Алматы (727)345-47-04
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
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Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
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Омск (3812)21-46-40
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Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саранск (8342)22-96-24
Саратов (845)249-38-78
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Чита (3022)38-34-83
Якутск (4112)23-90-97
Ярославль (4852)69-52-93

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GREAT WORK!

Supported by MAHLE Aftermarket

Our product range:
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GREAT WORK!
Supported by MAHLE

Every day, it is the workshops that are responsible for ensuring that millions of people around the world stay mobile. The mechanics always keep a cool head when things get complicated, responding quickly and flexibly when they're needed, learning new skills for the mobility of the future, and they're even prepared to get their hands dirty to achieve the impossible. They're real heroes!

We're there behind the scenes, watching the workshop owners' backs. After all, having an experienced, dependable, and innovative partner is all the more important at a time when mobility is rapidly changing, and economical, climate-friendly combustion engines exist alongside alternative drive concepts.

A partner who not only guarantees quality, reliability, and expertise but also knows how to navigate routes that no one has traveled before. Letting the workshops focus on their job and making sure everything runs smoothly when it comes to repairs and maintenance. So that, in the end, the only thing that takes center stage is what really counts: your GREAT WORK!

So, how do you actually do great work?

With a partner who has your back and offers an ever-expanding product portfolio that covers the following areas:

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

Everything we do at MAHLE needs to offer workshop owners and mechanics genuine added value. That's why we regularly ask ourselves the same questions: Does this spare part deliver on its promises? Is availability guaranteed?

What's it like to handle? How can we ensure that maintenance and service is possible across all models? And what's important when it comes to the mobility of tomorrow?

We believe that the combustion engine will continue to be the bedrock of a workshop's activity for a long time to come. At the same time, we know that the future belongs to e-mobility as well as to other alternative powertrain technologies and fuels.

That's why we're continuing to pursue both paths by supplying workshops with the right products and comprehensive service solutions for drives with combustion engines as well as for e-mobility, ranging from engine cooling and air conditioning to components and filters through workshop equipment and diagnostics.

We deliver performance—
even in the fast world of Formula 1

Pistons

They're constantly under fire, and their working conditions are getting tougher from year to year. The thermal load (up to 2,600°C) and average peak cylinder pressures have increased, and the inertia force loads have also become greater as a result of high-speed concepts and the trend toward larger piston strokes. Demands are rising accordingly: less weight, less oil consumption, and absolute safety—even in hot and cold load capacity testing and thermal shock endurance testing.

As a result, the overall height or compression height is continuously decreasing. The ECOFORM® pistons developed by MAHLE as new solutions save weight—the single-piece MONOTHERM® pistons, machined accordingly, weigh as little as those made of aluminum. And these, too, have been significantly refined—resulting in the aluminum piston with cooled ring carrier.

As a series manufacturer, MAHLE is committed to Formula 1, where it benefits from the wealth of experience and expertise in this premium racing class. As the world's largest manufacturer of pistons, MAHLE is intensively researching the products of tomorrow and already offers solutions for almost every engine today—quickly, reliably, and around the globe. With our pistons, aftermarket customers receive original equipment engine components and thus the guarantee that comes with all our products: tried and tested under the most grueling conditions and proven in practice. A promise you can count on.

> "The piston is a piece of metal that's absolutely essential to the operation of a combustion engine. It also serves to prevent engineers from becoming arrogant.
>
> **Ernst Mahle**

On the piston crown, you'll find the company or brand logo, the maximum piston diameter, the mounting clearance, and the installation direction according to the specifications of the relevant engine manufacturer.

The perfect piston— for every application

As the largest piston manufacturer worldwide, we offer a variety of product and material choices. Our product portfolio comprises cast and electron beam-welded aluminum pistons, as well as composite pistons with aluminum, nodular cast iron, and steel skirts. Composite pistons are screwed to piston crowns made of forged steel—a material that has been tried and tested with outstanding results. Not only are steel pistons delivered as bolted variants, they are also available as friction-welded or high-temperature brazed versions. The MAHLE piston range for large engines includes products with diameters of up to 580 mm.

Autothermatik®/ Hydrothermatik® pistons

Pistons for highly loaded gasoline and diesel engines in passenger cars. Their cast-in, nonslotted steel strips give the piston a uniform body with greater strength.

Autothermik/ Hydrothermik pistons

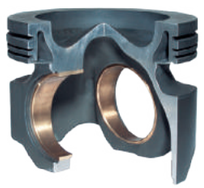
Very smooth-running pistons featuring cast-in steel strips for passenger car engines—the transition from the ring belt to the skirt area is slotted.

Pistons with cooled ring carriers

The ring carrier and cooling channel are combined to form one system using a special process. This improves heat transfer at the first ring groove.

Ring carrier pistons with pin bore bushings

Pistons for diesel engines with permanently fixed metallic ring carriers made of special cast iron for increased wear resistance, particularly in the first groove. Increased load capacity due to pin bore bushings made of a special material.



Monotherm® pistons

Single-piece, forged steel piston with an extremely high structural rigidity developed for modern combustion chambers with pressures of 250 bar and upward. With connected skirt and combined with a short piston pin, its weight is comparable to that of an aluminum piston.

Ring carrier pistons with cooling channel and crown reinforcement

For highly loaded diesel engines. A hard-anodized coating (HA coating) on the piston crown protects against cracks in the bowl rim or crown.

Ring carrier pistons with cooling channel

For high operating temperatures: intensive cooling of the piston crown and ring belt is achieved by circulating oil in the cooling channel.

Cast solid-skirt pistons

Cast solid-skirt piston with a long service life for gasoline and diesel engines—piston crown, ring belt, and skirt form a robust unit. Range of application: model engines to large engines.

Forged solid-skirt pistons

Mainly for highly loaded series production and motorsports engines. The special manufacturing process increases their strength and is a prerequisite for smaller wall cross sections and less weight.

Ecoform® pistons with pivoted side cores

Weight-optimized pistons for passenger car gasoline engines. A special casting technology allows for a low weight with high structural rigidity. Applications: railroad vehicles, special vehicles, marine technology, oil and gas, industrial engines.

Ferrotherm® pistons

The steel piston crown is movably connected to the aluminum skirt via the piston pin. The high strength and low wear rate enable highly loaded diesel engines to comply with low exhaust gas and emissions limits.

Two-stroke pistons

Made of special aluminum alloys for the high mechanical and thermal loads in two-stroke engines.

MonoWeld® pistons for commercial vehicles

The friction-welded steel piston is impressive thanks to its ability to withstand high thermal loads, making peak cylinder pressures over 230 bar possible. Its enclosed, rigid structure allows for improved cooling of the bowl rim because the walls can be made thinner. The connected skirt provides improved lateral support, thereby reducing cavitation propensity.

Piston ring sets

We're constantly improving the performance and running properties of our piston rings— with our state-of-the-art production facilities setting the benchmarks for quality.

Decades of development and production guarantee an efficient interplay between pistons and piston rings for the highest demands:

- Sealing off the combustion chamber from the crankcase
- Limiting and controlling oil consumption
- Dissipating the piston heat to the cooled cylinder bore

The circumference of the piston rings must fit tightly on the cylinder wall—even if the cylinder deviates slightly from its ideal shape. High inertia forces and combustion pressures, as well as severe wear stresses, place considerable demands on the material in terms of strength, surface quality, and shape.

The ideal ring set for every piston

We provide piston ring sets for virtually all passenger car gasoline and diesel engines, as well as commercial vehicle diesel engines with diameters from 52 to 160 mm—in original equipment quality or specifically for older engines.

Exclusively high-quality materials

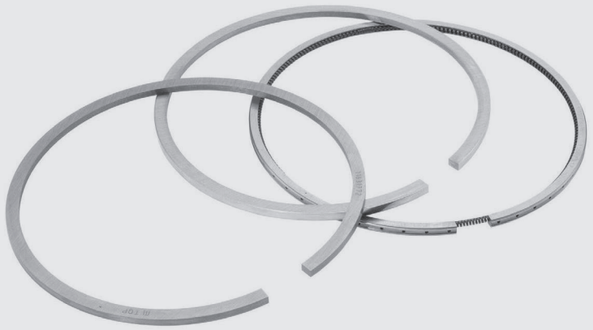
For normal to high stresses, materials with laminar graphite inclusions are used, while ultra-high requirements call for gray cast iron materials with embedded nodular graphite or steel materials.

Running surface coatings

To increase resistance to wear and scuffing, the running surfaces of the piston rings are coated (chromium or plasma spray coatings of metallic or ceramic materials).

Good to know

The MAHLE "N" ring set corresponds to the rings used in original equipment. This ring set can be used both for new pistons and for worn pistons. The MAHLE "V" and "G" ring sets provide a cost-effective solution for normalizing oil consumption and reducing compression loss in worn pistons.



Rings with TOP markings have to be fitted with these markings facing upward (toward the piston crown).

Reliable components— perfectly coordinated

Quality built to last—
precise fit and long life

Cylinder liners

We're also constantly improving our cylinder surfaces. The precise matching of the honed cylinder liners with the pistons and piston rings (through optimized cast iron surfaces) lowers oil consumption and reduces blowby, resulting in less wear, shorter run-in periods, and longer running times.

MAHLE produces cylinder liners for many international engine manufacturers—for both series production and the aftermarket and always according to the same strict quality standards for material, structure, and surface quality. Thanks to minimized production tolerances, the liners can be fitted precisely. We determine the alloy, the treatment of the melt, and the machining processes in close consultation with the engine manufacturers.

Materials

In addition to aluminum, we use cast iron alloy (gray cast iron alloyed with phosphorus) for cylinder liners. Additional alloy materials improve the wear properties, while the formation of bainite and very fine perlite strengthens the matrix.

Honing

Good honing reduces piston ring wear, particulate emissions, oil consumption, and frictional loss. Future improvements in honing will further shorten the run-in phase of the cylinder and improve the tribological properties. High material quality is a prerequisite for good, even honing of the cylinder bore (pore- and cavity-free cast materials with a homogeneous structure, uniform hardness, suitable for premachining the bore).

