizations) adopted an ambitious environmental strategy. One of the objectives was to achieve carbon neutrality by 2021, on route to net zero by 2030.

#### Formula 1 as a pioneer

As early as 2014, long before the boom in e-mobility, Formula 1 mandated the use of V6 hybrid engines. Thermal efficiency of more than 50 percent was achieved with this innovation—the highest of any engines in the world at the time. Enormous progress has also been made in battery technology. The efficiency of

the current F1 hybrid drives is unparalleled. They deliver more power while consuming less fuel—and therefore emit lower levels of CO<sub>2</sub>. As the ultimate racing spectacle, F1 has always driven new technologies that have then found their way into conventional road vehicles.

The research, development, and production of a sustainable fuel by the FIA has been another significant step toward achieving its environmental goals. For example, Formula 1 introduced E10 fuel for the 2022 season, a second-generation biofuel made from either waste products or nonfood crops. The fuel should be 100 percent climate-neutral by 2026. This poses a big challenge for engine and component developers like MAHLE.

## FRED TÜRK, VICE PRESIDENT MAHLE MOTORSPORTS

"Following hybridization, Formula 1 is now also making the switch to sustainable fuels. We have to adjust our development activities accordingly. We have major work packages ahead of us to align the engine components to the new fuels. Cooling will also have to be optimized with new materials and geometries for greater efficiency and endurance under peak load."



## »SUSTAINABILITY

# DTM ELECTRIC INNOVATION LAB

MAHLE is working hard to ensure there will be fully electric DTM race cars on the track in 2023. The DTM Electric racing series is set to deliver incredible sporting challenges around the world in the near future. With more than 1,000 horsepower and top speeds of well over 300 kilometers per hour, the series will offer sustainable motorsports of the highest caliber.

As an official technology partner, MAHLE is supporting the new all-electric racing series from the outset—in development and as a supplier. “The vehicle technology for DTM Electric is highly sophisticated. We can take important lessons from it for series

production applications and develop new solutions for the e-mobility of the future,” says Fred Türk, Vice President MAHLE Motorsports. MAHLE is developing and supplying innovative thermal management solutions for the traction motors, transmissions, and power electronics to be used in the DTM Electric championship’s fast touring cars. But the MAHLE engineers have even more innovations for this series up their sleeves, such as immersion cooling, 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 a matter of minutes.



## GERHARD BERGER, DTM

“Motorsports have always provided the impetus for series production. Close, constructive cooperation with technology partners is essential. I’m delighted that we’ve gained another top-level partner for the DTM platform with MAHLE. In the context of this partnership, MAHLE will support not only the DTM racing series, still dominated by the combustion engine, but also the transition to electric, which we hope will attract new fans and target groups—primarily with the DTM Electric championship. MAHLE’s expertise will help us support DTM and contribute to the development of DTM Electric in order to get this fascinating racing series onto the starting grid.”



### Optimizing the combustion engine

There’s no doubt that e-fuels will also become increasingly important in other motorsport series. MAHLE has been a technical partner of the DTM, or German Touring Car Masters, for many years and contributes, among other things, its expertise in the use of sustainable fuels. This represents extra development work for manufacturers, teams, and suppliers. “We’re also involved in this area as a partner to various manufacturers. And we’ve been instrumental in the DTM’s decision to switch to new fuels, which will happen very soon and will make the championship increasingly sustainable,” explains Fred Türk.





# — WORK. PERFECTLY DONE.

#workperfectlydone

Short distances or long haul; day and night; in windy, wet, cold, and hot conditions; on asphalt and gravel, or through fields and meadows: the vehicles that keep our world running have to cope with a wide range of challenges. And the workshops that maintain and repair these vehicles every day need one thing above all: an experienced, reliable, and innovative partner. Which is why we've got your back. With OE quality, an extensive range, and our top services, we make sure that you can focus wholly on your job and that everything runs smoothly.



#workperfectlydone

## VANS: CITY, COUNTRY, FREEWAY

Vans serve a whole range of purposes: whether as delivery vehicles for parcel and courier services; as technical support and customer service vehicles; for transporting tools, materials, and personnel in trade businesses; as sales vehicles with special adaptations; or as fire trucks and emergency vehicles.

Although vans share many assemblies with passenger cars, these agile, fast, and light commercial vehicles often face similar stresses to trucks. They are mostly used commercially and have to deliver a reliable performance under even the toughest conditions—fully laden and against the clock. Robust, high-quality components and parts are a must when faced with heavy loads, poor road conditions, high speeds, and constant stopping and starting.

## HEAVY-DUTY TRUCKS: IN IT FOR THE LONG HAUL

Large, heavy, powerful: trucks are designed for long service lives and high mileages. The demands placed on them are tough. Forwarders, fleet operators, and drivers face constant cost pressure, and downtimes must be kept to a minimum.

