Unrestricted access to low-emission zones

100% Diesel Particulate Filter Systems for Light Commercial Vehicles

SMF®-Sintered Metal Filter

SMF®-AR

HJS
Abgas-Systeme • Exhaust Systems

Clean logistics - Environmental protection pays for itself!

Clean solutions > Clean exhaust > Clean cities

Focus on mobility, health and environmental protection

Mobility, health and environmental protection are among our company's key concerns. The problem of ever-increasing volumes of traffic, allied to the associated risks to humans and the environment from exhaust emissions, represents a major challenge both today and for the future.

The main demands on the internal combustion engine in this respect relate to the need for low pollution and efficiency. Thanks to its outstanding characteristics and its benefits in terms of fuel consumption and CO_2, the diesel engine will continue in future to be used around the world as the most important type of engine for many areas of application. As far as environmental considerations are concerned, there is a critical debate focused especially on soot emissions.

The consistent use of diesel exhaust-gas aftertreatment systems makes it possible for such pollutants to be eliminated and for vehicles and machines alike to be operated cleanly and efficiently. This is where HJS technologies play an important role.

Diesel emissions

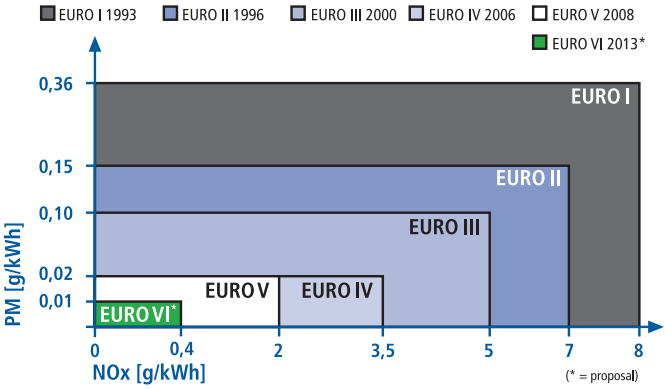
When fuel is combusted in a diesel engine, this gives rise to soot particles. The smaller these soot particles are, the easier it is for them to pass through our lungs and on into our bloodstream and other organs. Soot particles from diesel engines are known to represent a particular health hazard. According to studies carried out on behalf of the EU Commission, every year over 280,000 people in Europe – 65,000 in Germany alone – die prematurely from the effects of particulate matter. Moreover, high levels of particulate matter result in an average shortening of life expectancy by around six months. In the case of children who grow up in particularly polluted areas, respiratory disorders and allergies are twice as prevalent as they are in kids from less polluted areas.

This means that lowering the emissions of soot particles is very important in terms of human health and the environment. Any measure aimed at reducing such pollution must be viewed positively.

European exhaust emissions standards

A reduction of the pollution caused by commercial vehicles has been achieved in the past 15 years through in-engine measures. The further tightening of emissions limits, which will be introduced with the EURO V standard and, above all, the EURO VI standard, calls on the other hand for the use of exhaust-gas aftertreatment systems.

The consistent application of advanced exhaust treatment systems not only allows new vehicles to meet these high standards, but also older vehicles can be brought into line with the current state of the art.