The most important honing methods broken down into the individual processing steps

Description	Honing process					Application
	Variant	1st operation	2nd operation	3rd operation	4th operation	
Normal honing	1	Diamond	Diamond			Series gasoline pass. cars
	2	Diamond	Ceramic			Series diesel pass. cars
	3	Ceramic	Ceramic			Series commercial vehicles
Plateau honing	1	Diamond	Diamond	Diamond		Series gasoline pass. cars
	2	Diamond	Diamond	Diamond		Series diesel pass. cars
	3	Diamond	Ceramic	Ceramic		Series commercial vehicles
Brush honing	1	Diamond	Diamond	Brushing		Series comm. vehicles/pass. cars
	2	Diamond	Ceramic	Brushing		
Liquid honing		Diamond	Diamond	Liquid honing	Microfinishing	Series diesel pass. cars
Laser honing	1	Diamond	Laser structure	Ceramic	Ceramic	Testing/motorsports
	2	Diamond	Diamond/ceramic	Laser structure		

Resilient and robust—
for every engine type

Bearings

In cooperation with engine manufacturers, we develop and test bearings for every single engine type. Ongoing fundamental research and development of materials and production technologies guarantee the highest quality—fatigue-resistant, adaptable, highly resilient, and resistant to wear and corrosion. We supply bearing shells, flanged bearings, bushings, and thrust washers with diameters from 27 to 140 mm, as well as bushings with diameters from 6 to 105 mm.

Materials and production methods

In addition to existing cutting-edge technologies such as sputter bearings, MAHLE is a leader in the development of new materials and coatings for the OE market.

State-of-the-art, lead-free bronze alloys and new, very highly resilient aluminum alloys are in use. The combination of the new alloys with the new polymer coatings offers high wear resistance, very good boundary lubrication properties, and a greatly reduced tendency to seize, especially in phases with mixed friction in stop-start and hybrid engines.

The very latest polymer bearings used by OEMs can already replace sputter bearings in some applications.

Sputtering

A coating method that works on the principle of cathode atomization, in which atoms are knocked out from a metal cathode by the impacting ions from a gas discharge process. The resulting atomized metal condenses on the running surface of the bearing shell as a uniform layer.

In addition to all conventional technologies, MAHLE now also supplies various polymer-coated bearings and polymer-coated thrust washers.

Valve train components

Valves form a closed system together with valve seat inserts and valve guides, which has to withstand ultrahigh stresses. For that reason, our product range includes not only valves but also their tribological partners: valve seat inserts and valve guides. The combined development of these components in one system brings considerable advantages in terms of minimizing wear and increasing economic efficiency.

All types of valves

Worldwide, MAHLE produces valves of diverse designs and types for passenger cars and commercial vehicles—with stem diameters from 5 to 12 mm and valve lengths from 80 to 210 mm. Extensive technical expertise, high productivity, and outstanding quality have made MAHLE one of the most important valve manufacturers on the international market.

In large-scale production, we employ state-of-the-art technologies: plasma powder methods in blank production or high-speed grinding processes for mechanical finishing. Different materials are used depending on the purpose and our valves are reinforced around the seat, hardened, nitrided, or chrome-plated. Our range also includes sodium-filled hollow valves (maximum heat dissipation) for extreme applications.

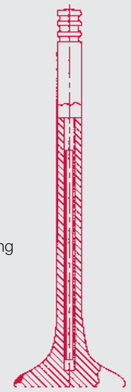
Valve guides and valve seat inserts

Valve guides center the valve on the valve seat and compensate for the lateral forces acting on the valve stem. They also dissipate heat to the cylinder head. Depending on the design, identical or different valve guides are used for the intake and exhaust sides. The range of materials extends from gray cast iron and brass to various alloys of sintered materials. The valve seat insert together with the valve seals the combustion chamber against pressure loss, and also transfers heat and prevents the valves from impacting the softer cylinder head material. Valve seat inserts are predominantly made from chromium–steel alloys or sintered materials.

Materials
Austenitic steels
Martensitic steels

Types
Monometallic valves
Bimetallic valves

Valve seat design
Plasma powder hard-facing
Induction hardening



Valve base induction hardening
Profile hardening
Full hardening
Base surface hardening

Hollow valves
Stem diameter: >6 mm
Bore sealing:
· Laser welding
· Friction welding
Sodium-filled

Fillet profile
Turned, ground
Contour-forged

Dished cover
Machined
Forged
With or without dish

Valve base geometry
1–3 grooves
Special designs

Valve length
80–210 mm

Valve disk diameter
18–65 mm

Stem diameter
5–12 mm

Surface treatment
Salt bath-nitrided,
hard chrome-plated
(coating thickness: 3–35 µm)

Our valves are designed for a wide variety of applications in order to withstand extreme mechanical, chemical, and thermal loads, and to ensure optimal heat dissipation.

Quality and safety—
kilometer after kilometer

Reducing emissions— delivering more performance

Turbochargers

Exhaust gas turbochargers are a key technology for increasing performance and reducing fuel consumption and emissions.

Turbochargers are recording strong growth rates in the automotive spare parts business. Nearly every diesel vehicle produced in Europe, North America, or Japan features turbocharging technology.

Highly efficient turbochargers are available to the aftermarket under the MAHLE brand. We cover over 70% of all fast-moving applications in the commercial vehicle sector.

Our range is constantly being expanded and a corresponding mounting kit is either already available or in preparation for virtually every turbocharger.

Cutting-edge quality through integrated development and manufacturing process

The highest level of development and manufacturing expertise is needed to ensure high efficiencies over a broad operating map area at engine speeds well above 300,000 rpm and exhaust gas temperatures in excess of 1,000°C. MAHLE therefore employs the latest simulation tools in the initial phase of its integrated development process to guarantee the thermodynamic and thermomechanical properties.

MAHLE turbochargers are manufactured in line with defined standards, using the latest processes in state-of-the-art facilities across the group.

- High-speed compressor wheel machining— for greater balance accuracy, optimized speed stability, and reduced running noises
- Double piston rings on the rotor shaft—for lower oil consumption and fewer foreign particles
- Turbine housings made of high-tech materials— for greater thermal stability and durability
- Functionally process-controlled central housings and progressive balancing of the rotor shaft— for improved mileage and less noise
- Electron beam-welded rotor shaft and wheels guarantee high strength

Unsurpassed innovation and quality standards

Gaskets

With its gasket range, MAHLE covers more than one million applications worldwide as well as around 200 million vehicle registrations for engines from 1990.

From the simplest composite forms to sophisticated multilayer steel designs—engine gaskets need to be tough. Drastic extremes of temperature, high internal pressures, coolants and lubricants of every kind—gaskets have to cope with it all.

The MAHLE Performance gasket range has been rebuilt from the ground up, using the latest technology and state-of-the-art materials to seal and protect engines—enabling them to run harder and faster, overcoming the limitations of conventional gaskets.

Sealing materials

Material for cylinder head and intake module gaskets

- Multilayer steel (MLS): cylinder head and manifold gaskets
- Composite material: cylinder head, exhaust manifold, and intake module gaskets
- Graphite: cylinder head and manifold gaskets

Valve/timer covers, oil pan, and other sealing materials

- High-performance composite control housing, water pumps, and differential gaskets
- Cork oil pan, control housing cover, and differential gaskets with metal substrate
- Valve covers and oil pan gaskets made of molded rubber

MAHLE offers a comprehensive range of products in this area as well as technical information, training, and support.

Filters

Our filter media range consists of specially treated papers, fleeces, or multilayer filter media, depending on the specification and application.

Filters made of paper

MAHLE paper filters are made of high-quality cellulose fibers impregnated with special resins for use in air, fuel, oil, and hydraulic filters. Preheating prepares the paper for embossing of vertical ridges. The paper is then pleated and impregnated according to the respective requirements—the precipitation heat treatment makes the paper mechanically stable and resistant to chemical and thermal influences. The stable pleat geometry prevents the forming of blocks even under high loads and ensures that air, oil, and fuel can flow freely at all times. The filter rating can reach as low as 1 µm, depending on the requirements.

Filter fleeces

Plastic fibers with thicknesses in the µm range provide the basic material for fleeces—the finer the fiber, the better the retention. The fleeces are applied in layers, whereby the fineness of the fibers and the fleece density increase from the dirty to the clean side. This funnel effect allows retention efficiencies of up to 99.9% with low flow resistance.

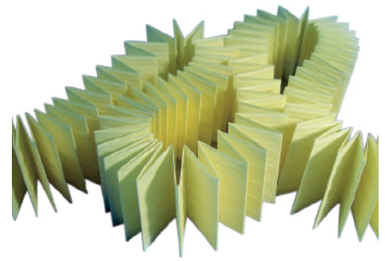
Fleeces have proven themselves in cabin filters, and their use in oil and air filters is steadily increasing. Filter performance is increased by up to 40%—prolonging service life at the same time. In fuel filters, fleeces are usually used in conjunction with a stabilizing base paper.

Multilayer filter media

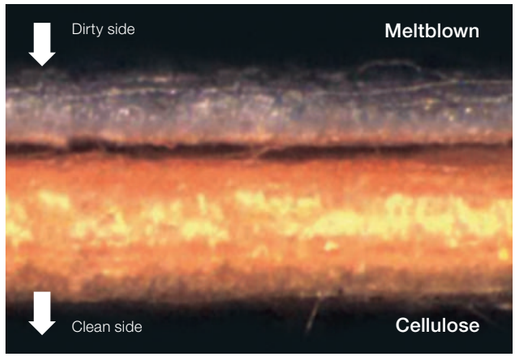
Compared with conventional paper filters, the combination of fleece and paper has an absorption capacity that is up to 40% higher—with an ability to filter particles of 3 to 5 µm. Multilayer filter media are predominantly installed in modern diesel fuel injection systems.

The impregnated cellulose fibers under a microscope.

Filter paper after embossing.



Ready-pleated paper for use in filters.



Multilayer filter medium with plastic fleece on the dirty side and paper on the clean side.

Air filters

Clean intake air is essential for optimal engine output. MAHLE air filters keep out up to 99.9% of dust, soot, and tire debris, and contribute to an optimal air–fuel mixture. The high particle retention capacity ensures a long service life—even under extreme conditions such as heat, cold, or chemical influences. It also prevents premature wear of the valves, cylinder surfaces, piston rings, bearings, and other engine components. To ensure perfect filter performance, all filters must be replaced within the intervals prescribed by the automobile manufacturer.

In passenger cars, round and panel elements are fitted in air filter housings mounted to the engine or chassis and are stabilized with glue beads on the dirty side and reinforcing grids on the clean side, in accordance with the specifications. For dusty environments, an additional prefilter (foam mat) is installed on the dirty side. Metal or plastic support studs counteract higher surface loads.

In commercial vehicles, robust, weight-optimized air filter systems made of recyclable plastic are used. These also reduce suction noise and, in order to achieve a large filter surface with high stability, are normally cylindrical in shape—optimized by radial seals and axial supports. Additional safety elements (special fleece cylinders) protect the clean side during maintenance and replacement.