For commercial vehicles, too, new regulations aimed at cutting consumption and emissions are driving the ongoing development of powertrain technology. Lower fuel consumption reduces the total cost of truck ownership. Efficiency gains can be achieved through, for example, new valve train systems with variable valve timing as well as functions such as engine braking, exhaust gas temperature management, and reduced compression ratio to lower the combustion temperature and pressure level. Improvements in engine mechanics relieve the strain on the oil circuit, among other things. All of this calls for plenty of know-how in carrying out repairs and replacing parts as well as a partner that can deliver those parts with the quality, availability, and market coverage required for quick repairs.

### OUR PORTFOLIO FOR VANS:

- › Engine components
- › Seals
- › Filters
- › Engine cooling & air conditioning
- › Starter motors & alternators
- › E-mobility & electronics
- › Workshop equipment & diagnostics



### OUR PORTFOLIO FOR TRUCKS:

- › Engine components
- › Seals
- › Filters
- › Engine cooling & air conditioning
- › Starter motors & alternators
- › E-mobility & electronics
- › Workshop equipment & diagnostics



#workperfectlydone

## AGRICULTURAL MACHINES: TOUGH ON ALL TERRAIN

Tractors are in use around the clock, especially at harvest time. They are the vehicles of choice when it comes to tilling the land, sowing, mowing, applying fertilizer, and caring for crops. They pull forage wagons, chippers, and balers, roll fodder piles in bunker silos, mix, distribute feed, and are used to move crops without damaging the soil. In other words, they're powerful and versatile machines on all terrain in all seasons—and essential to daily farm work. Construction sites have become another important area of application for tractors, especially because of their outstanding off-road capabilities, good ride comfort, and excellent all-round visibility.

Maintenance times for tractors can usually be scheduled for convenience, but downtime for repairs is frustrating because it brings work to a standstill. Performance and reliability are improved by using high-quality parts, such as oil, diesel, and air filters. When combined with efficient cooling of the engine, transmission, fuel, and hydraulic circuits, tractor operating hours can be increased and fuel consumption reduced.

### OUR PORTFOLIO FOR AGRICULTURAL MACHINES:

- › Engine components
- › Filters
- › Engine cooling & air conditioning
- › Starter motors & alternators
- › E-mobility & electronics
- › Workshop equipment & diagnostics



## CONSTRUCTION MACHINES: THE WORK NEVER STOPS

Construction machines perform heavy-duty work day after day and are pushed to the max on every assignment. Trouble-free cold starts and high power output in traction, hydraulic, and lifting systems over long periods, continuous shifting between forward and reverse operations, precise maneuvering in tight spaces, and high torques at low speeds: the engines, transmissions, and cooling systems in construction machines have to respond reliably to extreme demands.

In shift operations with different drivers and around the clock, in all weathers, and on all terrains. In extreme heat, cold, dryness, and humidity. In addition to maintaining full functionality, safe workflows are a top priority—and this relies on construction machines being in perfect technical condition. That can only be ensured through regular, professional maintenance using high-quality parts.

### OUR PORTFOLIO FOR CONSTRUCTION MACHINES:

- › Engine components
- › Filters
- › Engine cooling & air conditioning
- › Starter motors & alternators
- › E-mobility & electronics
- › Workshop equipment & diagnostics



# COOLING TWICE OVER

**In the future, the maintenance of thermal management systems will be just as important as regular oil changes. Here too, development is ongoing, with one example being MAHLE's indirect air conditioning condenser.**

The conventional air conditioning condenser is an integral part of most automotive A/C systems and can be found at the vehicle front: hot, compressed, gaseous refrigerant is cooled here by the ambient air until it condenses. Also installed in the front engine cooling module are the main radiator and, in the case of turbocharged engines, often a low-temperature radiator for indirect charge air cooling and a fan.

#### Better performance, flexible positioning

With the indirect design and the resulting flexibility over where it can be positioned in the vehicle, the conventional air conditioning condenser at the vehicle front is no longer needed. That's because an indirect condenser doesn't make use of the ambient air. The refrigerant and additionally the low-temperature radiator coolant flow through it instead. The coolant's lower temperature is used to cool down the hot gaseous refrigerant coming from the compressor, allowing the refrigerant to liquify. As the indirect air conditioning condenser doesn't have to be installed at the vehicle front, more air can reach the main radiator and low-temperature radiator, which in turn improves the efficiency of the entire system.

#### Versatile use

An indirect air conditioning condenser has two inlets and two outlets for refrigerant and coolant as well as an integrated filter-drier in certain configurations. This makes it very compact and also reduces the number of lines. In the various designs (without drier/with drier/with drier and subcooler), the condenser can be used in vehicles with a heat pump, with an air conditioning system, or with a heat pump and air conditioning system.

The indirect air conditioning condenser offers efficiency benefits for the conventional combustion engine: fuel consumption drops, while performance of the air conditioning system and charge air cooling process increases. BMW was the first vehicle manufacturer to use MAHLE's indirect condenser in large-scale production (X3 and X4 models). This condenser is also a good technical option as a heat pump component for purely electric vehicles.