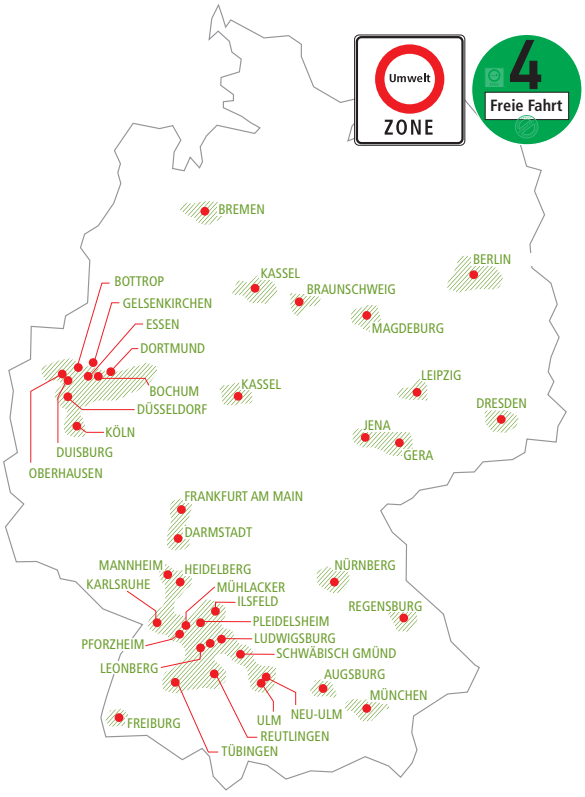
Fine particulate matter

According to the German federal environmental agency, road traffic – predominantly diesel-engined vehicles – is one of the principal sources of pollution. The particulate matter pollution caused by soot emissions from these engines accounts for around half of all particulate matter pollution in our towns and cities.
Consequently, various measures have and are being introduced to reduce the release of pollutants at both European and also German national level. Such measures include the EU clean air directive, which came into force at the beginning of 2005 and sets limits for air pollution from particulate matter and other pollutants such as nitrogen dioxide; the establishment of low-pollution zones with driving bans for vehicles with high exhaust emissions; as well as an emissions-dependent system of toll charges for heavy goods vehicles.

Low-emission zones throughout Europe and nationwide

The establishment of low-emission zones throughout Europe and nationwide is aimed at reducing particulate matter pollution levels and improving health protection for everyone. In Germany, the cities of Cologne, Hanover and Berlin have taken the lead in the battle against

| Unrestricted access to low-pollution zones with a green sticker



• Over 40 low-emission zones will be implemented in Germany

fine particulate matter by launching their low-emission zones at the beginning of 2008. Sooner or later, more than 40 towns and conurbations around the country will introduce low-emission zones. In Europe alone more than 25 low-emission zones have or will be implement (3 in Norway / 5 in Sweden / 1 in England / 13 in the Netherlands / 6 in Italy).

Driving bans for trades people and caravans

In Germany only vehicles displaying an appropriate emissions sticker

Which sticker has access to enter low-emission-zones in Germany?

Mobility till 2010	Mobility from 2010	Mobility from 2012
● ✔	● ✔	● ✔
● ✔	● ✔ ✘ partial	● ✔ ✘ partial
● ✔	● ✘ ✔ partial	● ✘

are allowed to enter the low-emissions zones. A traffic sign indicates which colour sticker(s) (green, yellow, red) give unrestricted access.

Drivers who enter a low-emission zone without or with the wrong sticker risk not only a fine of € 40 but having their licence endorsed with one penalty point. As of 2010, some zones, e.g. in Berlin or Bremen, will only permit access to vehicles with a green sticker. Other cities are taking a multiple-stage approach with a driving ban for vehicles with a red sticker starting 2010, this ban being extended to vehicles with a yellow sticker as of 2012.

Apart from drivers of diesel-engined cars, it is trades people with their vans and light duty vehicles as well campers with their caravans that are most affected. They can be restricted in their mobility and banned from inner city areas with low-emission zones if the vehicles is not equipped with a diesel particulate filter.

Long-term unrestricted access with HJS diesel particulate filters

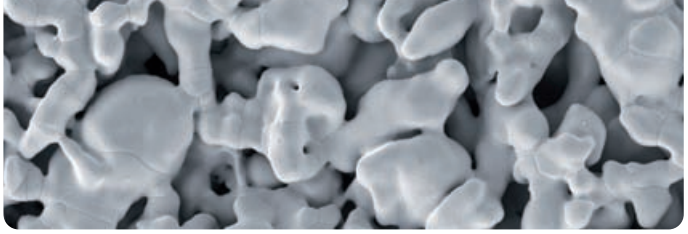
By being retrofitted with a 100% filter system from HJS, light commercial vehicles operated by tradesmen, retailers, inner-city couriers, taxi services and other small businesses as well as caravans or campervans qualify for a green emissions sticker (Germany), ensuring entry into low-emission zones well into the future.