Our air filters are completely sealed

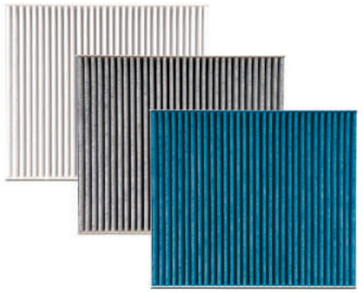
Unclean air in the intake section contaminates the air mass flow meter and distorts its results—which disrupts fuel injection and causes wear. To prevent this bypass air, we ensure that our filter elements fit exactly and the gaskets are carefully selected. PUR gaskets made of specially developed PU foam ensure continuous sealing between the dirty and clean sides. They're resistant to aging, chemical influences, and temperature. Their flexibility is precisely defined to perfectly fit the sealing geometry.

Cabin filters

During one single hour of driving, a volume of up to 100,000 liters of air is blown into the cabin. If the cabin filter becomes clogged or even fails, the pollutant concentration in the passenger compartment can increase to up to six times that of the outside air. MAHLE therefore recommends replacing the filters every 15,000 km or at least once a year.

Cabin filter (LA)

MAHLE cabin filters reliably supply the driver and passengers with cleaned air to breathe, thus safeguarding their health, well-being, and power of concentration even in the event of smog or a high pollen count. They also reduce the load on the blower, protect the heating, air conditioning system, and cabin from contamination, and prevent the windows from fogging.



The advantages of our cabin filters' pleat geometry:

- Long service life
- Low flow resistance minimizes the load on the blower
- The accurate fit eliminates bypass air

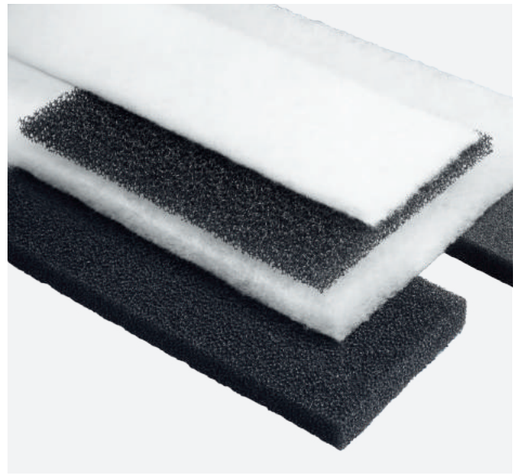
What's more, our cabin filters don't produce harmful vapors as they're manufactured using solvent-free methods.

Protection against:

- Pollen
- Fine dust
- Soot
- Tire debris
- Industrial dust

Cabin filters with activated carbon (LAK)

This type keeps out harmful exhaust gases, dirt, dust, and high ozone concentrations, and minimizes odors. The paper block used in these filters comprises three layers: an activated carbon layer is embedded in two layers of fleece.



In vehicles with a higher mileage or those operated in heavily polluted surroundings, an additional prefilter (LAP) made of polyester foams or fleece matting is frequently used, which prevents the cabin filter from becoming prematurely clogged—thus considerably extending the service life of our LA/LAK filters.

Extensive protection

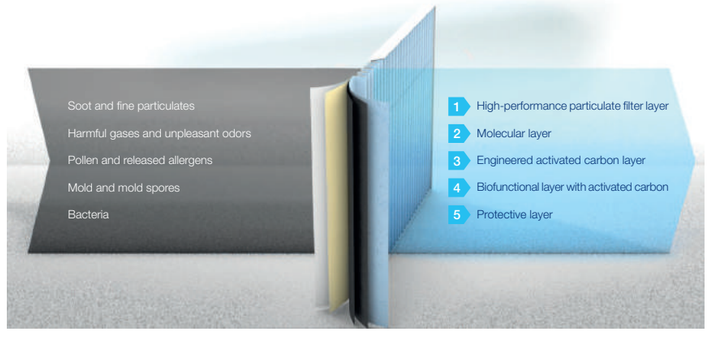
MAHLE offers vehicle owners a broad selection of cabin filters and develops these specifically for their individual requirements.

	Pollen	Fine dust	Soot	Tire debris	Industrial dust	Exhaust gases	Ozone	Light odors	Intense odors	Mold	Bacteria	Allergens
LA Good	■	■	■	■	■							
LAK Better	■	■	■	■	■	■	■	■				
LAO **CareMetix®** **Best**	■	■	■	■	■	■	■	■	■	■	■	■

■ = Cabin filter without activated carbon
■ = Cabin filter with activated carbon
■ = Cabin filter with additional protection against odors

CareMetix®—5 layers for total well-being

Harmful ammonia and sulfur gases—along with unpleasant odors—can develop in traffic jams, tunnels, around large construction sites, sewage treatment plants, or freshly fertilized fields. The new CareMetix® cabin filter provides protection through S5 broadband technology. It ensures that fine particulates, pollen, mold, soot, bacteria, and odors don't enter the cabin.



1. Filters out pollen, fine particulates ($PM_{2.5}$, PM_1), and ultrafine particles (e.g., diesel soot and brake dust)
2. Eliminates unpleasant odors, protects against allergens, and prevents the growth of bacteria and mold almost entirely
3. Highly effective at eliminating harmful gases like hydrocarbons
4. Highly effective at eliminating harmful gases like nitrogen oxides (NO_x) and sulfur dioxide (SO_2)
5. Helps to increase filter stability

- Protection against soot and fine particulates ($PM_{2.5}$ and PM_1)
- Protection against harmful gases and unpleasant odors
- Protection against pollen and released allergens
- Protection against mold spores
- Protection against bacteria

CareMetix® (LAO) with S5 broadband technology:

When you're on the road, you need clean air to focus and drive safely—and to feel good. But the air we breathe is often polluted with harmful, allergenic substances and odors that conventional filters can't eliminate. The solution: **CareMetix®** with S5 broadband technology—5 layers provide 5-fold protection—and also filter out odors!

Good to know

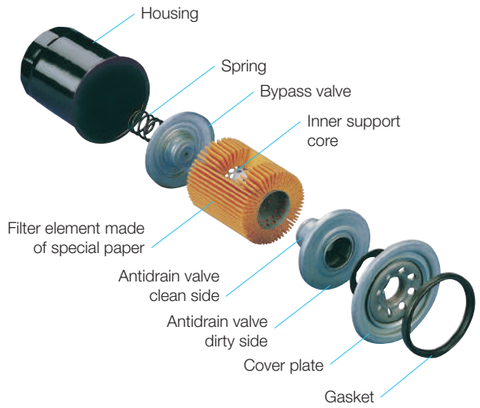
Cabin filters should be replaced annually or at least every 15,000 kilometers. This ensures you and your loved ones only breathe in fresh air. **CareMetix®** is also available for vehicles using alternative drive concepts.

Oil filters

Engine oil is permanently contaminated—combustion residues, dust, oil carbon, soot, abrasion particles, and condensates accelerate the wear of the engine components. Clean engine oil reduces friction, cools the engine parts, protects against corrosion, and seals the combustion chamber. MAHLE oil filters reliably keep out the dirt particles. The stable pleat geometry assures cold-start stability—peak loads of up to 20 bar are compensated by the high pressure resistance of the housing.

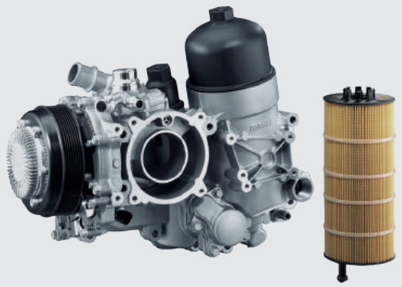
A pressure-relief valve guarantees the oil supply under all conditions—during cold-start phases, at low outside temperatures, and even when a filter element is badly clogged. An antidrain valve prevents the emptying of the filter when the engine is switched off and secures fast oil supply when the engine is started. High-grade sealing materials and custom-fit connecting pieces guarantee a reliable separation between contaminated and filtered oil.

In order for the oil filter to function correctly, however, it must be replaced promptly in accordance with the maintenance intervals prescribed by the automobile manufacturer.



More efficient replacement: oil change filters

OC oil change filters can be replaced with ease: the deep-drawn sheet steel housing with powdered coating has a multifaced collar to facilitate quick release. The cover plate has a thread for the screw-on spigot and a groove for the gasket—the filter element features an inner core as support against the oil pressure that is directed from the outside to the inside.



The MAHLE oil filter module for commercial vehicles is highly integrated on both the oil and coolant side. As a result, it has fewer interfaces and sealing points—high-performance plastics reduce both weight and costs.

Oil filter inserts

With filter inserts from the OX range, we offer particularly economical solutions for workshops: instead of replacing the complete filter, only the clogged filter element needs to be changed—an environmentally friendly solution that saves material and disposal costs. Oil filter inserts are available for all oil filters with housings that can be split.

Fuel filters

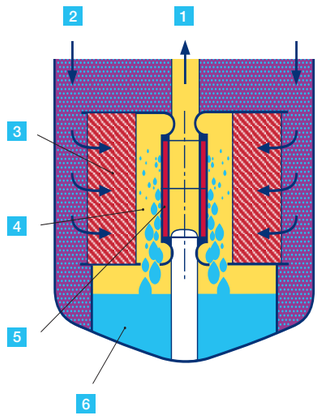
MAHLE fuel filters retain foreign objects reliably. High-quality filter media protect against the smallest dirt particles, and therefore against corrosion. This safeguards the engine function and ensures efficient operation. The constant fuel supply required is achieved through pressure regulation and the recirculation of surplus fuel from the injection pump to the tank—pulsation damping compensates for the pressure fluctuations caused by the fuel pump. MAHLE fuel filters comply fully with the high safety standards of the automobile manufacturers and ensure leaktightness even in the event of accidents. For the fuel filter to function correctly, it must be replaced regularly in accordance with the intervals prescribed by the automobile manufacturer.

Diesel fuel filters

In order to prevent paraffin separation and gelling at low ambient temperatures, our fuel filters rely on preheating with electric heating elements or the recirculation of fuel that has been warmed by the engine. Newer filter systems also separate water efficiently—if diesel fuel contains water, corrosion and cavitation damage may occur in the injection system.

Water separation is carried out in two phases:

- **Phase 1:** Alongside the actual particle filtration, fine water droplets are also coalesced to form larger ones.
- **Phase 2:** A water separation stage (hydrophobic fabric) prevents these larger water droplets from entering the clean fuel.



1 Filtered fuel
2 Emulsion downstream of the pump
3 Particle separation and agglomeration of water droplets
4 Clean diesel with water droplets
5 Hydrophobic mesh
6 Collected water volume

Schematic diagram of a two-stage filter with integrated water separator.

New and innovative

MAHLE has developed a special fuel filter module for commercial vehicle applications. The patented multistage filter element provides effective water separation. In the first stage, the solid particles are filtered out. Then—in subsequent stages—the microfine droplets coalesce to form larger droplets and the water is separated.