## ADVANTAGES

- › Lower fuel consumption in combustion engines
- › Improved air conditioning system performance
- › Improved indirect charge air cooler performance
- › Flexible positioning
- › Low weight and compact design
- › Can be used in electric vehicles with heat pumps



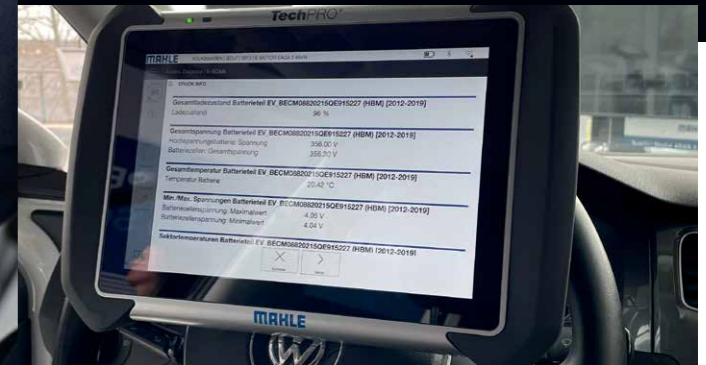
The indirect condenser for many BMW X3 and X4 models is now included in our product range. Find out more in this issue's "New on the market" overview or by visiting [catalog.mahle-aftermarket.com](http://catalog.mahle-aftermarket.com)

# HOW ARE YOU DOING, CELL?

Thanks to the E-scan function in the TechPRO® equipment range, independent workshops can now run battery diagnostics on electric vehicles for the first time. With just one click, the device provides all the information about the battery system's condition in a standardized report.

**Battery diagnostics from the charger**  
MAHLE is cooperating with software developer volytica diagnostics to obtain data on the battery condition from the charging plug as well. A special combination of charger and diagnostic tool is used to run the diagnostic check. MAHLE is thus able to get an initial assessment of the health of the vehicle battery via the vehicle's charging socket within ten minutes. This reading isn't

linked to the data provided by the vehicle manufacturer via the OBD diagnostics port, so it's completely neutral and independent. The battery data is then comprehensively evaluated and interpreted in the volytica cloud and the result is provided to the user. This innovation is another way in which MAHLE is opening up new, future-proof lines of business beyond the combustion engine for independent workshops.



There are more and more plug-in hybrids and electric vehicles on the market. What this means for you is that battery diagnostics is becoming increasingly important for the maintenance and repair of these vehicles, especially for determining their residual value. But how can you access battery system data without an original tester from the vehicle manufacturer? With other diagnostic testers, you have to read out the values individually from the control units. And that's a lot of figures. What's more, the vehicle manufacturers' battery parameters are neither uniformly named nor centrally stored, leaving you searching for the proverbial needle in a haystack.

#### Fast, comprehensive, consistent

The E-Scan function in TechPRO® diagnostic tools quickly shows you all the parameters relating to the condition of the high-voltage

battery and gives you information on the "health" of key electrical components. By using an algorithm to scan all the modules installed in the vehicle, the process takes an average of just 30 seconds. Best of all, MAHLE harmonizes the parameter descriptions used by the various automobile manufacturers and displays them via a standardized interface.

By analyzing the reports, you can learn more about the latest generation of electric motors and give your customers comprehensive information about the condition of the battery system. "With the E-Scan function, I'm convinced that we've made an important first step toward an innovative diagnostics solution for the repair and maintenance of the latest generation of vehicles," says Peter Riolo, Vehicle Diagnostics Product Manager at MAHLE Aftermarket Italy S.p.A.

All data protocols are stored locally so that you can always retrieve them without having to reconnect to the vehicle. With this function, MAHLE is giving you access to new and future-proof lines of business beyond the combustion engine.

The E-Scan function is initially available at no charge and is being installed on TechPRO® diagnostic tools during regular updates. Expanded diagnostic functions will be offered in the future within the framework of suitable licensing models.

For more information and to contact us directly, please visit [servicesolutions.mahle.com/techpro](https://servicesolutions.mahle.com/techpro)

## WHAT E-SCAN REPORTS\*:

- > Total state of charge
- > Total voltage
- > Overall temperature
- > Min/max voltages
- > Sector temperature
- > Cell/block voltages
- > Cell/block resistances
- > Cell/block average voltage
- > Battery condition

\* Depending on the vehicle brand and model



# GOOD SERVICE, GOOD BUSINESS

**Changing the oil and transmission oil filter in an automatic transmission is customer service in action. After all, this keeps the transmission in good condition and avoids the unnecessary expense of costly repairs or transmission damage, helping to retain the vehicle's value.**

Wear and tear in an automatic transmission is gradual and may go unnoticed. One big problem is that many manufacturers don't require oil changes in automatic transmissions, so it's not written in the service booklet. The oil contained ex works is expected to last the vehicle's lifetime—estimated at around 150,000 kilometers. However, a) vehicles are often driven for much longer than this and b) automatic transmission oil ages just like engine oil.