The benefits at a glance

✔ Active protection of health and the environment

✔ Unrestricted access to low-pollution zones well into the future

✔ Increase in the vehicle's resale value



Sintered Metal through an electron microscope

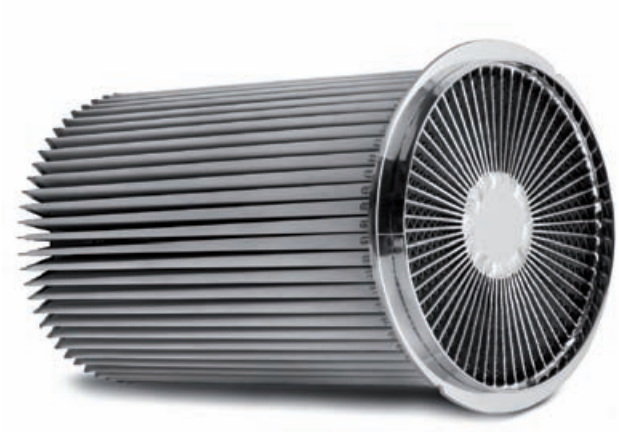
HJS Exhaust-Aftertreatment-Systems

Light commercial vehicles – guaranteeing mobility

SMF®-Sintered Metal Filter

100% soot-free

The centrepiece of all HJS exhaust treatment systems is the sintered metal filter (SMF®), with which HJS sets new standards in the global marketplace and for which HJS was awarded the 2003 German Environment Prize. This enclosed 100% filter reduces the emissions of soot particles, including fine particulate matter, down to the limit of detection, with a filter efficiency of over 99%.



SMF® - Sintered Metal Filter – 100% soot-free

Reliable and low on maintenance

The SMF® and the systems based on it are exceptionally reliable in operation, low on maintenance and also benefit from a long service life. HJS systems have proved their worth over many years in thousands of car, bus and truck applications. The advantages offered by an SMF® result from its special design as well as its use of sintered metal. The clogging known from conventional ceramic filters with their honeycomb structure is made impossible by the pocket-type construction of the SMF®. Exhaust backpressure is minimised by the fact that there is an unrestricted inflow of gas into the filter pockets from outside. In addition, the ash holding capacity of an SMF® is three to four times as high as that of a conventional ceramic filter system, which significantly increases the mileage before an HJS filter requires cleaning, including in the case of older commercial vehicles with particularly high oil consumption. For, whereas a ceramic filter requires cleaning after just a short period of operation, an SMF® is capable of several years of operation before maintenance is needed. This makes it possible to minimise the running costs for service and maintenance as well as the associated downtime costs, which means the operator can make considerable cost savings over the life of a vehicle.

Catalytic coating

For OE applications or in the case of vehicles that are operated at low temperatures, the SMF® can be provided with a specially developed catalytic coating to support the process of filter regeneration.

Flexible solutions for different applications

Thanks to their modular construction, sintered metal filters can be used in various systems and versions to suit different applications. They are suitable both as original equipment (OE) and also for retrofitting in commercial vehicles.

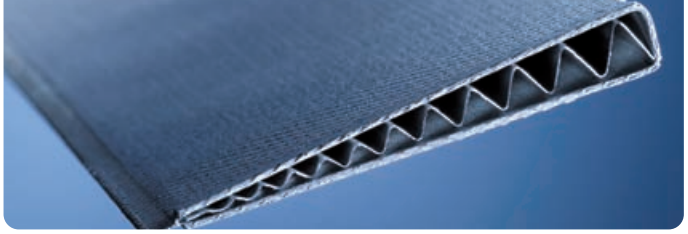
SMF® advantages at a glance

- ✔ Over 99% reduction of soot particles, incl. fine particulate matter
- ✔ Suitable for OE and retrofitting applications
- ✔ High ash holding capacity and low exhaust backpressure
- ✔ Catalytic coating provides extended temperature window
- ✔ Absolutely low-maintenance and economical
- ✔ Reliable with long service life
- ✔ 100% recyclable

Operating principle SMF®-AR

HJS's SMF®-AR system filters the exhaust-gas flow until an optimum quantity of soot for regeneration has been collected in the filter. The system makes use of the positive active properties of a fuel additive that on the one hand lowers the soot's ignition temperature and on the other hand significantly increases its burn-off speed. The soot held back in the filter can, therefore, be burned off automatically in a spontaneous regeneration process when the exhaust gas has an appropriate temperature of 400°C or higher.

If, however, these temperatures are not reached – which is frequently the case in city traffic – the system's active regeneration assistance function cuts in.