Spin-on fuel filters

Simply screwed on to the filter head thread adapter. Mounted elastomer gaskets ensure leaktightness between head and filter.

In-line fuel filters

These are made from sheet steel with corrosion protection, stainless steel, aluminum, or plastic and are mounted in the fuel line. Optional functions such as pressure regulation, preheating, and water separation are available.

Fuel filter elements

In filter housings that can be opened, only the filter elements are replaced in the service. The housing remains on the engine. This saves material costs and conserves resources.

Fuel filters—can be changed easily and cleanly

CleanLine filters

More efficient water separation

Conventional filter systems work in a single stage. However, test results show that the water separation efficiency of these systems drops from 96% to less than 15% for contaminated fuel. That is why the CleanLine filter works on a two-stage principle.

Stage 1
Filtration of contaminants from diesel fuel and agglomeration of water droplets

Stage 2
Separation of agglomerated water droplets from the filtered fuel

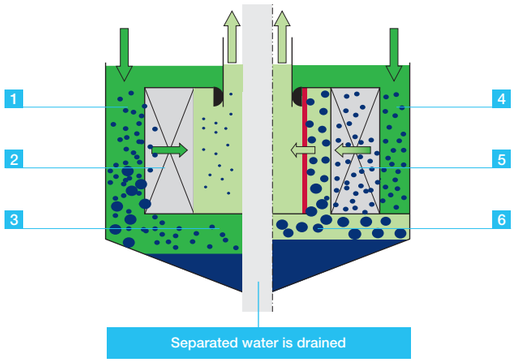
By capturing contaminants in the first filter stage, the water can be separated more efficiently in the second stage. This ensures maximum water separation throughout the service interval. Furthermore, thanks to the separation of the two filter stages, even the smallest water droplets are separated.

Field and laboratory tests prove that the new two-stage concept is superior to conventional systems in the medium and long term.

Three versions will be available worldwide:

- 2-stage CleanLine with integrated water reservoir (exclusively available in South America)
- 2-stage CleanLine without water reservoir (available in EMEA)
- 1-stage CleanLine without water reservoir (available in EMEA)

Comparison between conventional water separators and MAHLE's concept



1 Diesel contaminated with dirt and water

2 Contaminants and water are separated from the diesel in one stage

3 Reduced water separation efficiency during the filter's life cycle

4 Diesel contaminated with dirt and water

5 **Stage 1:** Contaminants separated from the diesel and smaller water droplets agglomerated

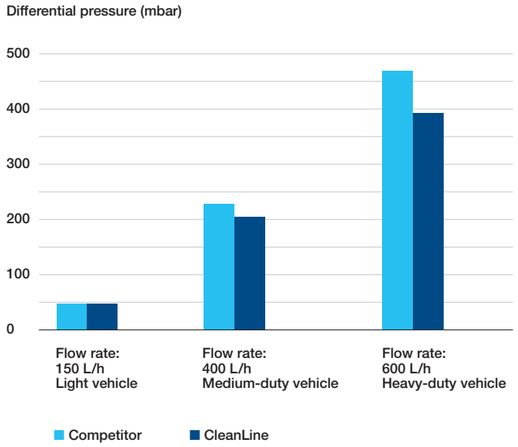
6 **Stage 2:** Larger water droplets separated from contaminant-free diesel

Protection against a permanent danger

Diesel has a natural tendency to absorb water. In countries such as South America, this problem has been compounded in recent years by the use of biodiesel blends. The greater the tendency to absorb water, the more the water content in the fuel increases and the more difficult filtration becomes.

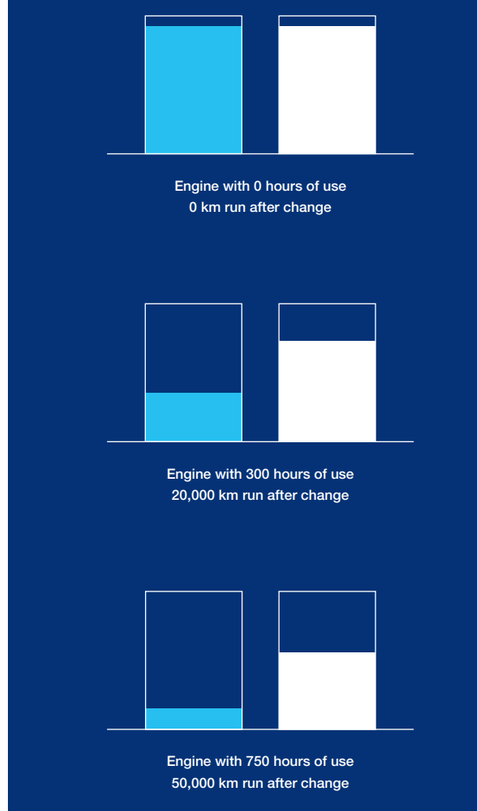
The water must be removed from the diesel fuel, otherwise it will damage the components of the injection system such as the fuel pump, injectors, valves, and fuel supply components. Another problem is caused by micro-organisms that multiply rapidly in standing diesel fuel with an increased water content. These organisms also clog the filter, resulting in a rising differential pressure.

Too high a differential pressure will damage the system in the long run. Thanks to its two-stage filtration, the CleanLine filter offers the most efficient solution to this challenge in the direct competitive environment.



Filter separates more water from diesel fuel

The superiority of two-stage filtration over conventional systems is best seen over time.



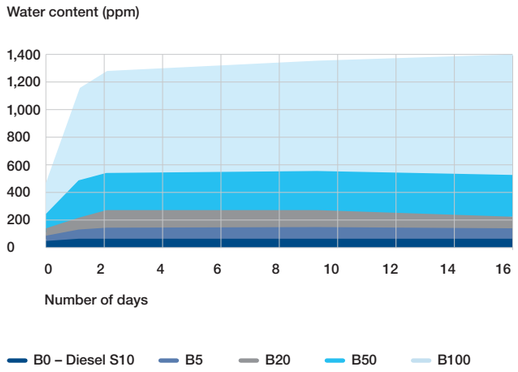
Filter less clogged

The more efficient two-stage filtration of the CleanLine filter separates more contaminants and reduces the extent of clogging (e.g., rising differential pressure) in every vehicle category.

Top marks compared with conventional systems

Condition of the filter	Water separation efficiency of conventional single-stage systems	Water separation efficiency of the two-stage CleanLine filter
New filter	Over 93%	Over **93%**
Filter used under operating conditions	Up to 20%	Over **70%**

More efficient separation of water from diesel fuel

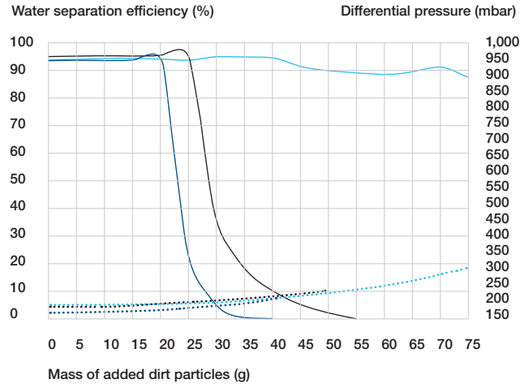


Less water in diesel fuel—laboratory testing of biodiesel over several days

The higher the proportion of biodiesel, the higher the water content in the diesel fuel.

Efficient water separation—laboratory test with clogged filters

A comparison was made between three systems: MAHLE, Competitor A, and Competitor B. Despite greater filter contamination, more water was separated with the two-stage CleanLine system.



Advantages of CleanLine filter

- Maximum water separation and dust retention capacity over lifetime
- Superior efficiency
- Better protection of the injection system
- Cost savings for maintenance of injectors and fuel pumps
- Robust plastic housing
- Reduced costs per kilometer
- Multi-application, resulting in lower documentation overheads
- Filters easy to change and existing water reservoir can be used

Air drier cartridges

For use in compressed air safety systems

Especially for commercial vehicles

Many control and closed-loop control processes in commercial vehicles work using compressed air, as is the case in brake systems. If the air still contains moisture, this can cause damage in lines and reservoirs. Freezing may occur if the lubrication films become watered down. To prevent this happening, air driers remove the moisture. As safety-relevant components, it's imperative that air driers be replaced according to the manufacturer specifications.

Air drier cartridges from MAHLE operate irrespective of the temperature. They contain a drying agent that is regenerated under system control—at the same time, contamination from the prefilter and condensation water is removed. MAHLE air drier cartridges are resistant to corrosion on both the inside and the outside, and work reliably even under the most difficult of conditions.

Materials: for the safety of people, engines, and the environment—only the best

The shell of the air drier cartridge is made of robust steel or polyethylene (PE). It has a pressed-in thread on the front end and can thus be threaded onto the head. What's outstanding about this cartridge is its contents: it consists of granulate or silicone beads just 1–3 mm in size, depending on the application and vehicle type. The materials are extremely porous. The entire surface is designed to capture and then release moisture unbelievably quickly.

It thus becomes active immediately when the air flows past from the compressor or from the separate reservoir, and it always regenerates itself autonomously. Oil separators (coalescers) are sometimes integrated in the air drier cartridges in order to increase the service life of the systems and separate the ultrafine oil particles from the air.

Air drier cartridges from MAHLE

Urea filters

Nitrogen oxides (NO_X) contribute to the formation of smog and acid rain and exacerbate the greenhouse effect. In order to reduce emissions, AUS 32 (a 32.5% urea solution) is used. AUS 32 is aqueous, clear, nontoxic, safe to handle, and doesn't present a risk to people or the environment. AUS 32 is sold at service stations or by accessory suppliers under the following trademarks: AdBlue in Europe, DEF in North America, and ARLA 32 in Brazil. Its consumption is around 5% of a vehicle's fuel consumption.

By using AUS 32, it's possible to comply with the increasingly stringent Euro 6 and Tier 2 Bin 5 (United States) statutory limits and beyond. This method of exhaust gas purification is technically complex and transforms the nitrogen oxides into harmless nitrogen (N_2) and water (H_2O) by means of selective catalytic reduction (SCR).

SCR system

By means of injection nozzles, the urea solution is sprayed in a controlled manner from a separate tank into the exhaust gas flow—directly upstream of the SCR catalytic converter. The hot exhaust gases decompose the urea solution to form ammonia and isocyanic acid (thermolysis).

The water contained in the solution breaks down the isocyanic acid into ammonia and carbon dioxide (hydrolysis).

The nitrogen oxides present in the exhaust gas system then react with the ammonia in the catalytic converter, where they're converted into harmless nitrogen and water vapor.