## Static is not an option

A static transmission oil change is not an option. Just draining and refilling the oil is simply a cosmetic step that would still leave 30 to 50 percent of the used oil in the torque converter, lines, oil filters, and valve body. As an automatic transmission is mechanically operated, there's friction between the clutch elements and contact surfaces. This produces material abrasion particles, which are absorbed by the transmission oil. If this oil isn't changed regularly—that is to say, every four years or 60,000 kilometers—all of that dirt stays in the transmission.

By contrast, a dynamic transmission oil change performed using one of MAHLE's FluidPRO® ATX 250/280 units replaces up to 100 percent of the oil. These devices clean transmission assemblies by flushing them with fresh oil. None of the contaminated, used transmission oil is left in the transmission. It's important to remember to change the transmission oil filter at the same time as well.



**Our tip: show your customers how important this service element is by filling a glass with used transmission oil. Put it next to a glass containing fresh oil. The difference is striking.**

## Normal aging process

Transmission oil is a wear part. It's completely normal for it to lose its lubricating properties over time. However, this increases friction in the transmission, causing the oil temperature to rise. It then "burns" (as it does in every clutch operation) and settles as oil sludge, which reduces the quantity of oil in the transmission. This gradual process may also affect mechanical components and other elements. Bearings and gears produce metallic chips that are flushed through the transmission. If the transmission oil filter is not changed for a long time, it can become blocked—all the abrasion particles and deposits travel through the transmission and cause a deterioration in shifting performance.



## IF CUSTOMERS REPORT THESE ISSUES, YOU SHOULD SUSPECT A TRANSMISSION PROBLEM AND CONSIDER SUGGESTING A TRANSMISSION OIL SERVICE:

- > Jerking during shifting
- > A humming noise when the vehicle is stopped with the gear engaged
- > Fluctuating engine speed
- > Kickdown problems
- > Difficulty shifting gears
- > Delayed downshift
- > Grinding during gear shifts
- > Vibrations



## Getting the service price right

Workshops can earn really good money through automatic transmission servicing. While this obviously requires an initial investment, it can pay for itself quickly. Workshops tend to charge between EUR 400 and EUR 700 to carry out a flush, depending on the price of the oil, replacement parts like oil pans, filters, and seals, and the time spent on dismantling and reassembly. Customers with a rough transmission are only too willing to pay this, as even an overhauled transmission would set them back around EUR 3,500.

# PREPARATION IS EVERYTHING

**Connect, switch on, done! OK, so automatic transmission flushing isn't quite as easy as that. But with MAHLE Aftermarket as a partner, you're supported every step of the way.**

A customer brings in their vehicle for an automatic transmission service. It's time for action. "It's important that an automotive professional starts by getting an overview of the type of vehicle they're dealing with," emphasizes Andreas Dippel, a technical trainer with MAHLE Aftermarket Deutschland GmbH. Depending on the gear type, different adapters are needed to connect the FluidPRO® unit. This information can be found either via a dedicated website (purchasing a unit gives you access) or in the database on the MAHLE service unit.

## Info at a glance

To find out the vehicle's gear type, it's no good searching under the Federal Motor Transport Authority (KBA) or chassis number. Instead, you have to look at the transmission identification plate on the vehicle. Using these details will give you information about the appropriate adapters (plus photos of the connection points), filling quantities, recommended transmission oil, assembly torques, and the suitable MAHLE transmission oil filter, including the part number. "This preparation is key to a perfect service. You'll find everything you need in the database," explains Dippel.

## Connection guaranteed

MAHLE currently has 65 different adapters in its range. The FluidPRO® unit comes with a 17-part standard adapter set, which can be used with numerous models from Audi, VW, BMW, Mercedes, and some French makes. "For many workshops, that already covers 80 to 90 percent of their customers' vehicles," notes Andreas Dippel. Another two sets are available to order as needed, plus individual adapters.

## Experience pays off

Automatic transmission flushing is not like an air conditioning service, where there are fixed connections that are usually easily accessible. "This job requires that a tad more experience and expertise to know, for example, where the lines run

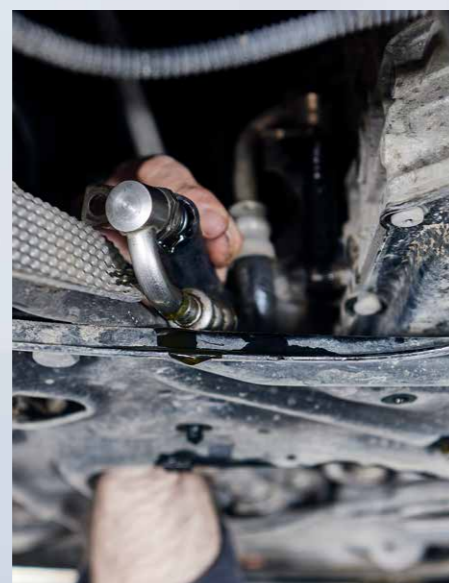
from the transmission and the best place to connect the adapters. But it's not rocket science for a professional," explains Dippel. Once the adapters are in place and the hoses are connected, the flushing unit takes over. It automatically determines the direction of flow, so that nothing can go wrong. During the flushing process, you can monitor the unit using an app on your smartphone or tablet. That's a huge advantage if, for example, you have to shift through individual gears during the flushing process. When the flush is complete, you can print out a final report as proof for your customer.

