INFO-HOTLINE
+49 2373 - 987 123
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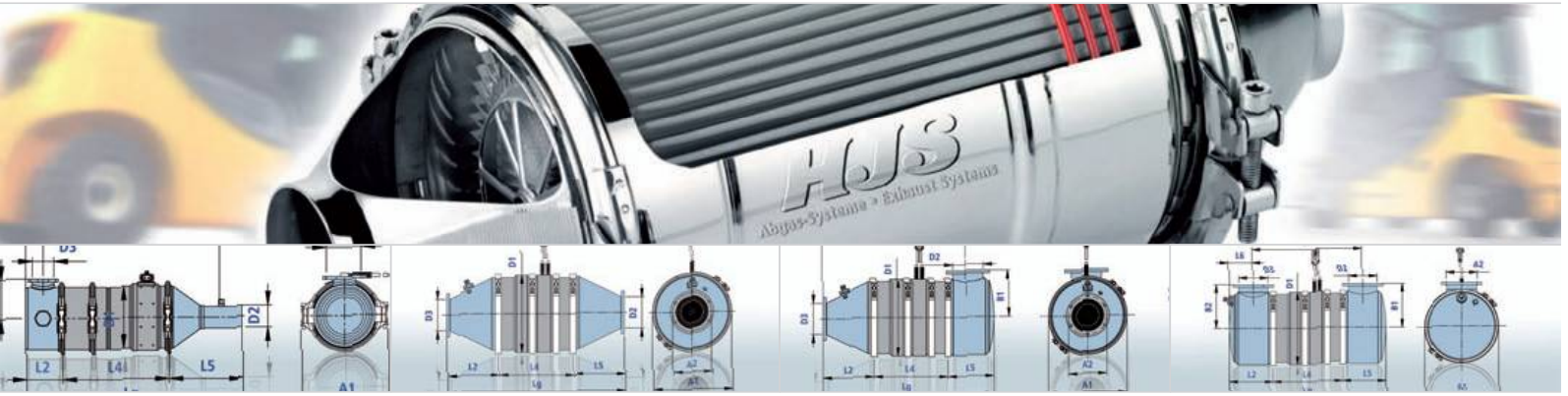
Diesel Particulate Filters
for Mobile Machinery and Stationary Applications



Modular SMF® and SMF®-AR Systems

Valid from 1 April 2010

HJS
Abgas-Systeme • Exhaust Systems

Inhalt

Clean Solution with Diesel Particulate Filters

Switzerland

Switzerland is benchmark when it comes to combatting diesel soot, a primary contributor to airborne particulate matter: particulate filters have been compulsory in construction machinery for a long time now. Since as long ago as 1983, numerous laws have been passed with respect to reducing emissions levels. Within the scope of the "VERT" project (Verminderung der Emissionen von Real-Dieselmotoren im Tunnelbau, or in English, "Reduction of Diesel Emissions in Tunnelling"), a quality test was defined specifically for diesel particulate filters. This test method has since become the internationally recognised standard for testing pollutant-reducing systems. Filters that meet the technically demanding criteria are listed by the Swiss Federal Office for the Environment (FOEN, or BAFU from the German). Only VERT-certified systems that achieve a filtration efficiency rate of at least 97% are allowed to be used in Switzerland. Above all, this applies to particularly harmful ultra-fine particulate matter (particulates with a diameter < 0.1 µm).

Since January 2009, the diesel PM emissions of mobile machinery on construction sites are subject to more stringent regulations. The new provisions laid down in the Air Quality Control Regulation (LRV) are for the most part oriented to the VERT method and stipulate the use of diesel particulate filters for mobile machinery with a power output from as low as 18 kW.

Particulate Filter		Conformity Certification			
Manufacturer	Filter Family/Type Classification	Assessment Dept.	Certification No.	Date of Certification	Valid Until
HJS	SMF®-AR	BAFU	B195/12.06	12.2006	31.12.2013
HJS	SMF®-CRT	BAFU	B159/03.05	03.2005	31.12.2013
HJS	SMF®-FBC	BAFU	B195/12.06	12.2006	31.12.2013

• BAFU filter list (extract)

Appreciable reduction in air pollution

BAFU filter list (extract)

HJS systems are VERT-certified and included on the BAFU filter list. As such, they meet the tough Swiss specifications for diesel particulate filters (More information: www.umwelt-schweiz.ch).

Tried-and-tested particulate filter systems for fitting to diesel engines

WORLDWIDE – Selection

Austria: In Tyrol and the redevelopment area of Vienna, construction machinery with a power output of 18 kW or more are only approved for use when fitted with a diesel particulate filter with a filtration rate of at least 95%.

UK: On selected construction sites in London, only construction machinery fitted with exhaust-gas aftertreatment systems are allowed to be used.

Italy: Particulate filters are mandatory for construction machinery deployed on public construction sites in South Tyrol.

USA: A range of different measures are being taken in the USA to reduce the level of pollutants emitted by construction machinery. The "Diesel Risk Reduction Plan" of the California Air Resources Board (CARB) envisages a reduction in particulate emissions in California of 85% by 2020. Other measures include the use of diesel particulate filters on construction sites in cities such as New York, Washington DC, Houston and Boston.

Well equipped for making bids

A step ahead with environmental protection technologies: Having particulate filters installed is increasingly becoming a crucial criterion if you are to win new contracts.

Servicing and maintenance

Automatic monitoring and maintenance indicator

The **HJS Service Unit** monitors a filter automatically by measuring the backpressure and temperature of the exhaust gases. Both pieces of information are displayed by the **HJS "ServiceCheck" display module**, which means the status of the filter is immediately visible at all times. The Service Unit is included in the scope of delivery and ensures the filter functions at optimum efficiency.

Benefits

- ✔ Constant monitoring of the exhaust backpressure and temperature
- ✔ Overload detection for the particulate filter
- ✔ Automatic indication that the filter needs to be cleaned
- ✔ Lower maintenance costs

• Automatic monitoring with the electronic Service-Check

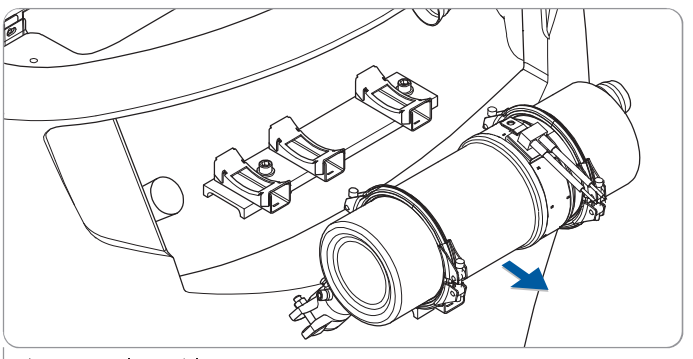
The HJS Service Unit complies with the LRV/VERT specifications

Maintenance

In addition to combustible soot particles, filter systems also remove all other solid particulate matter from the exhaust gases, above all ash from engine oils and additives. These residues must be removed from the filter at specific intervals by cleaning.

Cleaning intervals

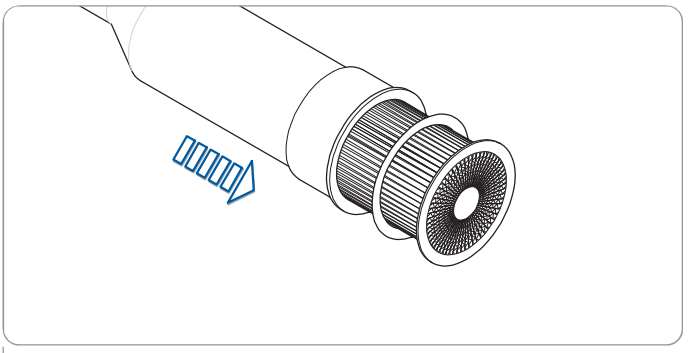
Thanks to the high ash holding capacity of the SMF®, the mileage it can cover before needing to be cleaned is considerably higher compared with that of a conventional wall-flow (honeycomb) filter. Experience shows that many machines can operate for longer than 2,000 hours before the first servicing work needs to be carried out. This makes it possible to keep the running costs for servicing and maintenance as well as the associated downtime costs to a minimum.



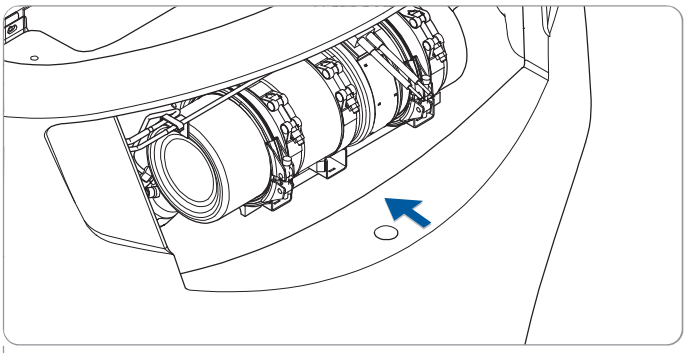
• 1. Dismount Filter Module

DIY filter cleaning

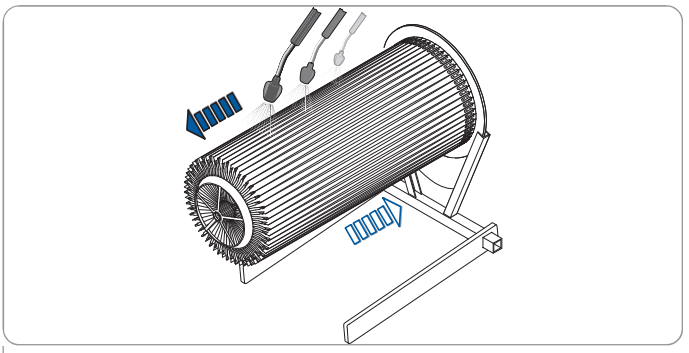
When a filter requires cleaning, you or your local garage can take care of it. The filter modules are simple and quick to remove and are then cleaned and freed of all residues with the aid of a commercially available high-pressure cleaner (the residues must be collected in an oil separator). Neither is it necessary to send the systems back to HJS, nor is there any need for complex and expensive cleaning equipment, such as a heat treatment furnace or filter cleaning system.