Sintered Metal Filter-pocket

Soot combustion following initial ignition

Modular SMF®-AR system – with active regeneration

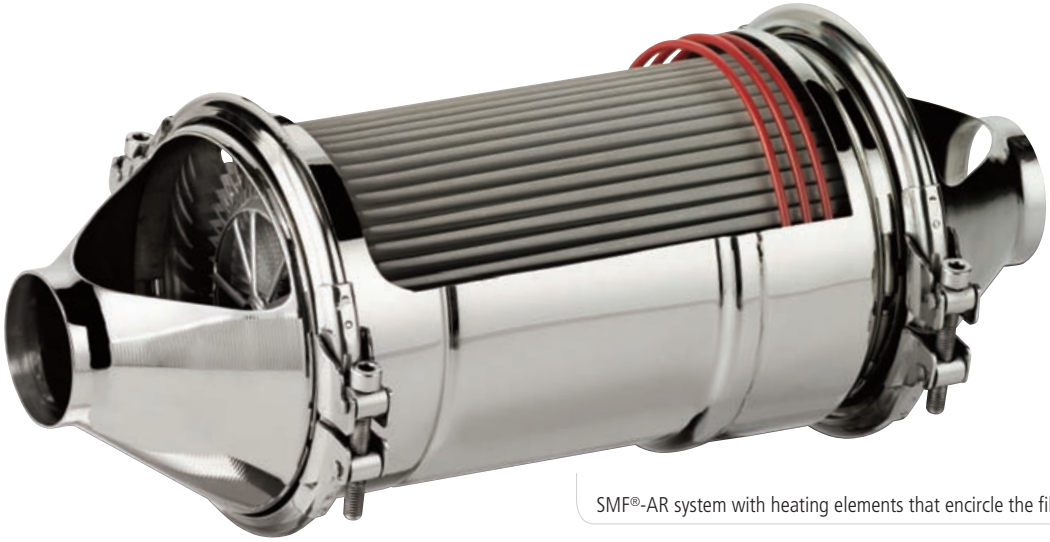
Light commercial vehicles, in particular, which are frequently driven in inner-city, stop-and-go traffic, often do not reach the minimum exhaust-gas temperature necessary for regeneration of the filter. This means conventional filter systems in most cases can't be fitted, because the danger of 'soot overload', i.e. clogging of the filter, increases rapidly.

Suitable for such applications are active systems like the SMF®-AR system developed by HJS, in which – independent of the temperature of the exhaust gases – the filter can be regenerated (cleared of the soot) in almost all engine operating conditions.