## COMPLETE RANGE FROM MAHLE:

› You can get everything you need for perfect automatic transmission servicing from MAHLE: a complete package featuring the MAHLE FluidPRO® ATX 250/280 flushing units, a comprehensive range of transmission oil filters in original equipment quality, technical and service information, and in-depth training delivered by professionals. When it comes to transmission oil filters in particular, MAHLE is really putting the pedal to the metal to offer you the broadest possible market coverage. Our "New on the market" section in MPULSE includes three new filters for many BMW, Hyundai, Audi, Seat, Škoda, and VW models.



Removing the underbody paneling is the part of the process that usually takes the most time and is frequently underestimated.



It's not always easy to find the transmission connection point you're looking for and select the correct adapter.



As a practical aid, the unit's database contains information and photo-realistic representations of the gear type, adapters, connection points, filling quantities, transmission oil, assembly torques, and the right MAHLE transmission oil filter.



Once the ATX 280 is connected, it can get to work. You don't need to worry about the direction of flow as the unit establishes this independently.



The ATX 280 is fully automated. The used oil flows on the left and the new oil on the right. The difference is unmistakable.



In clear need of replacement: the new transmission oil filter on the left and the old one on the right.



# READING THE SIGNS

Fitting a piston is a job for a professional, requiring know-how, hands-on skills, and the right tools. It's also important to check the symbols marked on the piston crown, which indicate the installation direction, among other things.



SYMBOL	INSTALLATION DIRECTION IN THE ENGINE	EXAMPLES
↑	Steering side (opposite the power output/clutch)	MB, VW, Opel, BMW
	Flywheel (power output/clutch)	Peugeot, Opel
<b>Kerbe</b> <small>(eingegossen)</small>	Steering side (opposite the power output/clutch)	Perkins, Opel
↑ <b>AV</b>	Steering side (opposite the power output/clutch), "AV" stands for the French word "avant" = front	Citroën, Renault
↑ <b>AR</b>	Flywheel (power output/clutch), "AR" stands for the French word "arrière" = back	Citroën, Renault
↑ <b>v</b>	Flywheel (power output/clutch), "V" stands for the French word "volant" = flywheel	Renault, Peugeot
	Flywheel (power output/clutch)	Renault, Peugeot, Citroën
<b>FRONT</b>	Steering side (opposite the power output/clutch)	GM, Perkins
<b>vorn</b>	Steering side (opposite the power output/clutch)	Hatz, Liebherr
<b>Abluft</b>	Exhaust air side in some air-cooled engines	Deutz, MWM
↑	Special case in pistons for two-stroke engines: direction of the exhaust manifold	Zündapp, Husqvarna
↑	Special case in some V engines: direction of the engine center	MB

This man knows what he's talking about. Christoph Dutschke began his training as an industrial mechanic at MAHLE some 39 years ago and then followed this up with mechanical engineering studies and a diploma thesis. He has now been sharing his knowledge with you for more than 30 years, both through technical training courses and over the phone via our MAHLE Aftermarket hotline.

The word "hieroglyph" comes from the Greek for "sacred carving." The ability to read these signs was clearly an advantage in ancient times. Although not quite as complex, the symbols found on the crown of MAHLE pistons are no less meaningful. "If you don't take note of the installation direction, you'll cause problems for yourself during fitting and, in a worst-case scenario, even run the risk of engine damage," emphasizes Christoph Dutschke of Technical Service Europe, who recommends marking the installation direction and position of pistons and conrod caps during disassembly. After all, these markings can often be difficult to read after cleaning.

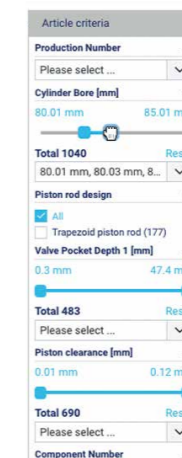
### An arrow and more

It's usually clear what an arrow pointing upward means—but not necessarily when it comes to pistons, as there are special cases depending on the specific engine. In general, the arrow on the piston should indicate the steering side. On pistons for two-stroke engines, however, it points in the direction of the exhaust manifold—and toward the engine center in the case of some

V engines. In addition to the arrow, there are other symbols that indicate the steering side, such as a cast-in notch or the words "FRONT" or "vorn." "When it comes to marking the installation direction, we go by the engine manufacturer's specifications. And these often vary widely. So it's always worth taking a look at the paperwork before starting installation," says Dutschke.