• 2. Remove SMF® Filter from casing



• 4. Mounting of filter module



• 3. SMF® Filter cleaning with high pressure washer

Quick and simple filter cleaning with a commercially available high-pressure cleaner

Certification

HJS diesel particular filters for mobile machinery and stationary applications …

… are certified and approved in accordance with **Switzerland's VERT** test method

… are included on the **Swiss BAFU filter** list and as such satisfy the tough specifications laid down by the national **Air Quality Control Regulation (LRV)**

…. are approved by the US **Mine Safety and Health Administration (MSHA)**

… satisfy Germany's **Technical Rules on Hazard Substances (TRGS) 554** – Diesel Engine Emissions

On the safe side with HJS

Practical experience

HJS diesel particulate filter systems are suited for original equipment as well as retrofitting of mobile machinery and stationary applications. Many engine and machinery manufacturers are already convinced – and more than 20,000 applications, such as industrial fork-lift trucks and construction machines, have already been equipped with tailor-made HJS solutions. We see ourselves as a cost- and quality-oriented partner who supplies its customers – you – with effective systems and components.

• Application example – dependant on the available installation space HJS Systems fitted accordingly

3. Equipping of Diesel Engines with Particulate Filter Systems

The following procedures must be followed when installing an exhaust-gas aftertreatment system for mobile machinery and stationary applications:

Application of the Machinery

Exhaust-gas temperature 250 to 450 °C

SMF® system

Determine size of filter taking into account maximum permissible exhaust backpressure

Determine size of catalytic converter in line with machinery power rating and emissions standard

Check temperature profile

barely sufficient

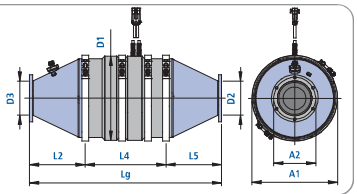
CSMF® system (coated filter)

sufficient

SMF® system (uncoated filter)

Take insulation into account

Take installation space into account



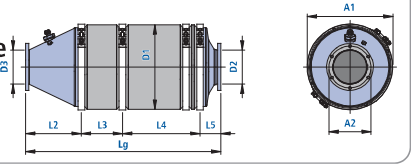
Exhaust-gas temperature from 150 °C

SMF®-AR system

Determine size of filter taking into account maximum permissible exhaust backpressure

Take insulation into account

Take installation space into account



All application specifications, installation guidelines and maintenance manuals provided by HJS Fahrzeugtechnik GmbH & Co KG must be complied with.

4. Modular SMF® System

SMF® technology has been developed specifically for applications in the medium to high power range. As a rule, the systems replace the original silencer, and they can be customised as required to match specific machines and stationary applications.

The modular SMF® systems require no extra regeneration aids, additives or intervention in the engine management system. The HJS Service Unit constantly displays the system's instantaneous operating state and indicates when the filter is in need of cleaning.

Catalytic coating

For low-temperature applications, the Sintered Metal Filter can be given a special coating in order to promote the regeneration process (CSMF® = Coated Sintered Metal Filter).

• Modular SMF® system

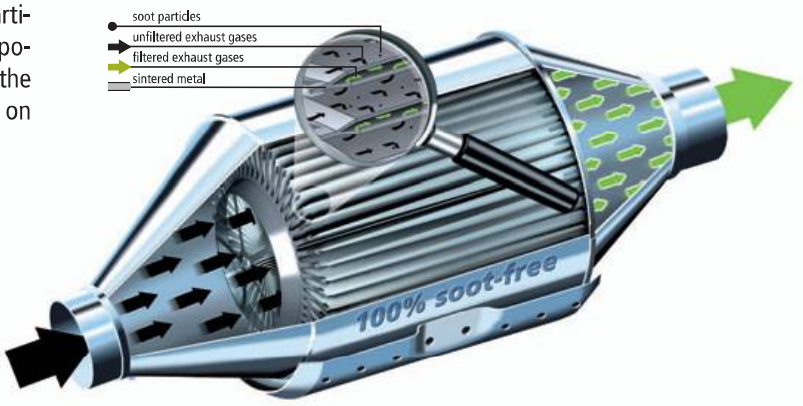
Application examples for SMF® systems:

Construction machinery, construction vehicles and construction equipment, such as industrial forklift trucks, wheel loaders, backhoe loaders, track loaders, special vehicles, power generating sets and district heating plants

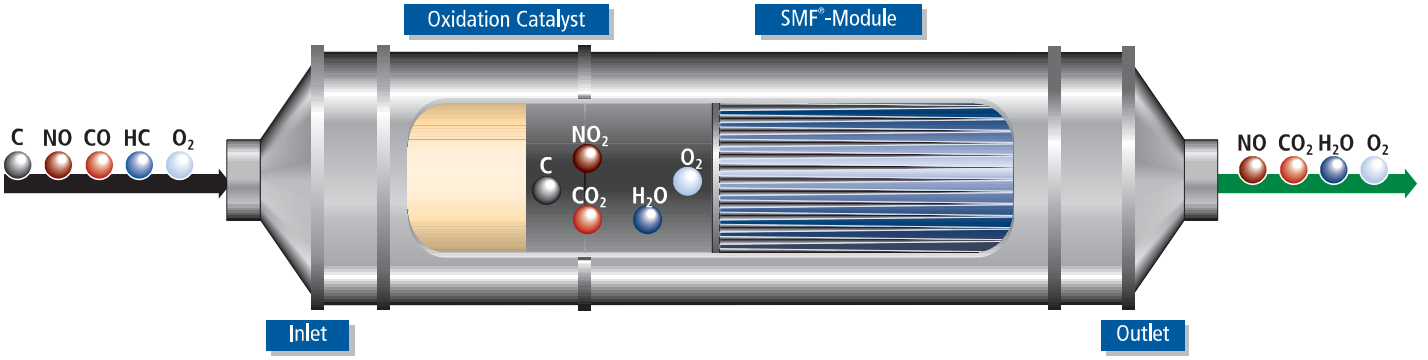
The right system for your specific requirement

Functional description

The hot exhaust-gases from the engine – which contain soot particles – are fed into the housing of the SMF®. The gaseous components flow through the microscopic pores of the filter pockets; the soot particles, including the fine particulate matter, are trapped on the surface and deposited on the individual filter pockets.



The CRT® (Continuous Regeneration Technology) effect is used to break down the soot that collects in the SMF®. The HJS system combines a highly efficient, upstream diesel oxidation catalyst (DOC) with an SMF®. Optimised tuning of the system results in the filter being continuously and effectively freed from the deposited soot.



• The CRT® (Continuous Regeneration Technology) effect continuously frees the filter from the deposited soot

Benefits

- ✔ No need for time-consuming and costly replacement of mobile machinery and stationary applications
- ✔ Reduction of soot particles and fine particulate matter by more than 99%
- ✔ Catalytic coating provides extended temperature window
- ✔ Flexible adaptation to different machines and engine power outputs

SMF® system for retrofitting

Technical data and requirements

Max. safe temperature operation for SMF®*: 650°C exhaust-gas temperature

Max. safe temperature operation for CSMF®:** 450°C (max. 3% of operating time 450°C < T < 500°C)

Filter material: high-temperature-resistant chrome-nickel steel

Filter housing material: 1.4301

Ash holding capacity: max. 50 g/l filter volume

Filtration efficiency rate: (number concentration in range from 20 – 300 nm) > 99%

Filtration efficiency rate: (in relation to soot mass) > 97%

* SMF®: uncoated Sintered Metal Filter

** CSMF®: coated Sintered Metal Filter

Application and operating conditions

The following application and operating conditions must be complied with in order to ensure the modular SMF®/CSMF® systems from HJS function optimally:

- Engine fulfils Stage II, Stage IIIA or B in Europe, Tiers 2, 3 and 4 in the USA
- Fuels used comply with DIN EN 590 (max. 50 ppm sulphur), DIN 51628 or DIN 14214 with a maximum phosphor concentration of 2 ppm and a maximum alkali concentration of 1 ppm
- Low-ash engine oils
- Exhaust-gas temperatures between 250°C and 450°C for > 35% of operating time for regeneration
- Strain-free, vibration-isolated installation of the systems and secure, gas-tight connection to the existing exhaust system
- Systems never mounted on the engine-gearbox unit
- Only components approved and released by the system supplier/HJS are fitted

Perfect connection of the system pipework ensures low exhaust backpressure. HJS offers insulating components for all its systems to reduce their surface temperature. The systems must only be operated in conjunction with the HJS Service Unit (included in the scope of delivery).

In order to ensure the systems operate as intended, HJS and its authorised partners offer a temperature-measurement service and one-on-one application consulting.

All application specifications, installation guidelines and maintenance manuals provided by HJS Fahrzeugtechnik GmbH & Co KG must be complied with.