The problem of contamination—the solution from MAHLE

More and more manufacturers are using SCR systems, and the demand for urea solution is rising. Increasingly complex storage and transport processes are inevitably raising the risk of contamination, with the danger that sensitive components (injection nozzles, catalytic converters, other system components) become dirty, wear out, or break down completely.

In order to prevent this, MAHLE Aftermarket offers urea filters in proven original equipment quality. Their fine-pored filter media guarantee the proper, long-term operation of SCR systems.

Well equipped for the future

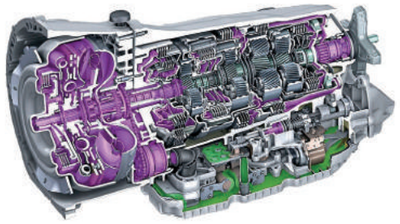
Urea filters from MAHLE ensure safe and robust operation of the SCR system. This means you are optimally equipped for current and future exhaust gas standards.

Transmission oil filters

For a longer transmission life

Just like all operating media in the vehicle, the transmission oil is subject to aging and wear. At extremely high temperatures—caused by sporty driving or towing a trailer, for example—automatic transmission oil can age faster than under normal conditions.

Comparison of oil change methods



■ Static oil change ■+■ Dynamic oil change

In a dynamic oil change, 90% to 100% of the oil is replaced.

To prolong the life of increasingly complex automatic transmissions and ensure that they operate smoothly, many vehicle manufacturers are changing their guidelines on transmission oil—moving away from a strategy of filling up to last throughout the service life toward changing it regularly or as needed.

Simply better: dynamic oil change

In a conventional, or static, oil change, approximately 30% to 50% of transmission oil is replaced, and new oil is mixed with old oil in the process. By contrast, up to 100% of the oil is replaced in a dynamic transmission oil change performed with the MAHLE FluidPRO® flushing unit.

Benefits for motorists:

- Avoids transmission repair costs
- Significantly improves transmission shifting performance
- Eliminates minor transmission malfunctions (such as jerking or poor start-up behavior)
- Extends transmission mileage

MAHLE transmission oil filters

Our transmission oil filters remove abrasion particles from the transmission and provide effective protection against damage. MAHLE already offers suitable solutions for many popular car brands and vehicle types. And our range will continue to expand in the future.

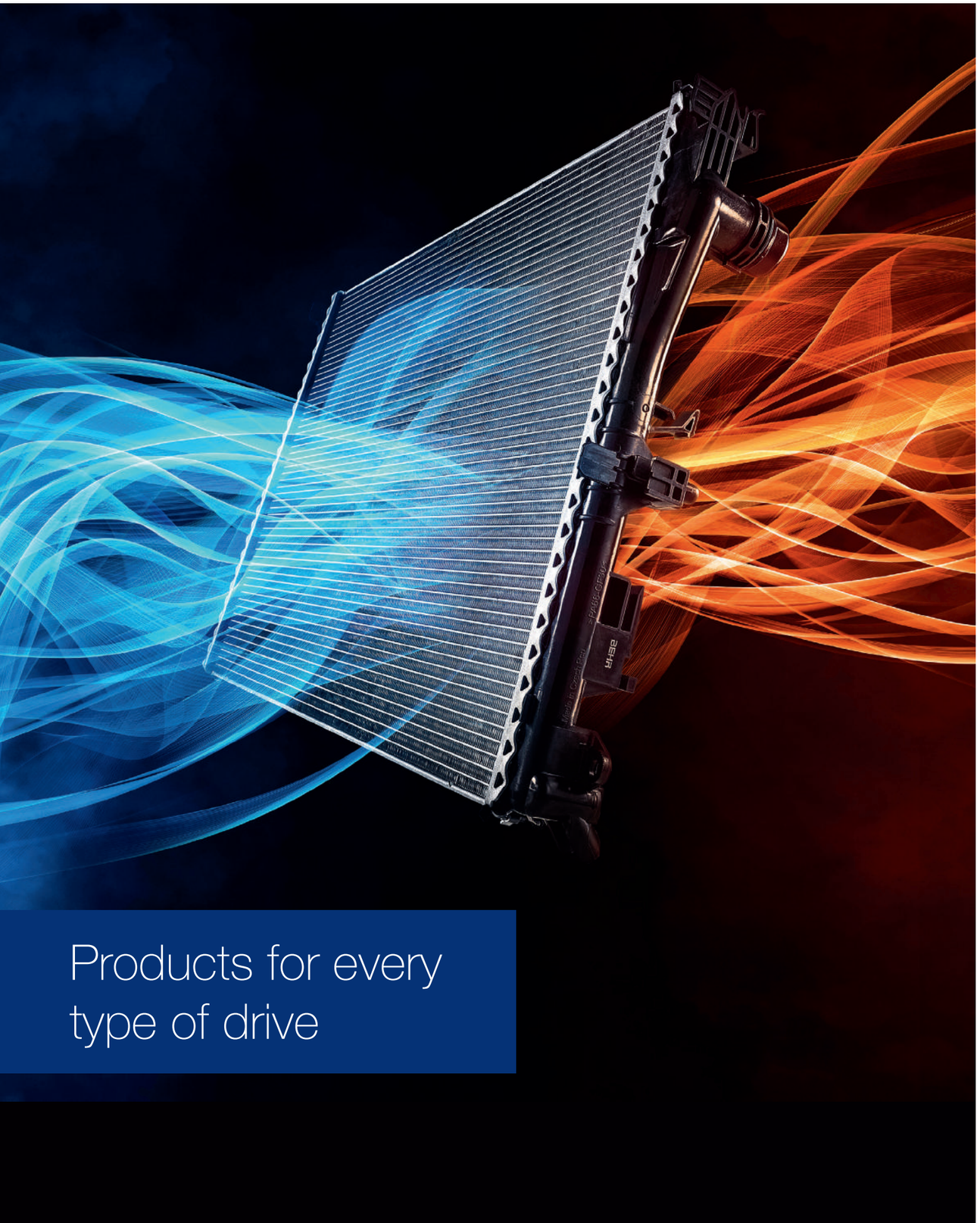
Good to know

Of the newly registered vehicles in the EU, **25%** already have an automatic transmission—and the numbers are increasing.

The global production of vehicles with automatic transmissions has grown by around **40%** in the last five years.

Changing the transmission oil every **60,000 km** or every **4 years** prolongs the service life of complex automatic transmissions and ensures optimal shifting behavior.

MAHLE offers the complete range of filters—in original equipment quality. They're all highly effective at protecting people, engines, and the environment. What's more: innovative products, such as the CleanLine filter, are constantly being added to the product range. And these filters too are manufactured in original equipment quality.



Products for every type of drive

Thermal management

Following the acquisition of the entire shareholding in Behr Hella Service (BHS) by MAHLE Aftermarket, all existing BHS activities were transferred to MAHLE on January 1, 2020. For MAHLE customers, this means access to a broad range of thermal management products for passenger cars and commercial vehicles as well as agricultural vehicles and construction machines. The products are offered under the BEHR sales brand and the portfolio is continuously expanding.

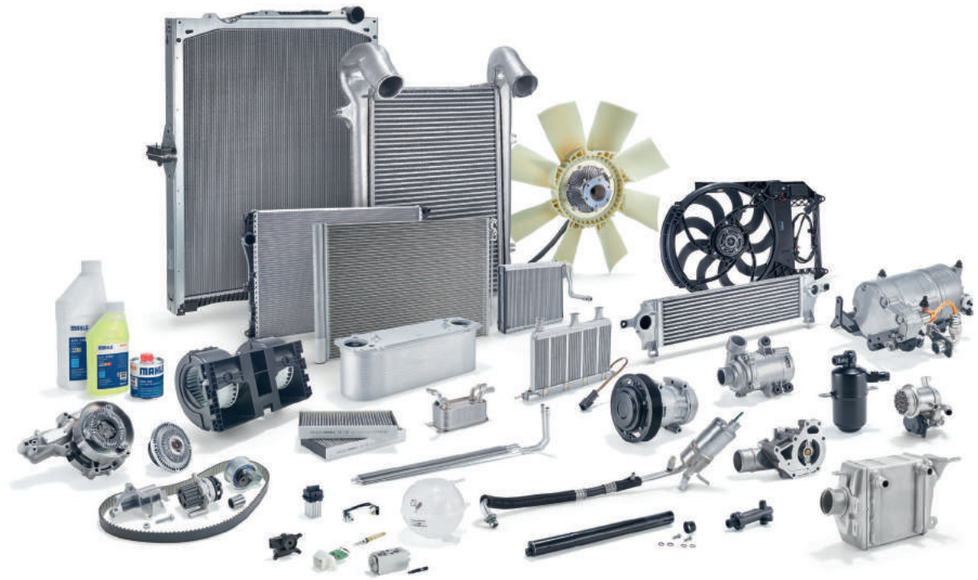
Expanded portfolio

Engine cooling

- Radiators
- Expansion tanks
- Visco® clutches/fan clutches
- Radiator/condenser fans
- Charge air coolers
- Oil coolers
- Cabin heat exchangers
- Exhaust gas recirculation coolers
- Water pumps and kits
- Switches and sensors
- Thermostats

Air conditioning

- A/C compressors
- A/C condensers
- Filter-driers and accumulators
- Expansion valves and orifice tubes
- Evaporators
- A/C switches
- Electric controls for blending flaps
- Interior blowers
- A/C compressor oils
- A/C blower regulators and resistors



Engine cooling

Radiators

Our radiators are fundamental to the performance of an engine cooling module. Positioned in the airflow at the vehicle front, they're able to optimally dissipate the waste engine heat, which is absorbed by the coolant, to the external air. All MAHLE components, such as the radiator core and water tank, including all connections and fastening elements, are carefully produced and offer a long service life. The radiator core itself is made up of the radiator network with a fin-and-tube system, the tube headers, and the core covers. In conventional radiators, the water tank is made of glass fiber-reinforced polyamide. All-aluminum radiators with reduced weight and a smaller packaging depth are also available.

Condenser/radiator fans

Efficient engine cooling requires not only powerful radiators but also high-performance fans, such as those available from MAHLE. They comprise an electric motor with a flanged fan wheel. They're installed upstream or downstream of the condenser or radiator and reliably extract the heat from the coolant by means of their airflow. Cars with air conditioning require an additional or correspondingly more powerful fan.

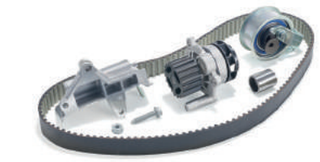
Exhaust gas recirculation coolers

The combustion temperature in the cylinder plays a significant role in the formation of nitrogen oxides in the combustion chamber. MAHLE exhaust gas recirculation coolers make it possible to reliably comply with the prescribed limit values. Special heat exchangers made of high-grade stainless steel or aluminum quickly cool part of the main exhaust gas flow. This is then fed back into the intake air. The lower combustion temperature in the cylinder has a positive impact on the formation of NO_x.