### Note the installation direction

There are pistons that must be oriented a particular way for installation in an engine. Pistons with an asymmetrical crown shape or valve pockets of different sizes fit into this category. The same is true for pistons with combustion cavities that aren't exactly in the center of the piston crown. "Don't be deceived: a specific installation direction is required even for some pistons that appear to be completely symmetrical and have a flat piston crown," explains Dutschke. That's because the piston pin in these models is slightly offset to the side rather than located exactly in the middle. Depending on the design, this offset may be less than a millimeter and can't always be seen with the naked eye.



### Our tip:

In the MAHLE online catalog, you don't always have to select a vehicle in order to choose a piston. The catalog also has a function that allows you to select and display products by dimensions. Select the brand and product group in the appropriate vehicle segment, then adjust the results list as needed under "Article criteria" (e.g., cylinder bore, pin diameter, and compression height) on the right side of the screen.

## PRACTICAL COURSES

In addition to teaching theory, MAHLE Aftermarket offers special practical training on damage prevention in the engine environment for passenger cars and trucks as well as for agricultural and construction machinery. We can be flexible: you select the topic, tell us when and where the training should take place—and we take care of the rest.

Find out more at [mahle-aftermarket.com/trainings](http://mahle-aftermarket.com/trainings)





# SIDEWAYS AT FULL THROTTLE

Drifting is extreme, for drivers and technology. Maximum concentration is needed to maintain control while intentionally oversteering at full speed. It also places extreme demands on the tires, chassis, and engine. Vaughn Gittin Jr., one of drifting's most iconic figures, trusts in MAHLE Aftermarket when it comes to engine matters.

Vaughn Gittin Jr. is a world champion drifter, off-road racing champion, and professional fun-haver. He's best known for his aggressive, "big-smoke" driving style from behind the wheel of arguably the most recognizable car in this motorsport: the Ford Mustang RTR Spec 5-D.

The cooperation between MAHLE, Vaughn Gittin Jr., and the RTR Motorsports team began in 2018, based on their shared professionalism, passion for motorsports, and unwavering focus on results.

Ever since, MAHLE has made a significant contribution to the success of the RTR team. Engine bearings, seals, pistons, and rings made by MAHLE can all be found on board the drift vehicles.



Vaughn Gittin Jr. and Chelsea DeNofa

## Awesome power

In the first year of its cooperation with MAHLE, the RTR Motorsports team already faced a big challenge: the drivers needed more engine power. With 800 to 900 hp at their disposal, they were at the lower end of the series in terms of performance. "MAHLE immediately promised support and assured us that it could handle the additional load and requirements in respect of this increased engine output. And sure enough, it delivered.

Our cars are absolutely reliable and can be controlled even with the boost in power," said Vaughn Gittin Jr. at the Formula Drift Finals in Irwindale, California/USA.

With the help of MAHLE components, the engineers were able to coax an additional 300 hp out of the engines. Vaughn went on to win the 2020 Formula Drift Championship, cementing his reputation as one of the best drifters in the history of the sport. His RTR teammate Chelsea DeNofa took second.







## On and off

Not content with being an expert on the track, Vaughn Gittin Jr. is a skilled operator off the asphalt too. In 2019, he launched the Fun-Haver Off-Road team together with champion off-road driver Loren Healy. In July 2021, RTR Vehicles presented the new 4400 Bronco, also known as the Brocky 2.0, for the Ultra4 Racing Series. The Brocky is a state-of-the-art off-road monster with a classic Ford Bronco body and a Ford Performance engine capable of delivering a thumping 720 hp. This engine is also equipped with MAHLE components. Vaughn claimed his first-ever Ultra4 Racing 4400 victory in Sturgis, South Dakota/USA, in August 2021—and won the Ultra4 Series Championship in the 4400 Class.

The success story of the RTR Formula Drift and MAHLE team continues in 2022. This year's drivers include the 2020 runner-up, Chelsea DeNofa, and legendary racing driver and RTR newcomer Adam LZ. Vaughn is taking time out from drifting in 2022 to focus on his duties as team boss. Don't forget to have fun, Vaughn!