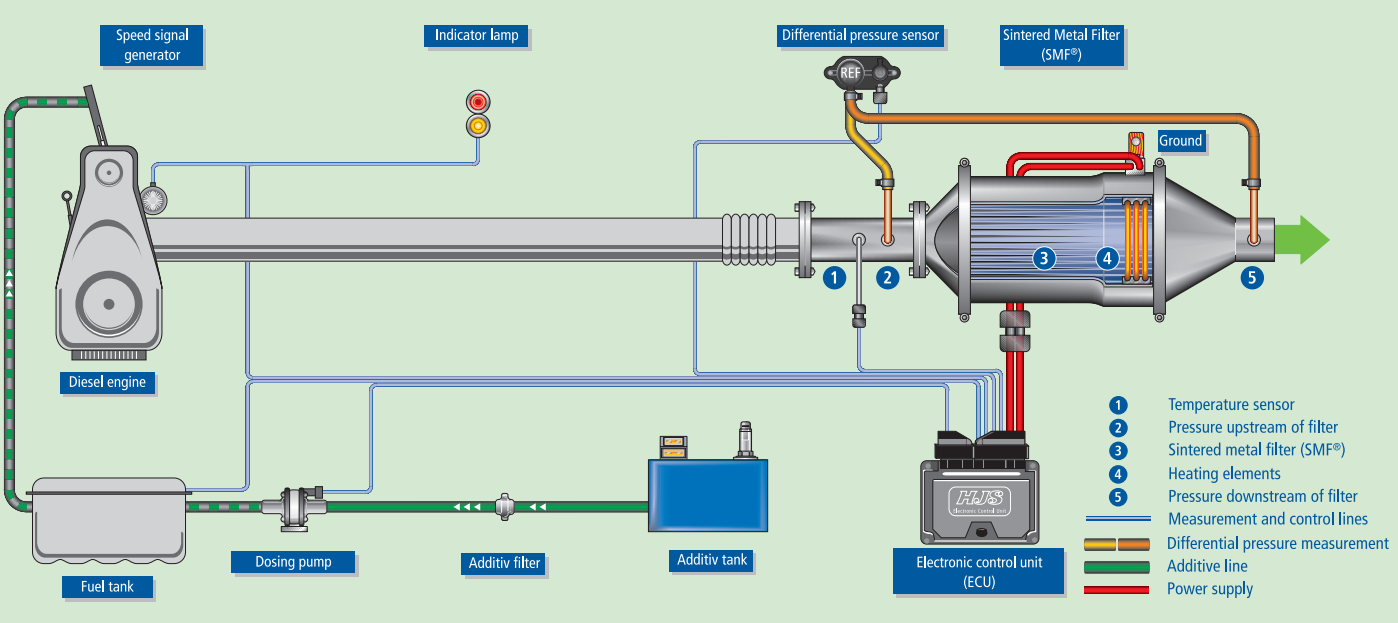
Active, thermoelectric regeneration

The control unit not only triggers ignition of the soot, but also doses the optimum amount of additive, monitors the filter load and, with the help of sensors, calculates the best timing for regeneration. In addition, a self-learning driving-cycle recognition functionality generally prevents a regeneration cycle that has already started from being interrupted when the engine is switched off. What's more, the high soot-holding capacity of the SMF® allows not just one single ideal moment for regeneration, rather regeneration can take place within a wide time slot.

If, then, one or even several regeneration cycles are cancelled owing to the engine being switched off, this poses absolutely no problem in



SMF®-AR system with heating elements that encircle the filter



Mercedes-Benz Atego – 100% soot-free

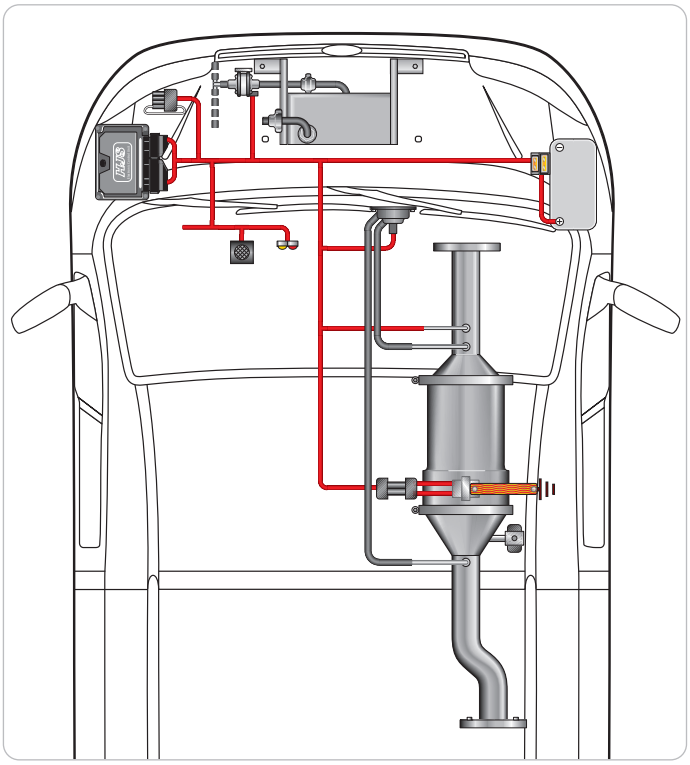
Mercedes-Benz Sprinter – unrestricted access with the SMF®-AR system

respect of safe and reliable operation of the SMF® system. A further advantage of the SMF® is its high ash holding capacity, which allows for long servicing and cleaning intervals.

Market coverage and product range

Many light commercial vehicles can be fitted or retrofitted with the HJS SMF®-AR particulate filter system. The product range covers the bulk of Germany's fleet of these vehicles. Systems are available for various vehicle models built by FIAT, IVECO, Mercedes-Benz, Peugeot and VW and have already been in use for a number of years. The HJS SMF®-AR system has proved itself in many applications and in tough fleet operation, both as original (OE) and retrofit equipment.