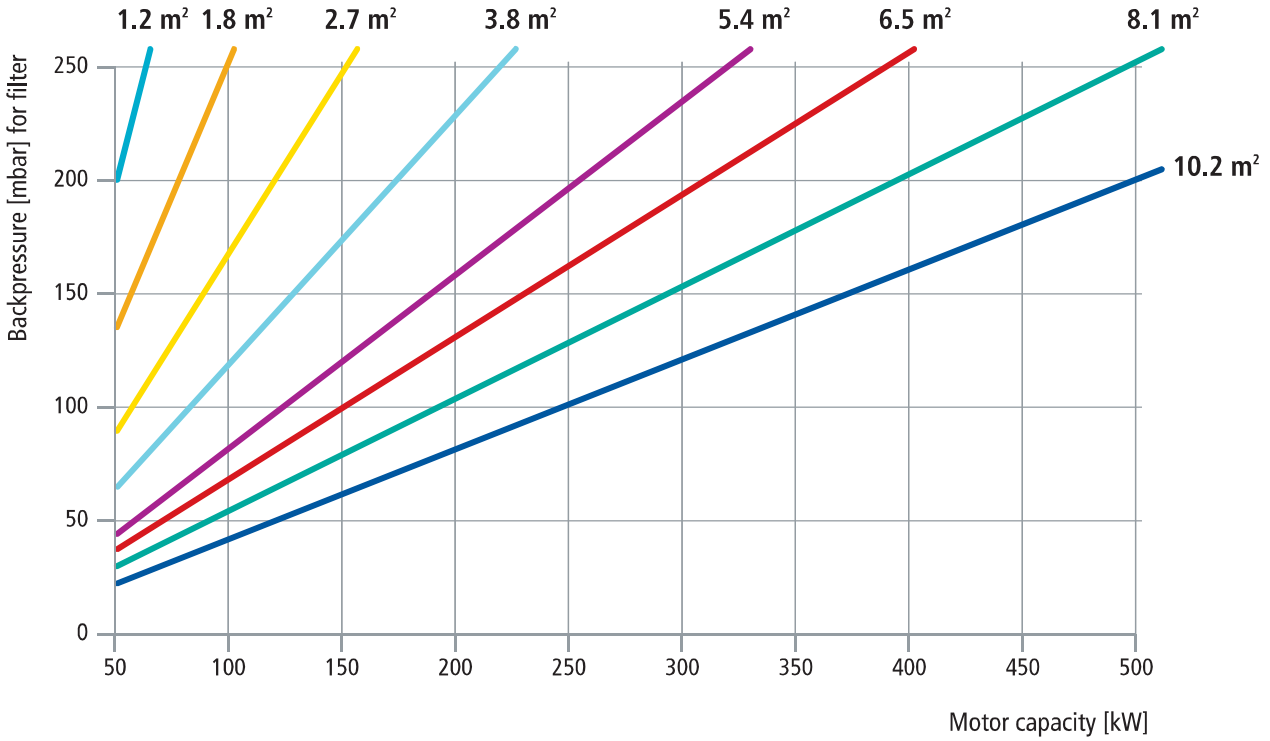
Dimensioning the filter

HJS offers modular SMF®/CSMF® systems with filter surface areas ranging from 1.2 m² to 10.2 m².

To help you choose the right size of filter, the diagram below shows the exhaust backpressure generated by each size of filter (not taking the inlet and outlet modules into account).

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

Filter surface areas* from 1.2 m² to 10.2 m²



* Refers to a filter module with a maximum temperature upstream of the DPF of 450°C

• Backpressure of the individual filter units

Example calculation

In the case of a construction machine with a power output of e.g. 250 kW and a maximum permissible exhaust backpressure of 200 mbar (as specified by the engine manufacturer), a filter with a surface area of 5.4 m² can be installed. In this simplified example, it should be noted that the backpressure flow of the inlet and outlet modules is not taken into account. The modules tend to result in a slightly higher backpressure. Further technical data are required if the filter is to be dimensioned more precisely.

Dimensioning the catalytic converter

The vehicle and engine data (plus some other data) are required in order to determine the size of catalytic converter (3-inch or 6-inch cat) required. In order to ensure catalytic converters operate as intended, HJS and its authorised partners offer one-on-one assistance (see section HJS Enquiry Form).

Considering the installation space available

After determining the size of the filter and catalytic converter, it's time to see how much space is available for installing them.

As a rule, the filter system replaces the original silencer. Alternatively, the particulate filter system can be installed at a different position in the exhaust system.

When selecting the installation position, make sure that there is sufficient clearance between the filter and other components and that the filter can be removed easily for servicing and maintenance work.

The filter unit can be installed horizontally or vertically. The matching inlet and outlet modules must be selected in line with the amount of installation space available in the machine (AXIAL-AXIAL, AXIAL-RADIAL, RADIAL-AXIAL, RADIAL-RADIAL).

To secure the filter, system mounts must be used.

The dimension tables contain the data of the

> Inlet module
> 3-inch or 6-inch cat module
> SMF® (uncoated filter) or CSMF® (coated filter)
> Outlet module

Scope of delivery

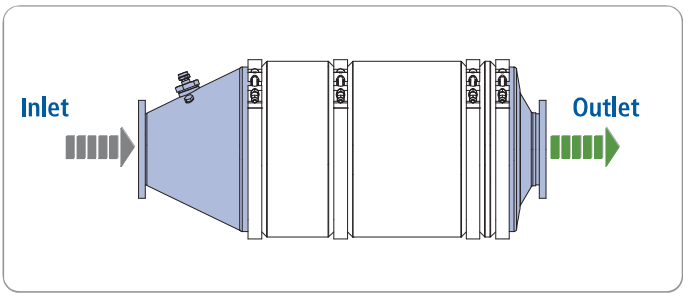
The item numbers listed describe fully assembled filter units with inlet and outlet module, system clamp, gasket set, insulation set and HJS Service Unit. In addition, all relevant technical documentations, such as the installation guidelines and maintenance manual, are included in the scope of delivery. The system mounts must be ordered separately (see Section Individual components).

Dimension tables

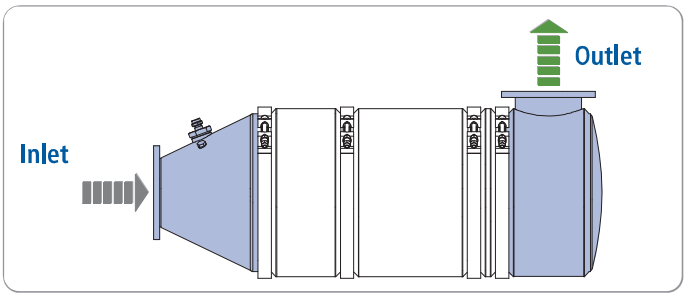
The dimension tables contain all dimensions of relevance to installation. All dimensions are stated in millimetres (mm).

This section describes and illustrates the different versions of filter systems with a surface area of 1.2 m^2 to 10.2 m^2.

AXIAL - AXIAL



AXIAL - RADIAL



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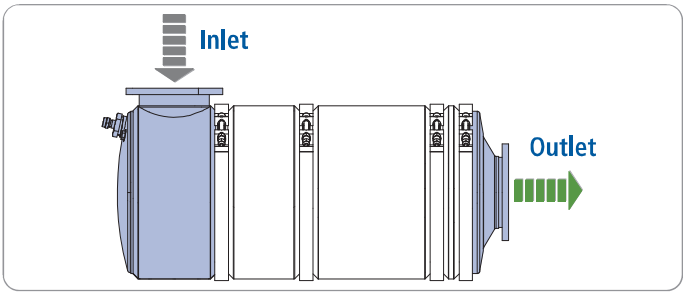
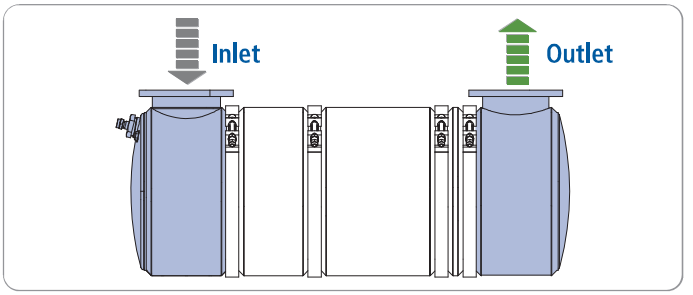
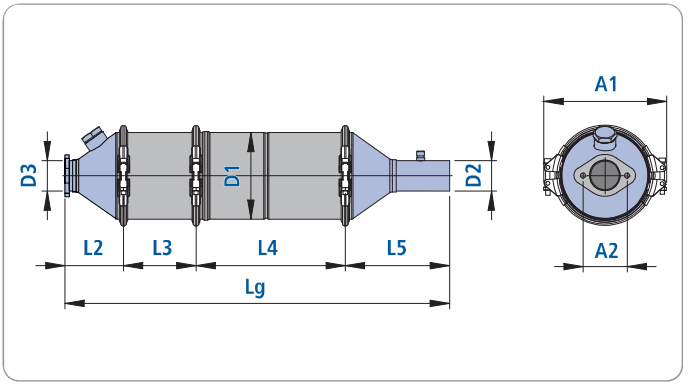