## KEEP UP TO DATE!

-  @RTR Vehicles
-  @MAHLE Aftermarket NA
-  @RTR Vehicles
-  @mahle\_impulse\_usa

# NOW OVER TO YOU

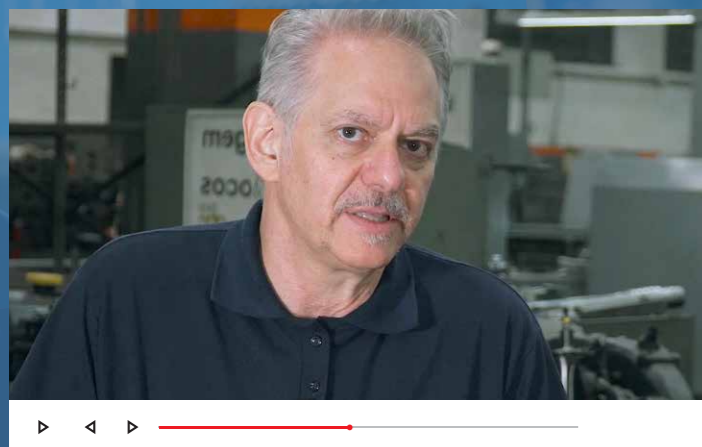


We're always interested in what's going on for you. What are your day-to-day challenges? What else can we do to support you? To get to know our customers better, MAHLE Aftermarket approached workshops all over the world. Check out our series of GREAT WORKER TALK videos to learn more about these workshops and their individual stories.

**Eswaramoorthy Ayyasamy,**  
Star Auto Parts/Star Re-Boring  
& Engineering Works,  
Coimbatore



*Every day is a new challenge for us. In particular, it's extremely important for us to have access to high-grade parts. Our focus is mainly on original equipment quality.*



**Ricardo Nunes,**  
Engine Rebuilding ABC,  
São Paulo

*We're experts in repairing diesel engines, especially for fleet operators, so we never compromise on product quality.*

**Weihua Zhang,**  
Automobile Repair Shop Harson,  
Shanghai



*New drive technologies such as plug-in hybrids and electric cars need maintenance and repair too, so we have to keep pace with developments.*



**Özer Yener,**  
Aksoy Otomotiv,  
Istanbul

*We choose parts very carefully. Using OE-quality parts from reliable suppliers increases a vehicle's service life and ensures durability. At the end of the day, customer satisfaction is our top priority.*

**Vania Gabbiadini,**  
Centro Serizi Auto Srl,  
Bergamo



*Technical training and modern workshop equipment are key to our ability to continue to perform diagnostics and repairs on vehicles in the future.*



# NEW ON THE MARKET

#usethebestparts

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

## » THERMOSTAT

**Vehicle type:**  
Motorcycles  
**Manufacturer:**  
Aprilia  
**Vehicle models:**  
RSV, RSV4  
**Engines:**  
1.0  
**Part no.:**  
TH 80 75



## » EXHAUST GAS RECIRCULATION COOLER

**Vehicle type:**  
Passenger cars  
**Manufacturer:**  
Citroën, Ford, Peugeot  
**Vehicle models:**  
C4, C5, DS4, DS5,  
Mondeo V, Kuga, 508, 308  
**Engines:**  
2.0 BlueHDi, 2.0 TDCi,  
**Part no.:**  
CE 41 000P



## » AIR CONDITIONING CONDENSER

**Vehicle type:**  
Passenger cars  
**Manufacturer:**  
BMW  
**Vehicle models:**  
X3 (G01, F97), X4 (G02, F98)  
**Engines:**  
Combustion engine and  
plug-in hybrid  
**Characteristic features:**  
Indirect air conditioning  
condenser with drier  
**Part no.:**  
AC 1130 000P



## » FUEL FILTER

**Vehicle type:**  
Passenger cars  
**Manufacturer:**  
Toyota  
**Vehicle models:**  
Avensis  
**Engines:**  
1.6, 2.0 diesel  
**Part no.:**  
KX 569D



## » OIL FILTER

**Vehicle type:**  
Passenger cars  
**Manufacturer:**  
Volvo  
**Vehicle models:**  
XC40  
**Engines:**  
1.5 gasoline engine  
**Part no.:**  
OX 1312D



## » CLASSIC LINE PISTON

**Vehicle type:**  
Passenger cars  
**Manufacturer:**  
Mercedes-Benz  
**Vehicle models:**  
190 E, 230 CE, 230 E, 230 GE,  
230 TE, G 230, G 230 GE  
**Engines:**  
M 102.982, M 102.985, M 102.987,  
M 102.989, M 102.997  
**Characteristic features:**  
Returning to the range  
**Part no.:**  
002 77 01



## » AIR FILTER

**Vehicle type:**  
Passenger cars  
**Manufacturer:**  
Mercedes-Benz  
**Vehicle models:**  
Marco Polo camper,  
V-Class, Vito  
**Engines:**  
OM 654.920  
**Part no.:**  
LX 4031/2



## » TRANSMISSION OIL FILTER

**Vehicle type:**  
Passenger cars  
**Manufacturer:**  
Hyundai  
**Vehicle models:**  
Accent, Creta, Elantra,  
i30, ix35, Tucson  
**Characteristic features:**  
For vehicles with  
automatic transmission  
**Part no.:**  
HX 254D



## » TRANSMISSION OIL FILTER

**Vehicle type:**  
Passenger cars  
**Manufacturer:**  
BMW  
**Vehicle models:**  
1, 3, X1, X3  
**Characteristic features:**  
For vehicles with  
automatic transmission  
**Part no.:**  
HX 240D