Fans and clutches

Providing cooling air in an efficient way reduces fuel consumption and lowers the impact on the environment. With the products from our traditional Visco® brand, which has been around for more than 50 years, MAHLE offers a range of highly proven and powerful fans and clutches. The Visco® clutches generate additional savings and reduce engine noise.

In commercial vehicle engines and powerful passenger car engines, they enable on-demand control of the cooling airflows by creating a frictional connection to the fan wheel—depending on the temperature—and influencing its speed. If no cooling air is needed, the clutch switches off completely.



Water pumps and kits

As a central element of a cooling circuit, water pumps are among the most sought-after spare parts. In order to fulfill market requirements, MAHLE offers conventional belt-driven pumps as well as electronically controlled models. Across the entire range, our water pumps are characterized by their high quality and fulfill all demands in terms of function and fit. They're available not only as single parts (including O-rings and gaskets, if needed), but also as easy-to-assemble kits—with perfectly coordinated timing belts and, if required, tension, deflection, and guide rollers as well as gaskets and dampers.

Charge air coolers

From the performance increase across the whole rpm range to fuel savings and a lowering of the thermal load on the engine: cooling the combustion air in turbocharged engines with a charge air cooler offers numerous advantages. So, it's no surprise that almost all modern motor vehicles with turbochargers are equipped with this technology.

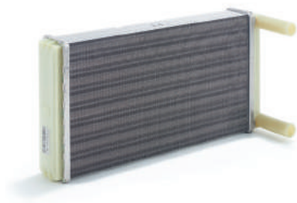
MAHLE offers two different variants: models for direct charge air cooling, in which the cooler—fitted in the vehicle's front end—is cooled via the ambient air as well as models with indirect charge air cooling. These models make use of coolants and dissipate the heat to the ambient air via a low-temperature radiator.

Oil coolers

With technologically advanced oil coolers from MAHLE, not only are oil change intervals longer, but, thanks to the almost constant temperature spectrum of the engine oil, the engine's service life is also increased. To fulfill all of our customers' demands, we offer a wide selection of air- and coolant-cooled oil cooler types. The variable stacked-plate oil cooler features a particularly lightweight, space-saving, all-aluminum design with no coolant housing.

Expansion tanks

If the coolant temperature rises, it expands. This causes the pressure in the cooling system to rise at the same time. To keep this pressure constant, MAHLE's robust expansion tanks receive the expanding coolant via a valve located in the cap. In this way, they reliably ensure that the pressure is returned to the predefined level and the load on the cooling system reduced.



Cabin heat exchangers

MAHLE cabin heat exchangers use the waste engine heat for temperature management in the vehicle cabin. The principle is as simple as it is effective: Coolant flows through the heat exchangers located under the dashboard. The airflow generated by the interior blower moves past the heat exchangers and is heated up. This heat is emitted directly into the passenger cabin and ensures a comfortable climate when it's cold outside.

Air conditioning

A/C compressors

An A/C compressor is indispensable for temperature management in a passenger car: It compresses the gaseous refrigerant, heating it up in the process. The refrigerant passes via the intermediate stops of the A/C condenser and the evaporator, where the required evaporation cooling for the cabin is produced, and it is then returned to the A/C compressor—and the cycle starts all over again. The unit is generally driven by the engine via a V-ribbed belt. For lubrication, the A/C compressor is filled with a special oil, some of which circulates through the air conditioning system with the refrigerant. The size of the A/C compressor varies according to the size of the system. MAHLE's range of high-quality models is extensive and includes the latest generation of electrically driven, vehicle-specific units.

A/C condensers

The A/C condenser is the counterpart to the A/C compressor: the latter compresses and heats the refrigerant, while the condenser reduces the temperature again. To this end, the gas flows through the pipework and fins of the A/C condenser installed upstream of the radiator, thereby emitting heat. This lowers the pressure and causes the refrigerant to liquefy. To facilitate logistics and assembly, MAHLE's range not only includes numerous A/C condensers but also finished modules. These are ready-made units comprising a flat-tube condenser and the collection/expansion tank with integrated drier.

Electric controls for blending flaps

Electrically driven controls for MAHLE air conditioning systems fulfill even the most stringent demands: they're primarily used in automatically controlled air conditioning systems to control air flaps or mixing flaps. In this way, they ensure optimal distribution of the airflow within the vehicle cabin. This decreases the risk of windows fogging or freezing up, or of the driver's concentration being hampered by an uncomfortable cabin climate or air draft.

Expansion valves and orifice tubes

The expansion valve—or, depending on the design of the air conditioning system, the orifice tube—is located upstream of the evaporator and separates the high- and low-pressure areas in the refrigerant circuit. The liquid refrigerant is injected into the evaporator via the valve, where it is converted into gas, producing the required evaporation cooling. To achieve optimal cooling performance, MAHLE expansion valves or orifice tubes regulate the refrigerant flow precisely as needed.

Evaporators

The evaporator is a core element of temperature management. It is located in the vehicle cabin below the dashboard and is integrated into the ventilation system. The evaporator takes care of the heat transfer between the surrounding air and the refrigerant in the air conditioning. Under high pressure, the liquid refrigerant transforms into a gaseous state. The evaporation cooling generated by this process is then dissipated into the environment via the large surface of the evaporator and routed directly into the vehicle cabin by the blower's airflow. MAHLE evaporators are characterized by their high performance, small packaging depth, and low weight.

Interior blowers

Providing a clear view and pleasant climate inside the vehicle, interior blowers from MAHLE not only play a significant role in terms of comfort, but also for the safety of drivers and front-seat passengers. That's why it's so important that they're produced carefully—to ensure a long service life.

Filter-driers and accumulators

If the refrigerant is contaminated or contains moisture, this may damage the A/C compressor and other components. The carefully produced MAHLE filter-driers, which—depending on the system—are also called accumulators, prevent this: the liquid refrigerant flows through this component and passes through a hygroscopic filter, which retains both moisture and fine particles. However, as the filter-drier can only absorb a limited amount of moisture before the drying medium becomes saturated, it must be replaced regularly—every two years or every time the refrigerant circuit is opened. Filter-driers from MAHLE also fulfill another important task: their top section serves as a compensation chamber, while the lower section acts as a refrigerant store. This compensates pressure fluctuations in the system in an optimal way.

A/C blower regulators and resistors

Blower control units regulate the blower fan and thus the air flow in the passenger cabin. They're often located near the interior blower or installed directly on the fan. MAHLE offers a number of different control unit variants that work either electrically or electronically. The electric blower control units have several resistors and, in most cases, an integrated thermal fuse—in case of overload, they're switched off to protect other components. The electric control units allow the fan to be operated at different speeds. The electronic blower control units from MAHLE are controlled via a pulse-width-modulated signal. Air conditioning can thus be adjusted thanks to a convenient and continuously variable fan. Another advantage is the integrated self-diagnostics: they can determine their own state and report any errors immediately to the control unit.

A/C switches

MAHLE A/C switches reliably control various shunt relays and are responsible for switching individual systems components on and off at specified pressure points. This means that the air conditioning can be used safely and effectively at all times and in any conditions.

A/C compressor oils

The quality of the A/C compressor oils used is crucial for ensuring that the air conditioning can be used safely and for a long time. The use of low-grade or incorrect oil results in increased wear and may lead to premature failure of the A/C compressor. MAHLE offers a range of synthetic compressor oils. We particularly recommend the PAO 68 oil, which has been used effectively for more than 20 years and helps increase the performance of the air conditioning system. In contrast to other oils, PAO 68 is not hygroscopic—i.e., it does not absorb any moisture from the ambient air. It can replace various PAG oils and can be used in air conditioning systems with R134a and, in some cases, R1234yf. Sometimes it is also found in electrically driven A/C compressors (please see the relevant usage overview). This makes handling significantly easier: one version of the PAO 68 oil is sufficient for most applications. The full warranty applies to A/C compressors from MAHLE running on PAO 68 oil as well as PAO 68 Plus UV oil.

PREMIUM LINE in OE quality—
for customers who expect the best

It's your choice!

MAHLE always puts the customer's needs first. That's why we offer the most extensive premium range for automotive air conditioning and engine cooling in the independent aftermarket. PREMIUM LINE features OE-quality spare parts that are designed to last for the vehicle's entire life cycle. Even under extreme conditions, they deliver maximum output.

Premium or good standard?

PREMIUM LINE

PREMIUM LINE offers spare parts in OE quality, and comprises around 4,500 products produced by MAHLE, AKG, HANON, and other OE manufacturers.

PREMIUM LINE products in OE quality are particularly durable and deliver peak performance even under extreme conditions, making them the ideal solution for customers who expect the best.

A clear difference in quality

Catalogs often show two suitable products for a specific vehicle—each PREMIUM LINE product is labeled accordingly. The PREMIUM LINE label also appears on the packaging labels and on the parts themselves. With this clear product classification, it's always obvious what's inside the carton.

The standard is always good

The approximately 3,000 standard products of the same quality without the PREMIUM LINE prefix offer good performance and are a cost-effective solution with an excellent price–performance ratio. Good quality at an attractive price.

In roughly 1,200 applications, the customer can choose between premium and good standard products.

And the most important thing is that with the right products—whether PREMIUM LINE or standard—and valuable services, you can make your customers happy and ensure that they come back time and again.

Optimal operating temperature—
intelligently controlled

Thermostats

For optimal efficiency, a combustion engine requires the temperature level to remain as constant as possible. This is ensured through the use of thermostats, which regulate the engine temperature with coolant.