RADIAL - RADIAL

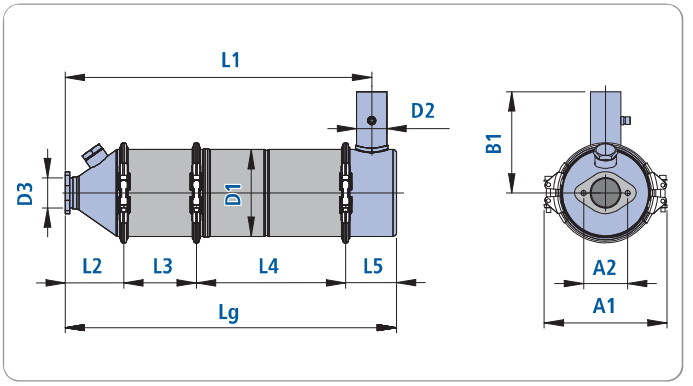


SMF® – 1.8 m²

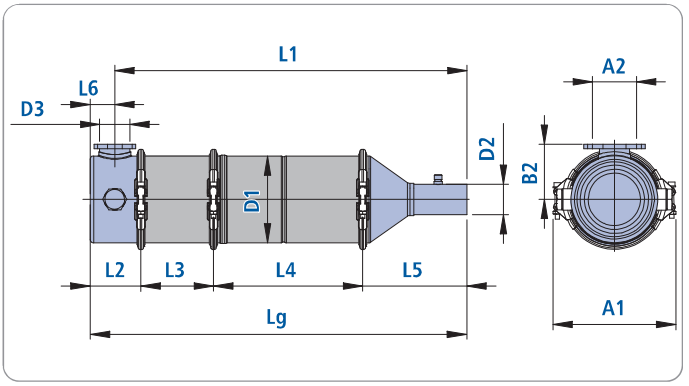
AXIAL - AXIAL



AXIAL - RADIAL



RADIAL - AXIAL



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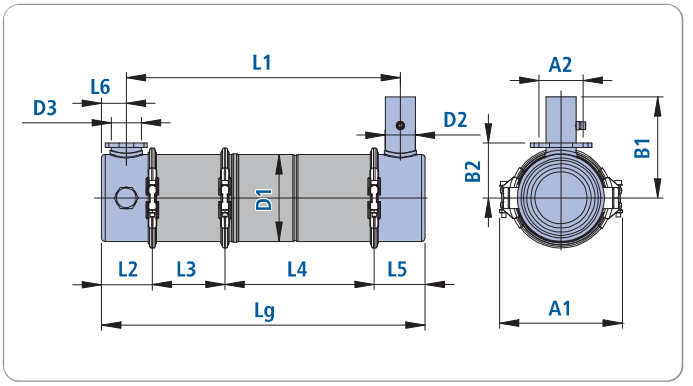


Measurement Table SMF® – 1.8 m²

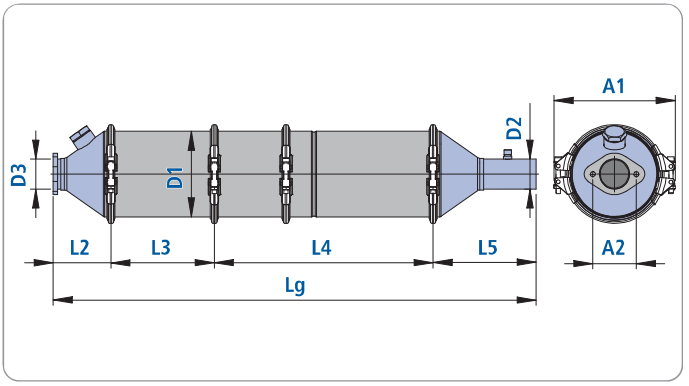
HJS Item No*1	System*2 m²	Confi-guration	Lg		L1		L2	L3		L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
			Cat 3-inch	Cat 6-inch	Cat 3-inch	Cat 6-inch		Cat 3-inch	Cat 6-inch										
93 72 0109	SMF® 1.8	AX - AX	699	-	-	-	106	132	-	272	189	-	220	80	-	-	158	55	55
93 72 0110	SMF® 1.8	AX - AX	-	758	-	-	-	-	191	272	189	-	220	80	-	-	158	55	55
93 76 0109	CSMF® 1.8	AX - AX	699	-	-	-	106	132	-	272	189	-	220	80	-	-	158	55	55
93 76 0110	CSMF® 1.8	AX - AX	-	758	-	-	-	-	191	272	189	-	220	80	-	-	158	55	55
93 72 0111	SMF® 1.8	AX - RAD	602	-	557	-	106	132	-	272	92	-	220	80	184	-	158	55	55
93 72 0112	SMF® 1.8	AX - RAD	-	661	-	616	-	-	191	272	92	-	220	80	184	-	158	55	55
93 76 0111	CSMF® 1.8	AX - RAD	602	-	557	-	106	132	-	272	92	-	220	80	184	-	158	55	55
93 76 0112	CSMF® 1.8	AX - RAD	-	661	-	616	-	-	191	272	92	-	220	80	184	-	158	55	55
93 72 0113	SMF® 1.8	RAD - AX	685	-	640	-	92	132	-	272	189	45	220	80	-	100	158	55	55
93 72 0114	SMF® 1.8	RAD - AX	-	744	-	699	-	-	191	272	189	45	220	80	-	100	158	55	55
93 76 0113	CSMF® 1.8	RAD - AX	685	-	640	-	92	132	-	272	189	45	220	80	-	100	158	55	55
93 76 1114	CSMF® 1.8	RAD - AX	-	744	-	699	-	-	191	272	189	45	220	80	-	100	158	55	55
93 72 0115	SMF® 1.8	RAD - RAD	588	-	498	-	92	132	-	272	92	45	220	80	184	100	158	55	55
93 72 0116	SMF® 1.8	RAD - RAD	-	647	-	557	-	-	191	272	92	45	220	80	184	100	158	55	55
93 76 0115	CSMF® 1.8	RAD - RAD	588	-	498	-	92	132	-	272	92	45	220	80	184	100	158	55	55
93 76 0116	CSMF® 1.8	RAD - RAD	-	647	-	557	-	-	191	272	92	45	220	80	184	100	158	55	55

*1 Item no. without system mount; please order separately - see section `Individual components, *2 SMF® = uncoated filter; CSMF® = coated filter

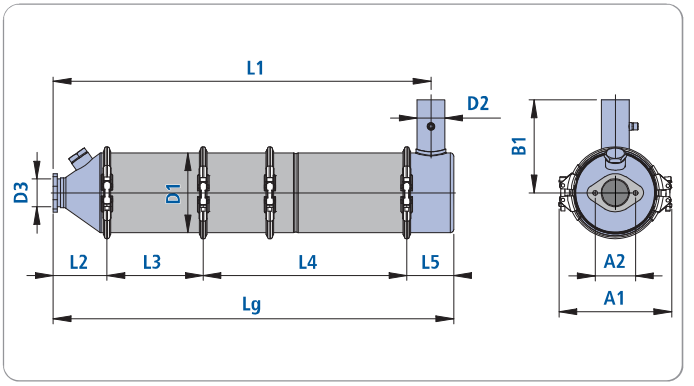
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

SMF® – 2.7 m²

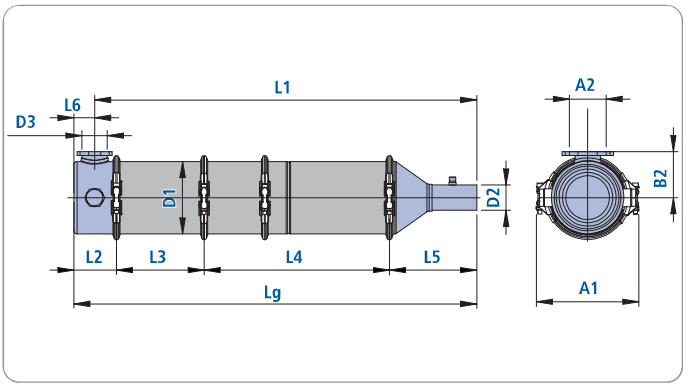
AXIAL - AXIAL



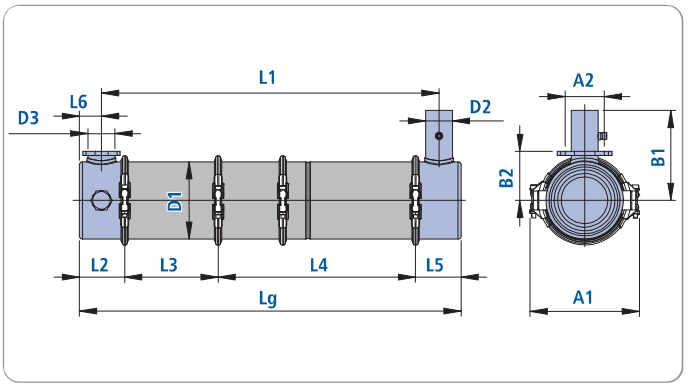
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



Measurement Table SMF® – 2.7 m²

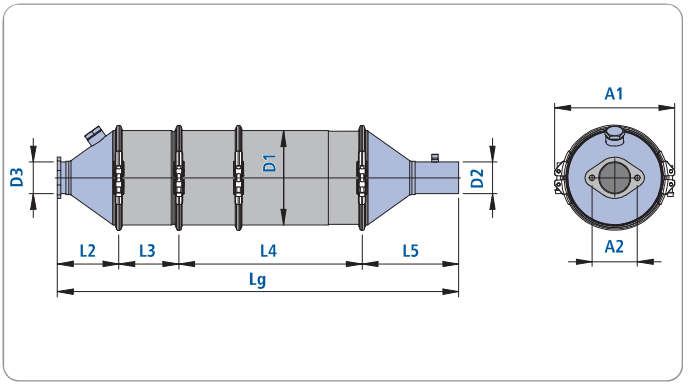
HJS Item No*1	System*2 m²	Confi-guration	Lg		L1		L2	L3		L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
			Cat 3-inch	Cat 6-inch	Cat 3-inch	Cat 6-inch		Cat 3-inch	Cat 6-inch										
93 72 0117	SMF® 2.7	AX - AX	831	-	-	-	106	132	-	404	189	-	220	80	-	-	158	55	55
93 72 0118	SMF® 2.7	AX - AX	-	890	-	-	-	-	191	404	189	-	220	80	-	-	158	55	55
93 76 0117	CSMF® 2.7	AX - AX	831	-	-	-	106	132	-	404	189	-	220	80	-	-	158	55	55
93 76 0118	CSMF® 2.7	AX - AX	-	890	-	-	-	-	191	404	189	-	220	80	-	-	158	55	55
93 72 0119	SMF® 2.7	AX - RAD	734	-	689	-	106	132	-	404	92	-	220	80	184	-	158	55	55
93 72 0120	SMF® 2.7	AX - RAD	-	793	-	748	-	-	191	404	92	-	220	80	184	-	158	55	55
93 76 0119	CSMF® 2.7	AX - RAD	734	-	689	-	106	132	-	404	92	-	220	80	184	-	158	55	55
93 76 0120	CSMF® 2.7	AX - RAD	-	793	-	748	-	-	191	404	92	-	220	80	184	-	158	55	55
93 72 0121	SMF® 2.7	RAD - AX	817	-	772	-	92	132	-	404	189	45	220	80	-	100	158	55	55
93 72 0122	SMF® 2.7	RAD - AX	-	876	-	831	-	-	191	404	189	45	220	80	-	100	158	55	55
93 76 0121	CSMF® 2.7	RAD - AX	817	-	772	-	92	132	-	404	189	45	220	80	-	100	158	55	55
93 76 0122	CSMF® 2.7	RAD - AX	-	876	-	831	-	-	191	404	189	45	220	80	-	100	158	55	55
93 72 0123	SMF® 2.7	RAD - RAD	720	-	630	-	92	132	-	404	92	45	220	80	184	100	158	55	55
93 72 0124	SMF® 2.7	RAD - RAD	-	779	-	689	-	-	191	404	92	45	220	80	184	100	158	55	55
93 76 0123	CSMF® 2.7	RAD - RAD	720	-	630	-	92	132	-	404	92	45	220	80	184	100	158	55	55
93 76 0124	CSMF® 2.7	RAD - RAD	-	779	-	689	-	-	191	404	92	45	220	80	184	100	158	55	55