## » TRANSMISSION OIL FILTER

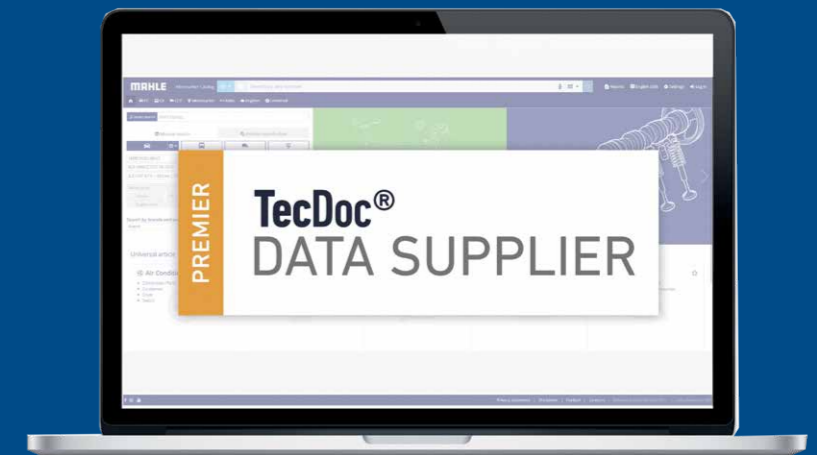
**Vehicle type:**  
Passenger cars  
**Manufacturer:**  
Audi, Seat, Škoda, VW  
**Vehicle models:**  
A1, A3, Q2, Altea, Ibiza, Leon,  
Rapid, Superb, Beetle, Caddy  
**Characteristic features:**  
For vehicles with  
automatic transmission  
**Part no.:**  
HX 191



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the trusted TecDoc Standard format:  
[catalog.mahle-aftermarket.com](http://catalog.mahle-aftermarket.com)



# AFTERBURNER

Latest reports, hot topics, and electrifying news.



## Lightest e-bike drive on the market

With its new X20 drive system, MAHLE SmartBike Systems is advancing the development of e-bike technology and setting a new industry benchmark. The X20 is even lighter than its predecessor, the X35+, is concealed within the bike—and adapts to riding behavior.

Just 3.2 kilograms! That's all the X20 weighs, including motor, battery, and components. This makes the new MAHLE system the lightest drive on the market once again. The X20 motor exerts more than 23 newton meters of torque on the rear wheel, equivalent to 55 newton meters in mid-drive motors. Two battery variants are available: the iX250, offering 242 Wh, and the iX350, delivering 359 Wh. The optional range extender can almost double the cruising range—providing enough power for extended climbs and long bike rides. By means of a docking station, this additional battery can also be used as a power bank. MAHLE SmartBike Systems has built plenty of intelligence into the X20: a sophisticated sensor package measures acceleration, speed, torque, temperature, and pedaling rate. It also uses AI to continuously adapt the drive to the person in the saddle—for a tailor-made cycling experience.

Discover all you need to know about the X20 online at [mahle-smartbike.com](http://mahle-smartbike.com).

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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](http://mpulse.mahle.com)

## Let the tool do the work

MAHLE is offering a Digital ADAS 2.0 upgrade kit for its calibration tool that uses artificial intelligence and process automation to boost speed and precision. The upgrade kit contains a horizontal bar with magnetic strips and new radar mirror holders as well as the new MAHLE laser meters, which measure the distances to the vehicle and transmit this data to the diagnostic tool via Bluetooth. At the touch of a button, the calibration panel also moves automatically into the correct position in front of the camera or sensor thanks to artificial intelligence. The upgrade kit for the MAHLE and BRAIN BEE brands is available from all authorized distributors.



## A focus on the fundamentals

It pays to be well prepared when offering an air conditioning and cooling system service. That's why MAHLE has created the AC Essentials Line, which brings together everything you need to carry out a flawless service: products, accessory parts, and consumables. Although designed for intensive and professional use in MAHLE air conditioning service units, the range is equally compatible with other equipment on the market. The AC Essentials Line includes PAG/POE/PAO oils (R134a and R1234yf), contrast agent for leak tests, leak detection kits, flushing kits with special filters and accessories, valve kits, sanitizing products, hybrid systems, and the Expert Kit: the complete package for A/C service units.



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## Time to get measuring!

Particle measurement for diesel engines is coming soon. But don't worry—we have an innovative and future-proof solution for you: our EmissionPRO® PMU 400. Thanks to MAHLE's condensation particle counter (CPC) technology, the unit counts the particles using a method called scattered light measurement, which guarantees high measurement accuracy even at low concentrations. Upgrade now to be ready for the new requirements!

Find out more at [servicesolutions.mahle.com/emissionpro](https://servicesolutions.mahle.com/emissionpro)



# MAHLE