MAHLE Aftermarket offers a variety of thermostats and components for temperature regulation:

- Thermostat inserts; integrated, housing, and sleeve valve thermostats; and map-controlled thermostats
- EGR thermostats
- Oil thermostats
- Thermocouples and thermal switches

Map-controlled thermostats—the most effective in the cooling circuit

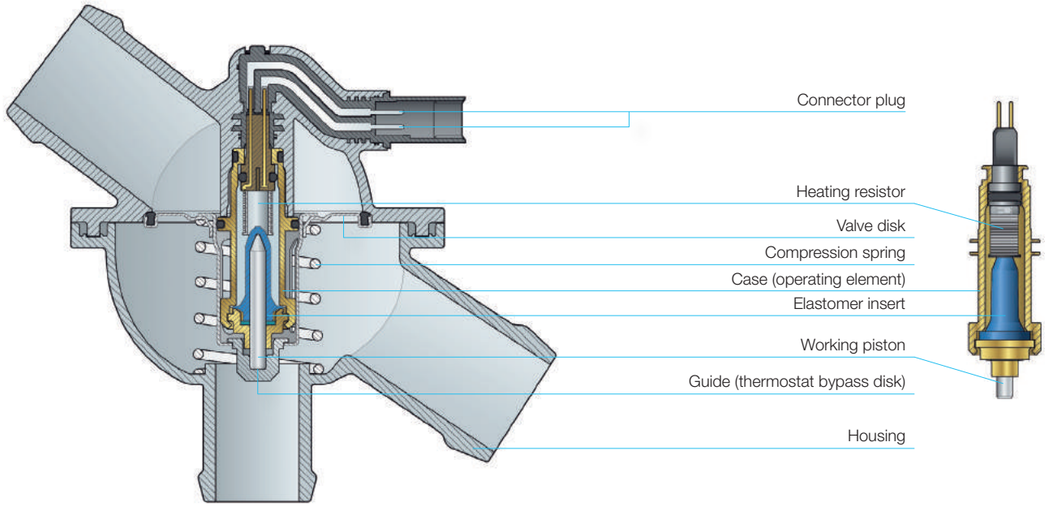
Map-controlled thermostats increase engine efficiency because an electrical heating resistor is additionally integrated in the operating element's wax, which is electrically controlled via the control unit and therefore reacts much faster to changing load cases and operating conditions.

This load-dependent temperature regulation has the following advantages:

- Optimal combustion
- Lower fuel consumption
- Fewer pollutant emissions
- Longer engine service life
- Higher performance
- Greater comfort

As a global partner, MAHLE develops and produces thermal management systems and components for well-known automobile and engine manufacturers.

MAHLE thermostats work just as well in tropical heat as in arctic cold. They quickly bring each engine to the correct operating temperature by controlling the cooling circuit. MAHLE provides a variety of thermostats and other temperature-regulating components for various requirements.



Cross section of a map-controlled thermostat with electrical connections and heating resistor integrated in the wax element.

Powerful and efficient—
for the perfect start

Starter motors & alternators

All mechatronics products are equipped with a counterfeit-proof VeoMark® security label. The range includes around 700 starter motors, well over 700 alternators, more than 400 electric drive motors, and almost 5,000 spare parts at present—and is constantly being expanded.

Starter motors and alternators

We already have the right product for a large number of vehicle applications from all renowned OE manufacturers—our coverage includes more than 50% of starter motors and more than 44% of alternators. Thanks to ongoing development, we're striving for a total coverage of over 80% in Europe.

Electric drives and controllers

To meet the growing demand in this segment—triggered by the increasing electrification of vehicles and equipment—we offer a wide range of electric motors and controllers for passenger cars, commercial vehicles, forklifts, industrial vehicles, sweepers, pallet trucks, golf carts, and passenger bus air conditioning. These products are presented in detail in a separate catalog.

Regularly the number one choice—for good reason

- We deliver only original equipment quality.
- You'll always receive brand-new products from us. Serviced or refurbished components are not an option.
- With our products, you can count on a long service life, ease of maintenance, and a high degree of functionality. Because they're resistant to salt, water, and dust, and insensitive to vibrations, low temperatures, and other weather factors, our products are suitable for use in the heavy-duty and commercial vehicle industry.
- Our compact design allows space for new developments and a variety of applications.
- All our components are electromagnetically compatible and fulfill international standards.
- We employ sustainable manufacturing practices and use resources wisely.

Expertise in the best tradition

Used in passenger cars, commercial vehicles, agricultural and construction machinery, golf carts, and boats: our starter motors, alternators, electric drives, and controllers are backed by more than 50 years of experience and knowledge.

Innovative solutions—
for the mobility of the future

Control and power electronics

Take advantage of an even bigger product range from a single source—for all mobility solutions.

A new addition to the MAHLE product portfolio is Nagares—a Spanish electronics specialist. With this acquisition, MAHLE is strengthening its competence in products for the e-mobility sector and is now in a position to offer systems solutions across the broad product portfolio of electric drives, auxiliary components, and thermal management.

The portfolio includes the following products:

- Actuators and switches
- Electronics products, such as control units for diesel glow plugs and low-voltage motors, acoustic warning signal controllers, and electronic battery disconnects
- High-performance electronics such as DC/DC converters
- Various sensors

Greater added value for trade and workshops

- Global MAHLE network with a personal contact on site
- An even bigger product portfolio from a single source—for all mobility solutions
- Comprehensive technical support from the MAHLE Aftermarket product specialists
- Knowledge transfer at MAHLE Aftermarket product training sessions

Even more benefits

- Control and power electronics for passenger cars and commercial vehicles in uncompromising original equipment quality from MAHLE Nagares
- Many years of expertise in vehicle electronics development and manufacturing in the new Electronics product area
- Access to the expanded product range, which now includes pioneering electronics applications and is constantly adapted to market requirements

Actuators and switches

Electronics

Sensors

High-performance electronics

A/C service units

Efficient and innovative

ArcticPRO® A/C service unit line

MAHLE Aftermarket developed the ArcticPRO® product line with E3 technology for an efficient, eco-friendly, and economical A/C service.

Efficient solutions—for maintenance and service

From the basic/lightweight model to entry-level, professional, and premium solutions, we offer the ideal products for every requirement.

Advantages at a glance

+ **Efficient** and **successful servicing,** regardless of the vehicle and ambient temperature
+ **USB interface, Wi-Fi,** and **Bluetooth** for remote diagnostics, software updates, and ASA connectivity
+ Suitable for **passenger cars as well as commercial, off-road, agricultural, and hybrid vehicles**
+ **LED** light indicates status anywhere in the workshop
+ **Remote control** via a smartphone/tablet app (iOS and Android)
+ **Ergonomic design:** front of the unit opens using a handle

The EGEA label

It stands for the quality and functionality of professional workshop equipment products. A device that has been developed and designed in accordance with the EGEA specification fulfills all legal requirements and safety standards. The label certifies that MAHLE develops high-quality and effective service units for workshops. Many of our A/C service units for R1234yf carry this label.

The new generation of equipment

The new generation of A/C service units from MAHLE are cutting edge when it comes to connectivity and ease of maintenance—with Bluetooth and Wi-Fi, a large touch screen, a status monitoring app, and remote service.

Our new devices boast impressive, comprehensive connectivity. They all connect onto to our server and receive permanent, automatic software updates. Their ergonomic design and intuitive user interface are state of the art. With single-hand control of the maintenance flap, we're setting entirely new standards. All new-generation A/C service units are already convertible to the refrigerant R513a and designed for integration in the ASA network.

The 7-inch touch screen guides the workshop technician simply and safely through all the necessary steps of the A/C service. Our professional and premium devices can be controlled and monitored via an app. We also offer an efficient, Europe-wide service network with technical support, instruction, and training.

Always present in all our units—MAHLE's A/C formula: E³ = Eco-friendly × Economical × Efficient

E³ – FILL
Always ready for use, regardless of the vehicle and ambient temperature.

E³ – CONNECT
Complete recovery of refrigerant from hoses and couplings.

E³ – PUMP
The internal cleansing process for the vacuum pump significantly extends oil change intervals. Up to 1,000 operating hours. The benefit: significantly reduced maintenance costs.

Refrigerant R134a

ArcticPRO® ACX 320

- High-performance vacuum pump
- 12 L refrigerant tank
- Large 7-inch touch screen
- Printer for customer reports
- Database for service data
- Convertible to refrigerants R1234yf and R513a

ArcticPRO® ACX 350

- High-performance vacuum pump
- Convertible to refrigerants R1234yf and R513a
- Large 7-inch touch screen
- Printer for customer reports
- Database for service data
- A/C performance test
- Nitrogen/forming gas leak test

ArcticPRO® ACX 380

- Suitable for hybrid vehicles
- High-performance vacuum pump
- Convertible to R1234yf and R513a
- Large 7-inch touch screen
- Printer for customer reports
- Database for service data
- A/C performance test
- Nitrogen/forming gas leak test
- Oil care system: hermetically sealed oil bottles

Refrigerant R1234yf

ArcticPRO® ACX 420

- 12 L refrigerant tank
- Large 7-inch touch screen
- For passenger cars as well as commercial, off-road, agricultural, and hybrid vehicles
- Printer for customer reports
- Database for service data
- Convertible to refrigerant R513a
- Optional: hybrid function, standard in the ACX 420

ArcticPRO® ACX 450

- High-performance vacuum pump
- CE/PED certifications
- Fully automated drainage of noncondensable gases
- Printer for customer reports
- Database for service data
- A/C performance test
- Convertible to refrigerant R513a
- Nitrogen/forming gas leak test

ArcticPRO® ACX 480

- High-performance vacuum pump
- Large 7-inch touch screen
- Printer for customer reports
- Database for service data
- A/C performance test
- Convertible to refrigerant R513a
- Nitrogen/forming gas leak test
- Oil care system: hermetically sealed oil bottles

Accesso-ries for A/C servicing

NEW

Nitrogen/hydrogen leak detector kit

Leak detector kit

- Kit for identifying leakages in air conditioning systems
- Kit comprises forming gas bottle, leak detector for forming gas, and pressure regulator

NEW

ACX RFID—refrig-erant analysis unit

External analysis unit for MAHLE ACX A/C service units for refrigerant R1234yf and now also for R134a

- Meets German Association of the Automotive Industry (VDA) specifications
- Simple, automatic operation and instant measurement result

ROU—recovery only unit

Removes unknown and contaminated refrigerants from vehicle air conditioning systems simply and safely.

- For refrigerants R134a and R1234yf
- It's all organized: one call is all it takes—transport, analysis, and disposal—automatically and with no paperwork

ACX—universal flushing unit

Flushing tank with support for flexible usage—entirely independent of the A/C service unit location and model

- For refrigerants R134a and R1234yf
- Direct access to refrigerant filter for fast replacement
- Flexible application: HP hose connector adapter set for various A/C service units

ArcticPRO® LD-2 dual mode leak detector

The ArcticPRO® LD-2 is a dual mode leak detector featuring both electronic sensor and patented UV detection modes.

- The solid electrolyte sensor technology detects refrigerants R134a and R1234yf.
- The digital display also works inde-pendently of the audible alarm and sensitivity level, allowing precise location of the leak source.

Remote diagnostics and service support

MAHLE A/C service and transmission flushing units are easy to operate and extremely reliable. Should there be any problems, however, our remote diagnostics service offers fast assistance.