*1 Item no. without system mount; please order separately - see section `Individual components, *2 SMF® = uncoated filter; CSMF® = coated filter

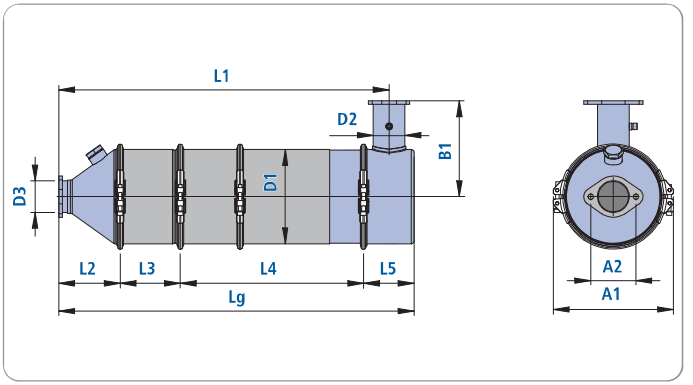
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

SMF® – 3.8 m²

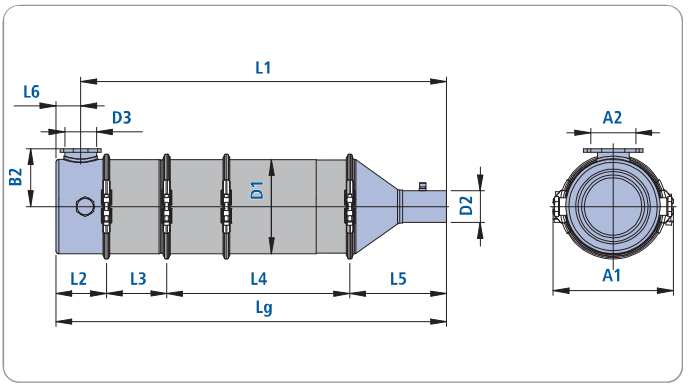
AXIAL - AXIAL



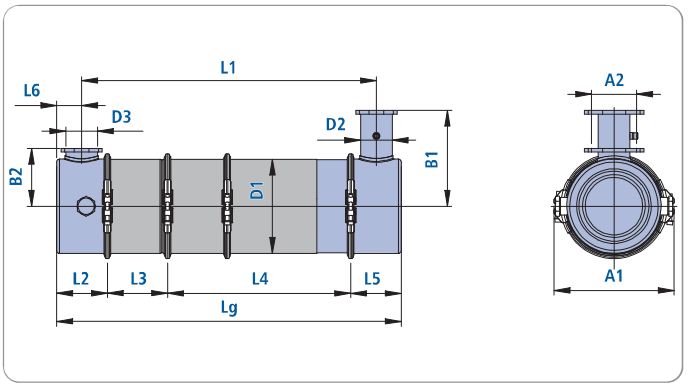
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



Measurement Table SMF® – 3.8 m²

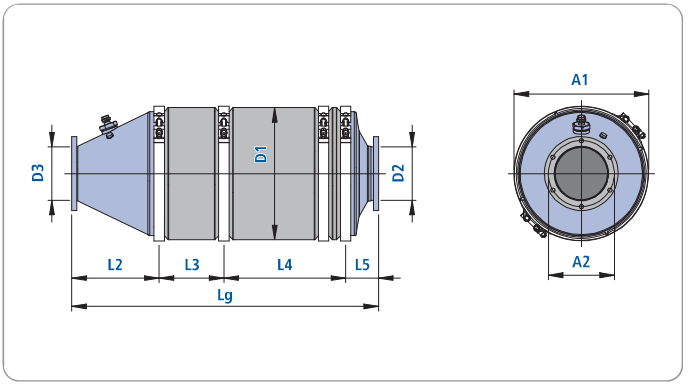
HJS Item No*1	System*2 m²	Confi-guration	Lg		L1		L2	L3		L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
			Cat 3-inch	Cat 6-inch	Cat 3-inch	Cat 6-inch		Cat 3-inch	Cat 6-inch										
93 72 0125	SMF® 3.8	AX - AX	888	-	-	-	135	134	-	404	215	-	266	100	-	-	208	70	70
93 72 0126	SMF® 3.8	AX - AX	-	945	-	-	-	-	191	404	215	-	266	100	-	-	208	70	70
93 76 0125	CSMF® 3.8	AX - AX	888	-	-	-	135	134	-	404	215	-	266	100	-	-	208	70	70
93 76 0126	CSMF® 3.8	AX - AX	-	945	-	-	-	-	191	404	215	-	266	100	-	-	208	70	70
93 72 0127	SMF® 3.8	AX - RAD	786	-	731	-	135	134	-	404	113	-	266	100	212	-	208	70	70
93 72 0128	SMF® 3.8	AX - RAD	-	843	-	788	-	-	191	404	113	-	266	100	212	-	208	70	70
93 76 0127	CSMF® 3.8	AX - RAD	786	-	731	-	135	134	-	404	113	-	266	100	212	-	208	70	70
93 76 0128	CSMF® 3.8	AX - RAD	-	843	-	788	-	-	191	404	113	-	266	100	212	-	208	70	70
93 72 0129	SMF® 3.8	RAD - AX	864	-	809	-	111	134	-	404	215	55	266	100	-	123	208	70	70
93 72 0130	SMF® 3.8	RAD - AX	-	921	-	866	-	-	191	404	215	55	266	100	-	123	208	70	70
93 76 0129	CSMF® 3.8	RAD - AX	864	-	809	-	111	134	-	404	215	55	266	100	-	123	208	70	70
93 76 0130	CSMF® 3.8	RAD - AX	-	921	-	866	-	-	191	404	215	55	266	100	-	123	208	70	70
93 72 0131	SMF® 3.8	RAD - RAD	762	-	519	-	111	134	-	404	113	55	266	100	212	123	208	70	70
93 72 0132	SMF® 3.8	RAD - RAD	-	819	-	576	-	-	191	404	113	55	266	100	212	123	208	70	70
93 76 0131	CSMF® 3.8	RAD - RAD	762	-	519	-	111	134	-	404	113	55	266	100	212	123	208	70	70
93 76 0132	CSMF® 3.8	RAD - RAD	-	819	-	576	-	-	191	404	113	55	266	100	212	123	208	70	70

*1 Item no. without system mount; please order separately - see section `Individual components, *2 SMF® = uncoated filter; CSMF® = coated filter

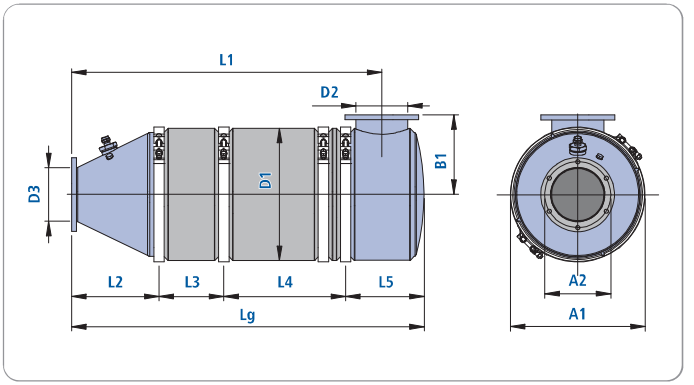
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

SMF® – 5.4 m²

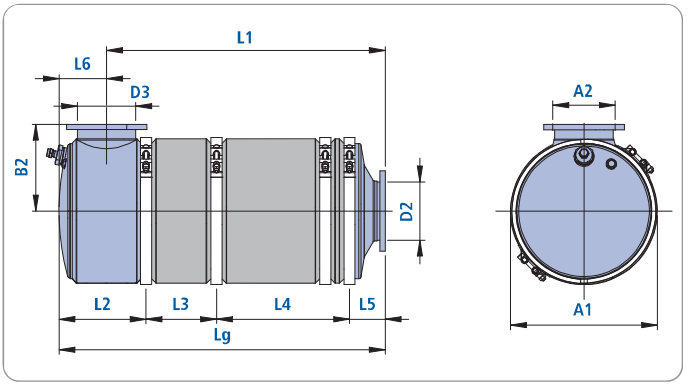
AXIAL - AXIAL



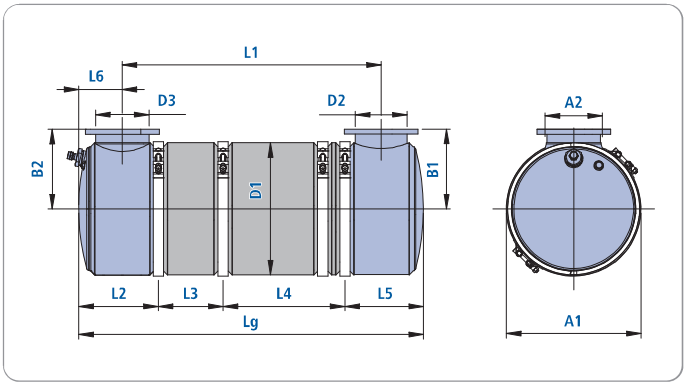
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