The existing HJS product range is subject to ongoing review and expansion, which means that there will be constant additions of new vehicle models, especially EURO II and EURO III vehicles.



SMF®-AR system in a Mercedes-Benz Sprinter

SMF®-AR advantages at a glance

- ✔ Suitable for OE and retrofitting applications
- ✔ Over 99% reduction of soot particles, incl. fine particulate matter
- ✔ Particularly suitable for inner-city stop-and-go traffic
- ✔ Fully automatic, active regeneration
- ✔ Modular construction
- ✔ Reliable operation and low maintenance

| Mobility without boundaries

Vehicle	Year	EURO Standard	Engine	Displacement ltr.	Performance kW	System	Article-Nr.
Citroën							
Jumper 2,8 HDI 130	ab 2002	III	2,8 Hdi 130	2,8	94	SMF®-AR	93 32 2004
Fiat							
Ducato 2,3 JTD	ab 2002	III	2,3 JTD	2,3	81	SMF®-AR	93 32 2005
Ducato 2,8 JTD	ab 2002	III	2,8 JTD	2,8	94	SMF®-AR	93 32 2004
IVECO							
Daily III	ab 2003 - 2006	III	2,3 Ltr.	2,3	71/100	SMF®-AR	93 71 2013
Daily III	ab 2000 - 2006	III	2,8 Ltr.	2,8	92/107	SMF®-AR	93 71 2011
Daily III	ab 2004 - 2006	III	3,0 Ltr.	3,0	100/122	SMF®-AR	93 71 2011
Mercedes Benz							
Sprinter 208, 308, 408 CDI	1999 - 2006	III	OM 611 DE 22 LA	2,2	60	SMF®-AR	93 13 2001
Sprinter 211, 311, 411 CDI	1999 - 2006	III	OM 611 DE 22 LA	2,2	80	SMF®-AR	93 13 2002
Sprinter 213, 313, 413 CDI	1999 - 2006	III	OM 611 DE 22 LA	2,2	95	SMF®-AR	93 13 2000
Sprinter 216, 316, 416 CDI	1999 - 2006	III	OM 612 DE 27 LA	2,7	115	SMF®-AR	93 13 2003
Sprinter 216, 316, 416 CDI	1999 - 2006	III	OM 612 DE 2 7 LA	2,7	115	Einbausatz Automatik	93 02 4800
Sprinter 616 CDI	1999 - 2006	III	OM 612 DE 27 LA	2,7	115	SMF®-AR	93 13 2003
Peugeot							
Boxer 2,8 Hdi	ab 2002	III	2,8 HDi	2,8	94	SMF®-AR	93 32 2004
VW							
Bus T4	1993 - 2003	III	1,9 Ltr.	1,9	50	SMF®-AR	93 11 2007
LT 35 A	2001 - 2006	III	BBE 2,5 Ltr.	2,5	61	SMF®-AR	93 11 2018

As a medium sized company based in Menden/Germany, HJS Fahrzeugtechnik GmbH & Co KG has more than 30 years experience and expertise in the field of exhaust-gas aftertreatment. Some 500 employees develop, produce and market modular systems for the reduction of pollutant emissions. These innovative environmental protection technologies can be used either for original equipment or for retrofitting in passenger cars, commercial vehicles and various non-road applications. In addition to systems for spark-ignition engines, HJS is particularly specialised in systems for diesel engines – especially for reducing soot particle and nitrogen oxide emissions. All systems meet the statutory requirements and are certified in accordance with the valid licensing regulations.

With its extensive range of patents for DPF® (Diesel Particulate Filter) and SCRT® (Selective Catalytic Reduction Technology), HJS sets benchmarks, both nationally and globally.

HJS Technology portfolio for OE- and Retrofit-Applications

> Oxidation Catalysts
> Diesel Particulate Filters (DPF®)
  • Sintered Metal Filters (SMF®)
  • Silicium Carbit Filters (SiC)
  • Cordierite Filters
> Modular CRT®-SMF®-Systems
> Modular CSMF®-Systems
> SMF®-AR-Systems – with active regeneration
> Fuel-Converter for DPF® regeneration
> SCR-Systems to eliminate nitrogen oxides
> SCRT®-Systems – reduction of soot particle and nitrogen oxide emissions

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