ACX and ATX Manager

Remote diagnostics and service support: anytime and anywhere

- Immediate assistance when you need it—on site without a technician
- A/C service unit connects simply to your PC via USB or Wi-Fi
- Your workshop service partner can control the service unit and individual components or correct defects remotely, without an on-site visit
- For MAHLE A/C service units ArcticPRO® and MAHLE FluidPRO®

Remote service

A function of the ACX and ATX Manager software

- Download the software directly onto your PC.
- Connect the service unit to your PC via the USB port or Wi-Fi.
- Remote Service will now start in the ACX and ATX Manager software.
- Your MAHLE partner or authorized service partner can access your MAHLE service unit using the serial number.
- The hydraulic schematic and components will be displayed.
- Your service partner can control the service unit and individual compo-nents or correct errors remotely.

Automated maintenance for automatic transmissions

FluidPRO® ATX 150/ATX 180

User-friendly design and state-of-the-art technology

- 25 L swap tank for new ATF with quick-change unit
- Admixture tank: 500 ml

- Drain grille for oil pan
- Holder for the hose rack
- New oil filter: stainless steel mesh filter/150 µm size
- Automatic cycle: supported procedure
- Flushing: automatic
- Hose cleaning: automatic
- Drainage of the old ATF tank
- Dimensions: 750 × 750 × 1,200 mm
- Weight: approx. 65 kg

- Display: 4.3-inch LCD
- Keyboard: membrane keyboard
- Software update: USB Type A with USB 2.0 key
- Hydraulic circuit: supply pump 10 L/min. single-stage gear pump
- Hydraulic connections: 3 m net length of service hoses 1 and 2/ length of the old ATF drain hose 1.5 m (FluidPRO® ATX 180 only)

Advantages at a glance

+ Fully automated
+ Intuitive operation
+ Oil changes are safe and easy

The number of vehicles with automatic transmissions has increased considerably in the last few years. A transmission system service is recommended every 60,000 km on average. With the right equipment, such as the FluidPRO® ATX from MAHLE, this is an uncomplicated task.

Vehicle manufacturers recommend servicing automatic transmissions:

- To avoid significant follow-up costs in case of problems
- To extend the service life of the automatic transmission
- To maintain good vehicle performance
- To avoid malfunctions due to wear and contaminated ATF
- To ensure a more comfortable drive

Our solution—FluidPRO® ATX

- Zero Cross—a fast program facilitates safe, convenient oil changes with the highest purity (FluidPro® ATX 180 only)
- Intelligent database—quickly provides detailed information on relevant vehicle specifications and service information, e.g., oil type, fill level, adapters, and filters
- Complete—the simple and intuitive user interface guides you quickly and comprehensively though the automated service process
- Highest degree of purity—no oil contamination thanks to the use of two pumps, separate oil circuits, and an automated cleaning process
- Clear indication of oil quality and transmission oil pressure during the service
- Changing oil types is easy with the removable oil tanks
- A service time of just 5 to 15 minutes
- Hose connections are automatically checked and adjusted to the flow direction before each service—this no longer needs to be changed manually
- Automatically controls the temperature of the transmission oil—the flushing process starts automatically as soon as the oil reaches the correct temperature
- Dipstick mode—alternative oil change method via the oil guide pipe (FluidPRO® ATX 180 only)
- Integrated process for removing the oil pan and changing the transmission oil filter

Even more solutions— for efficient servicing

“Our new EmissionPRO® 180 is the outstanding result of our cooperative development and production efforts with BRAIN BEE.” Olaf Henning—Corporate Executive Vice President and General Manager MAHLE Aftermarket

EmissionPRO® 180

Reliable exhaust gas measurement for diesel and gasoline engines

- Meets emissions testing guideline 5.01
- Software separation of calibration and user interface
- Modular design
- Open PC solution
- Integrated operating instructions
- Intuitive software
- Possible to integrate diagnostics and guided troubleshooting
- Universal rpm measurement module with data transfer via USB or Bluetooth
- A powerful vehicle communication interface for reading the fault memory
- A convenient rolling cart with printer, keyboard, mouse, 24-inch monitor, and computer

Advantages at a glance

+ MAHLE’s complete emissions testing package
+ Windows-based emissions testing station
+ Can be used as a mobile or stationary unit
+ Can be configured to suit individual customer demands

High-precision measuring tool for diesel particles

Easy to operate

PMU400

High-precision measuring tool for diesel particles

- Measures particles from gasoline engines with a size of only around 10 nm
- An add-on model that works perfectly with the EmissionPRO® 180 as well as with other makes

Advantages at a glance

+ Industry-leading technology
+ Easy to operate
+ Works as a stand-alone solution thanks to existing display and keyboard
+ Can be operated via Bluetooth or USB

Simple—calibration of driver assistance systems

Digital ADAS calibration tool

TechPRO® Digital ADAS

Digital ADAS calibration tool

- Simple and reliable calibration of driver assistance systems
- With this intuitive and future-proof solution, MAHLE is setting new benchmarks in this promising product group

This tool allows workshops to adjust and calibrate driver assistance systems quickly and easily—using just a digital calibration panel. This saves time and money. The tool is continuously updated online and expanded to cover more vehicles.

Good to know

Of course, accessories such as the EASY PLACING KIT, wheel clamps, and dust protectors are also available. For more information, please refer to our separate price lists.

The fastest diagnostic tools in the world

TechPRO®
TechPRO® SMART

Ready to start vehicle diagnostics within just seven seconds

- Easy to operate
- Integrated technical information (wiring diagram, error list, status display)
- Functions: reads data, reads errors, and displays solutions; diagnostics for individual parts and component coding

- 10.1-inch touch screen and Wi-Fi (terminal only)
- TecDocPOWERED
- Dimensions: 317 × 217 × 50 mm (terminal)/120 × 48 × 25 mm (VCI)
- Weight: 1,500 g (terminal)/90 g (VCI)
- Communication protocol: ISO 14230 (ISO 9141-2)/ISO 11519—J1850 PWM/ISO 11519—J1850 VPW/ISO 11898-2—high-speed CAN bus/ISO 11898-3—low-speed CAN bus/SAE J2411—single-wire CAN bus

- SAE J2534 PASS-THRU: NEXUS-THRU (optional)
- Wireless connection: Bluetooth 4.1—Wi-Fi 802.11 b/g/n dual antenna—beamforming technology (terminal)/Bluetooth 4.1 with a range of up to 100 m in the open air (VCI)
- Display: 10.1-inch touch TFT LCD with a resolution of 1,200 x 800 (terminal)

Advantages at a glance

+ Constantly updated via Wi-Fi
+ An innovative interface design gives you immediate and fast access to all the information you need for your professional work
+ EU automobile market coverage of over 90%
+ PASS-THRU control and programming function available

TechPRO®—diagnostic tools

The TechPRO® product range acts as an interactive interface between you, the automotive professional, and the vehicle. With numerous versatile functions, extensive scanning options, simple application software, and a large number of interfaces, TechPRO® scanning tools guarantee fast work with excellent results. TechPRO® is easy to use and precisely tailored to workshop operation. The unit reads out data and errors, displays solutions, allows component diagnostics, and offers component coding.

TechPRO® Scan

This is a powerful operating system that is up to ten times faster than other vehicle diagnostics systems. TechPRO® Scan gives you immediate and fast access to all the information you need for your professional work. The diagnostics station recognizes the vehicle system and provides a user-friendly display. This allows you to immediately see which tasks are required for maintenance.

MAHLE OzonePRO for reliable cleaning

MAHLE OzonePRO is the professional cleaning unit designed for easy use in your workshop. With its special sensor, OzonePRO allows the cleaning process to be carried out safely with an optimal result.

No room for viruses!

Using information on the type of vehicle and the internal condition of the vehicle, the sensor continuously analyzes the concentration of ozone produced inside the vehicle until the ideal level is reached, and keeps it constant for the time required to ensure optimal cleaning.

OzonePRO also reliably eliminates unpleasant odors caused by bacteria and fungus inside the vehicle.

Why is it so important to clean the vehicle cabin?

Viruses, bacteria, and mold are often found in upholstery, carpets, or the air conditioning circuit of vehicles. For your safety and that of your customers, we therefore recommend cleaning the vehicle cabin thoroughly every time maintenance is carried out. A cleaning service with highly effective products is currently more essential than ever.

Ozone (O_3) is often used to clean sanitary facilities and its cleaning effect reliably destroys viruses, mold, and bacteria on surfaces or inside the vehicle.

Ozone is recognized as a natural cleaning agent and has a wide range of applications: it can be used to clean air, water, surfaces, and fabrics.

What all our products include

The best vehicle parts are in the right place at the right time. MAHLE Aftermarket operates more than a dozen logistics centers and numerous regional support points at strategic locations in Europe, North and South America, and Asia—with an optimized flow of goods and the best possible availability.

MAHLE products are among the most sought-after on the automotive parts market—by genuine buyers and counterfeiters alike. That's why the packaging used for our engine components, turbochargers, and thermostats now features a special security label. It combines several security features, such as the VeoMark® and MAPP code, which are linked together to provide the trade with maximum protection against counterfeiting. Our logistics centers and sales branches are wherever you need us to be—in Argentina, Brazil, China, Dubai, France, Germany, Great Britain, India, Japan, Mexico, Poland, Russia, Singapore, South Africa, Spain, Sweden, Turkey, Ukraine, and the USA.

1,700 employees

25 locations worldwide

150,000 spare parts

25,000 sales partners

100% OE competence

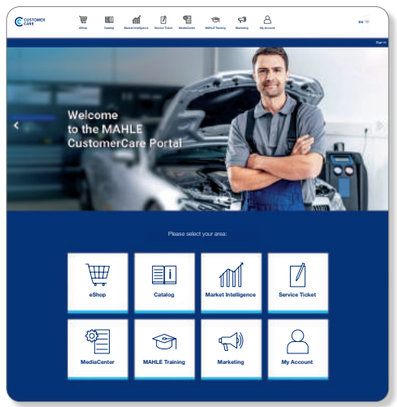
MAHLE Aftermarket—the right range every time

MAHLE Aftermarket combines seven strong brands that are synonymous with innovation and uncompromising quality—on a global and regional basis.

Take advantage of our expertise and our comprehensive, ever-expanding product portfolio that covers the following areas:

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

Thanks to our comprehensive logistics network, our products are available to you as quickly as possible.



Damage brochures

Our damage brochures have become indispensable reference guides for workshops and home mechanics. With images and detailed explanations on findings and causes as well as how to remedy or avoid these, you'll find descriptions of the types of damage that frequently occur in the respective product groups.

Алматы (727)345-47-04
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89

Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81

Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Ноябрьск (3496)41-32-12
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47

Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саранск (8342)22-96-24
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Тверь (4822)63-31-35

Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)33-79-87
Тюмень (3452)66-21-18
Улан-Удэ (3012)59-97-51
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Чебоксары (8352)28-53-07
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Чита (3022)38-34-83
Якутск (4112)23-90-97
Ярославль (4852)69-52-93

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