Measurement Table SMF® – 5.4 m²

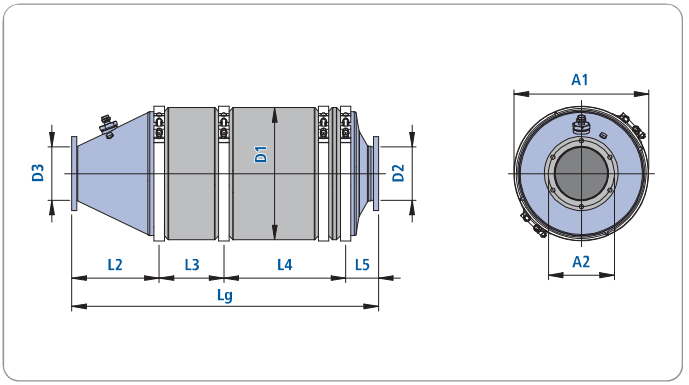
HJS Item No*1	System*2 m²	Confi-guration	Lg		L1		L2	L3		L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
			Cat 3-inch	Cat 6-inch	Cat 3-inch	Cat 6-inch		Cat 3-inch	Cat 6-inch										
93 72 0133	SMF® 5.4	AX - AX	663	-	-	-	211	79	-	294	79	-	Ø 325	Ø 159	-	-	319	129	129
93 72 0134	SMF® 5.4	AX - AX	-	740	-	-	-	-	156	294	79	-	Ø 325	Ø 159	-	-	319	129	129
93 76 0133	CSMF® 5.4	AX - AX	663	-	-	-	211	79	-	294	79	-	Ø 325	Ø 159	-	-	319	129	129
93 76 0134	CSMF® 5.4	AX - AX	-	740	-	-	-	-	156	294	79	-	Ø 325	Ø 159	-	-	319	129	129
93 72 0135	SMF® 5.4	AX - RAD	773	-	672	-	211	79	-	294	189	-	Ø 325	Ø 159	192	-	319	129	129
93 72 0136	SMF® 5.4	AX - RAD	-	850	-	749	-	-	156	294	189	-	Ø 325	Ø 159	192	-	319	129	129
93 76 0135	CSMF® 5.4	AX - RAD	773	-	672	-	211	79	-	294	189	-	Ø 325	Ø 159	192	-	319	129	129
93 76 0136	CSMF® 5.4	AX - RAD	-	850	-	749	-	-	156	294	189	-	Ø 325	Ø 159	192	-	319	129	129
93 72 0137	SMF® 5.4	RAD - AX	644	-	539	-	192	79	-	294	79	105	Ø 325	Ø 159	-	192	319	129	129
93 72 0138	SMF® 5.4	RAD - AX	-	721	-	616	-	-	156	294	79	105	Ø 325	Ø 159	-	192	319	129	129
93 76 0137	CSMF® 5.4	RAD - AX	644	-	539	-	192	79	-	294	79	105	Ø 325	Ø 159	-	192	319	129	129
93 76 0138	CSMF® 5.4	RAD - AX	-	721	-	616	-	-	156	294	79	105	Ø 325	Ø 159	-	192	319	129	129
93 72 0139	SMF® 5.4	RAD - RAD	754	-	548	-	192	79	-	294	189	105	Ø 325	Ø 159	192	192	319	129	129
93 72 0140	SMF® 5.4	RAD - RAD	-	831	-	625	-	-	156	294	189	105	Ø 325	Ø 159	192	192	319	129	129
93 76 0139	CSMF® 5.4	RAD - RAD	754	-	548	-	192	79	-	294	189	105	Ø 325	Ø 159	192	192	319	129	129
93 76 0140	CSMF® 5.4	RAD - RAD	-	831	-	625	-	-	156	294	189	105	Ø 325	Ø 159	192	192	319	129	129

*1 Item no. without system mount; please order separately - see section `Individual components, *2 SMF® = uncoated filter; CSMF® = coated filter

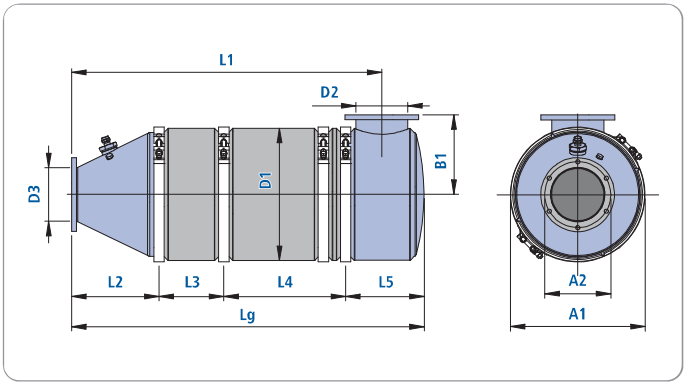
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

SMF® – 6.5 m²

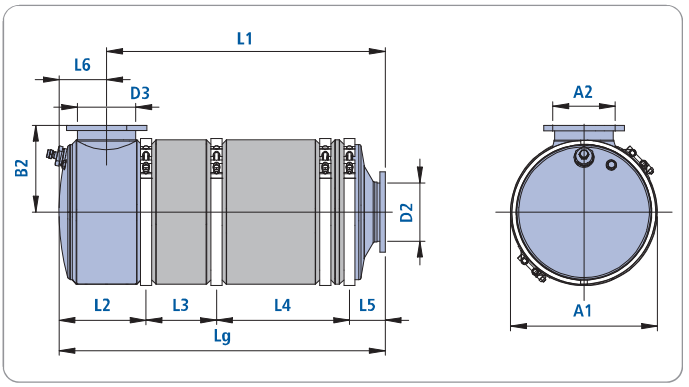
AXIAL - AXIAL



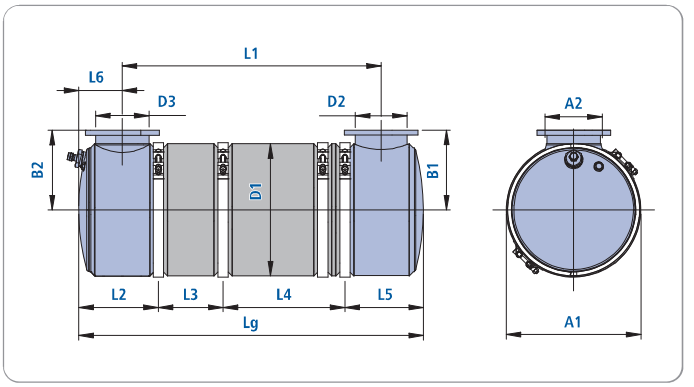
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



Measurement Table SMF® – 6.5 m²

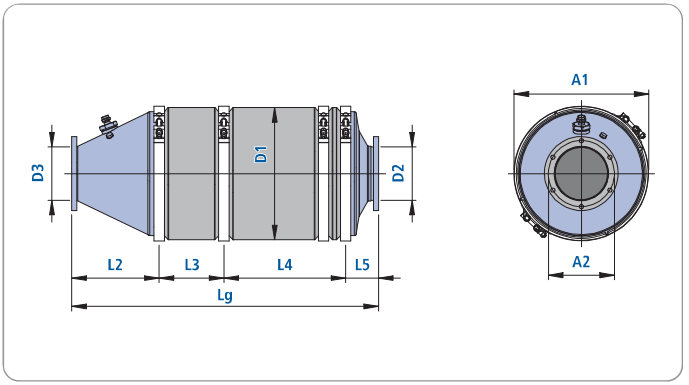
HJS Item No*1	System*2 m²	Confi-guration	Lg		L1		L2	L3		L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
			Cat 3-inch	Cat 6-inch	Cat 3-inch	Cat 6-inch		Cat 3-inch	Cat 6-inch										
93 72 0141	SMF® 6.5	AX - AX	706	-	-	-	211	79	-	337	79	-	Ø 325	Ø 159	-	-	319	129	129
93 72 0142	SMF® 6.5	AX - AX	-	783	-	-	-	-	156	337	79	-	Ø 325	Ø 159	-	-	319	129	129
93 76 0141	CSMF® 6.5	AX - AX	706	-	-	-	211	79	-	337	79	-	Ø 325	Ø 159	-	-	319	129	129
93 76 0142	CSMF® 6.5	AX - AX	-	783	-	-	-	-	156	337	79	-	Ø 325	Ø 159	-	-	319	129	129
93 72 0143	SMF® 6.5	AX - RAD	816	-	715	-	211	79	-	337	189	-	Ø 325	Ø 159	192	-	319	129	129
93 72 0144	SMF® 6.5	AX - RAD	-	893	-	792	-	-	156	337	189	-	Ø 325	Ø 159	192	-	319	129	129
93 76 0143	CSMF® 6.5	AX - RAD	816	-	715	-	211	79	-	337	189	-	Ø 325	Ø 159	192	-	319	129	129
93 76 0144	CSMF® 6.5	AX - RAD	-	893	-	792	-	-	156	337	189	-	Ø 325	Ø 159	192	-	319	129	129
93 72 0145	SMF® 6.5	RAD - AX	687	-	582	-	192	79	-	337	79	105	Ø 325	Ø 159	-	192	319	129	129
93 72 0146	SMF® 6.5	RAD - AX	-	764	-	659	-	-	156	337	79	105	Ø 325	Ø 159	-	192	319	129	129
93 76 0145	CSMF® 6.5	RAD - AX	687	-	582	-	192	79	-	337	79	105	Ø 325	Ø 159	-	192	319	129	129
93 76 0146	CSMF® 6.5	RAD - AX	-	764	-	659	-	-	156	337	79	105	Ø 325	Ø 159	-	192	319	129	129
93 72 0147	SMF® 6.5	RAD - RAD	797	-	591	-	192	79	-	337	189	105	Ø 325	Ø 159	192	192	319	129	129
93 72 0148	SMF® 6.5	RAD - RAD	-	874	-	668	-	-	156	337	189	105	Ø 325	Ø 159	192	192	319	129	129
93 76 0147	CSMF® 6.5	RAD - RAD	797	-	591	-	192	79	-	337	189	105	Ø 325	Ø 159	192	192	319	129	129
93 76 0148	CSMF® 6.5	RAD - RAD	-	874	-	668	-	-	156	337	189	105	Ø 325	Ø 159	192	192	319	129	129

*1 Item no. without system mount; please order separately - see section `Individual components, *2 SMF® = uncoated filter; CSMF® = coated filter

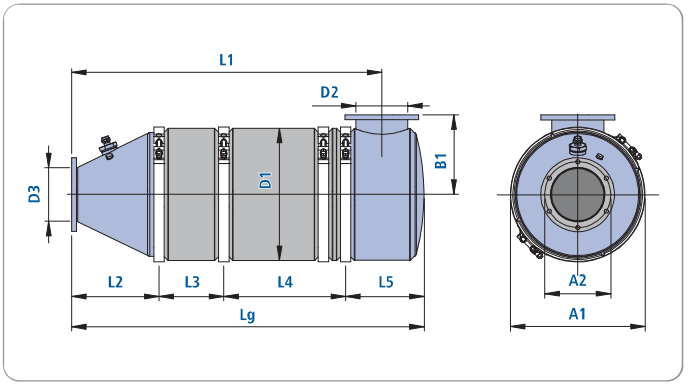
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

SMF® – 8.1 m²

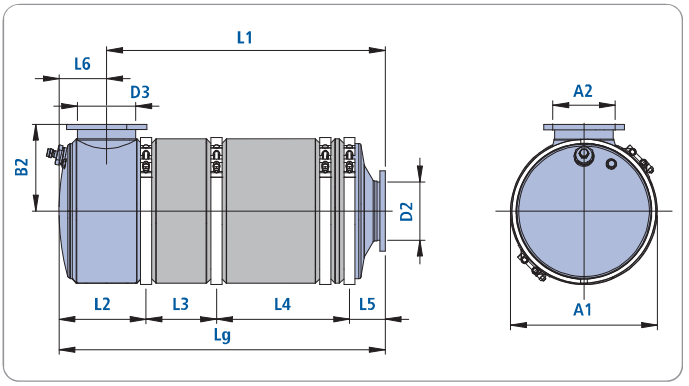
AXIAL - AXIAL



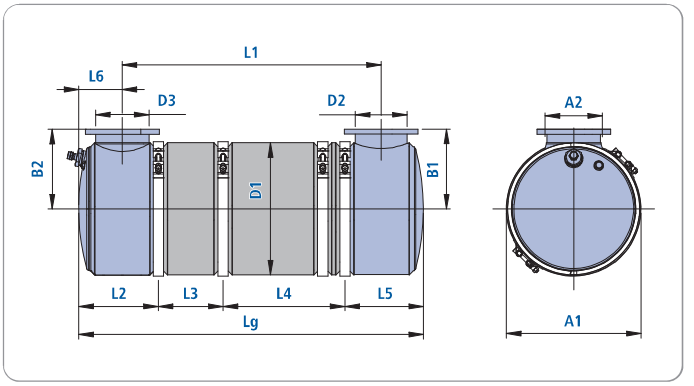
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



Measurement Table SMF® – 8.1 m²

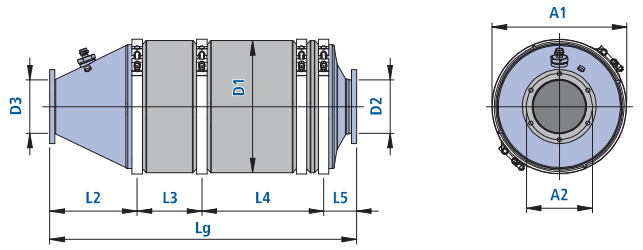
HJS Item No*1	System*2 m²	Confi-guration	Lg		L1		L2	L3		L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
			Cat 3-inch	Cat 6-inch	Cat 3-inch	Cat 6-inch		Cat 3-inch	Cat 6-inch										
93 72 0149	SMF® 8.1	AX - AX	795	-	-	-	211	79	-	426	79	-	Ø 325	Ø 159	-	-	319	129	129
93 72 0150	SMF® 8.1	AX - AX	-	872	-	-	-	-	156	426	79	-	Ø 325	Ø 159	-	-	319	129	129
93 76 0149	CSMF® 8.1	AX - AX	795	-	-	-	211	79	-	426	79	-	Ø 325	Ø 159	-	-	319	129	129
93 76 0150	CSMF® 8.1	AX - AX	-	872	-	-	-	-	156	426	79	-	Ø 325	Ø 159	-	-	319	129	129
93 72 0151	SMF® 8.1	AX - RAD	905	-	804	-	211	79	-	426	189	-	Ø 325	Ø 159	192	-	319	129	129
93 72 0152	SMF® 8.1	AX - RAD	-	982	-	881	-	-	156	426	189	-	Ø 325	Ø 159	192	-	319	129	129
93 76 0151	CSMF® 8.1	AX - RAD	905	-	804	-	211	79	-	426	189	-	Ø 325	Ø 159	192	-	319	129	129
93 76 0152	CSMF® 8.1	AX - RAD	-	982	-	881	-	-	156	426	189	-	Ø 325	Ø 159	192	-	319	129	129
93 72 0153	SMF® 8.1	RAD - AX	776	-	671	-	192	79	-	426	79	105	Ø 325	Ø 159	-	192	319	129	129
93 72 0154	SMF® 8.1	RAD - AX	-	853	-	748	-	-	156	426	79	105	Ø 325	Ø 159	-	192	319	129	129
93 76 0153	CSMF® 8.1	RAD - AX	776	-	671	-	192	79	-	426	79	105	Ø 325	Ø 159	-	192	319	129	129
93 76 0154	CSMF® 8.1	RAD - AX	-	853	-	748	-	-	156	426	79	105	Ø 325	Ø 159	-	192	319	129	129
93 72 0155	SMF® 8.1	RAD - RAD	886	-	680	-	192	79	-	426	189	105	Ø 325	Ø 159	192	192	319	129	129
93 72 0156	SMF® 8.1	RAD - RAD	-	963	-	757	-	-	156	426	189	105	Ø 325	Ø 159	192	192	319	129	129
93 76 0155	CSMF® 8.1	RAD - RAD	886	-	680	-	192	79	-	426	189	105	Ø 325	Ø 159	192	192	319	129	129
93 76 0156	CSMF® 8.1	RAD - RAD	-	963	-	757	-	-	156	426	189	105	Ø 325	Ø 159	192	192	319	129	129

*1 Item no. without system mount; please order separately - see section `Individual components, *2 SMF® = uncoated filter; CSMF® = coated filter

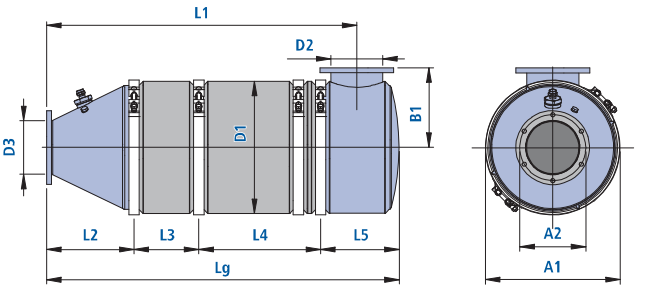
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

SMF® – 8.0 m²

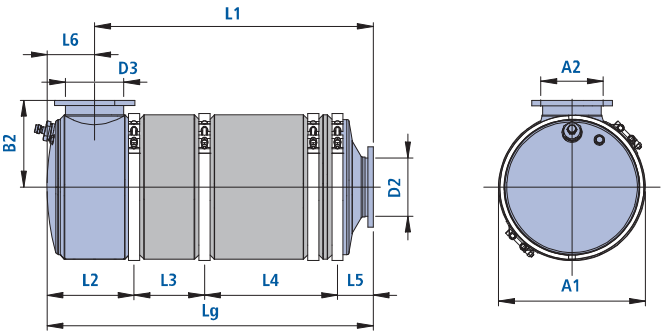
AXIAL - AXIAL



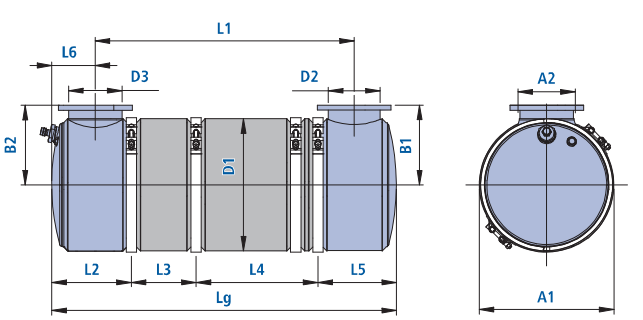
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



Measurement Table SMF® – 8.0 m²

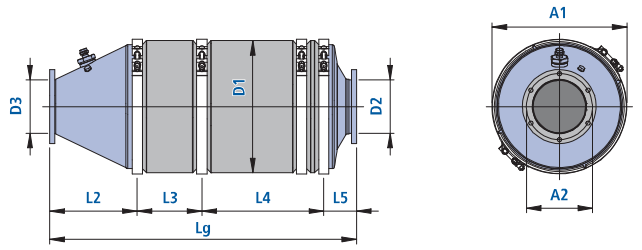
HJS Item No*1	System*2 m²	Confi-guration	Lg Cat 3-inch	Lg Cat 6-inch	L1 Cat 3-inch	L1 Cat 6-inch	L2	L3 Cat 3-inch	L3 Cat 6-inch	L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
93 72 0157	SMF® 8.0	AX - AX	707	-	-	-	211	79	-	338	79	-	Ø 350	Ø 159	-	-	343	129	129
93 72 0158	SMF® 8.0	AX - AX	-	784	-	-	-	-	156	338	79	-	Ø 350	Ø 159	-	-	343	129	129
93 76 0157	CSMF® 8.0	AX - AX	707	-	-	-	211	79	-	338	79	-	Ø 350	Ø 159	-	-	343	129	129
93 76 0158	CSMF® 8.0	AX - AX	-	784	-	-	-	-	156	338	79	-	Ø 350	Ø 159	-	-	343	129	129
93 72 0159	SMF® 8.0	AX - RAD	817	-	715	-	211	79	-	338	189	-	Ø 350	Ø 159	208	-	343	129	129
93 72 0160	SMF® 8.0	AX - RAD	-	894	-	792	-	-	156	338	189	-	Ø 350	Ø 159	208	-	343	129	129
93 76 0159	CSMF® 8.0	AX - RAD	817	-	715	-	211	79	-	338	189	-	Ø 350	Ø 159	208	-	343	129	129
93 76 0160	CSMF® 8.0	AX - RAD	-	894	-	792	-	-	156	338	189	-	Ø 350	Ø 159	208	-	343	129	129
93 72 0161	SMF® 8.0	RAD - AX	685	-	583	-	189	79	-	338	79	102	Ø 350	Ø 159	-	208	343	129	129
93 72 0162	SMF® 8.0	RAD - AX	-	762	-	660	-	-	156	338	79	102	Ø 350	Ø 159	-	208	343	129	129
93 76 0161	CSMF® 8.0	RAD - AX	685	-	583	-	189	79	-	338	79	102	Ø 350	Ø 159	-	208	343	129	129
93 76 0162	CSMF® 8.0	RAD - AX	-	762	-	660	-	-	156	338	79	102	Ø 350	Ø 159	-	208	343	129	129
93 72 0163	SMF® 8.0	RAD - RAD	795	-	591	-	189	79	-	338	189	102	Ø 350	Ø 159	208	208	343	129	129
93 72 0164	SMF® 8.0	RAD - RAD	-	872	-	668	-	-	156	338	189	102	Ø 350	Ø 159	208	208	343	129	129
93 76 0163	CSMF® 8.0	RAD - RAD	795	-	591	-	189	79	-	338	189	102	Ø 350	Ø 159	208	208	343	129	129
93 76 0164	CSMF® 8.0	RAD - RAD	-	872	-	668	-	-	156	338	189	102	Ø 350	Ø 159	208	208	343	129	129

*1 Item no. without system mount; please order separately - see section `Individual components, *2 SMF® = uncoated filter; CSMF® = coated filter

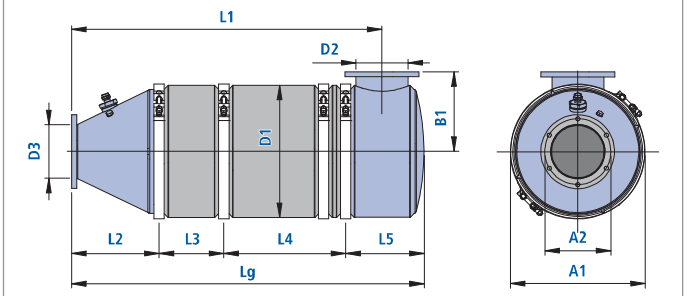
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

SMF® – 10.2 m²

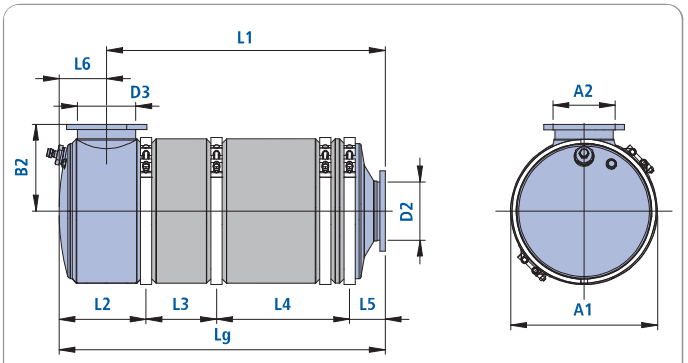
AXIAL - AXIAL



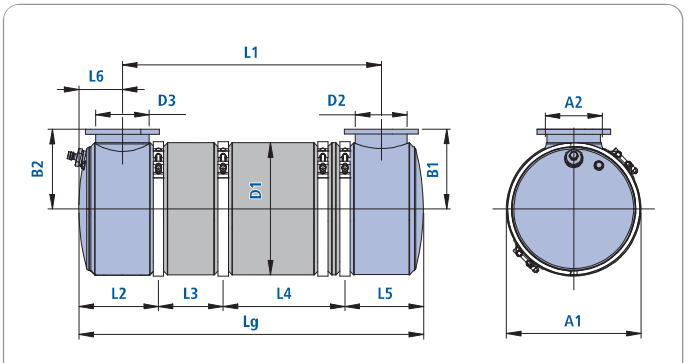
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



Measurement Table SMF® – 10.2 m²

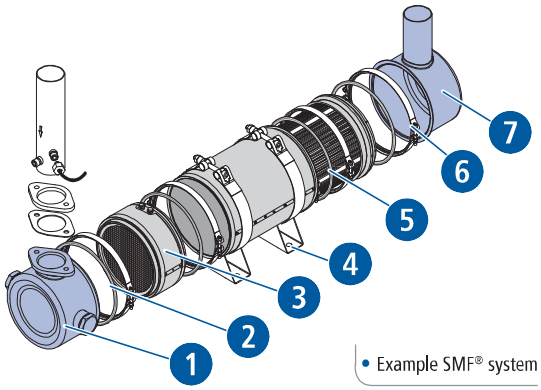
HJS Item No*1	System*2 m²	Confi-guration	Lg		L1		L2	L3		L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
			Cat 3-inch	Cat 6-inch	Cat 3-inch	Cat 6-inch		Cat 3-inch	Cat 6-inch										
93 72 0165	SMF® 10.2	AX - AX	795	-	-	-	211	79	-	426	79	-	Ø 350	Ø 159	-	-	343	129	129
93 72 0166	SMF® 10.2	AX - AX	-	872	-	-	-	-	156	426	79	-	Ø 350	Ø 159	-	-	343	129	129
93 76 0165	CSMF® 10.2	AX - AX	795	-	-	-	211	79	-	426	79	-	Ø 350	Ø 159	-	-	343	129	129
93 76 0166	CSMF® 10.2	AX - AX	-	872	-	-	-	-	156	426	79	-	Ø 350	Ø 159	-	-	343	129	129
93 72 0167	SMF® 10.2	AX - RAD	905	-	803	-	211	79	-	426	189	-	Ø 350	Ø 159	208	-	343	129	129
93 72 0168	SMF® 10.2	AX - RAD	-	982	-	880	-	-	156	426	189	-	Ø 350	Ø 159	208	-	343	129	129
93 76 0167	CSMF® 10.2	AX - RAD	905	-	803	-	211	79	-	426	189	-	Ø 350	Ø 159	208	-	343	129	129
93 76 0168	CSMF® 10.2	AX - RAD	-	982	-	880	-	-	156	426	189	-	Ø 350	Ø 159	208	-	343	129	129
93 72 0169	SMF® 10.2	RAD - AX	773	-	671	-	189	79	-	426	79	102	Ø 350	Ø 159	-	208	343	129	129
93 72 0170	SMF® 10.2	RAD - AX	-	850	-	748	-	-	156	426	79	102	Ø 350	Ø 159	-	208	343	129	129
93 76 0169	CSMF® 10.2	RAD - AX	773	-	671	-	189	79	-	426	79	102	Ø 350	Ø 159	-	208	343	129	129
93 76 0170	CSMF® 10.2	RAD - AX	-	850	-	748	-	-	156	426	79	102	Ø 350	Ø 159	-	208	343	129	129
93 72 0171	SMF® 10.2	RAD - RAD	883	-	680	-	189	79	-	426	189	102	Ø 350	Ø 159	208	208	343	129	129
93 72 0172	SMF® 10.2	RAD - RAD	-	960	-	757	-	-	156	426	189	102	Ø 350	Ø 159	208	208	343	129	129
93 76 0171	CSMF® 10.2	RAD - RAD	883	-	680	-	189	79	-	426	189	102	Ø 350	Ø 159	208	208	343	129	129
93 76 0172	CSMF® 10.2	RAD - RAD	-	960	-	757	-	-	156	426	189	102	Ø 350	Ø 159	208	208	343	129	129

*1 Item no. without system mount; please order separately - see section `Individual components, *2 SMF® = uncoated filter; CSMF® = coated filter

Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

Individual components

The table below contains the data of the individual components of a SMF® system.



• Example SMF® system

1. Inlet Module
2. Gasket
3. Cat Module
4. System Mount
5. SMF® Filter / CSMF® Filter
6. System Clamp
7. Outlet Module

Service-Unit	
SMF® 94 10 4101	CSMF® 94 10 4102

System m²	Confi-guration	Inlet Module	Cat Module 3-Zoll	Cat Module 6-Zoll	SMF® Filter (uncoated)	CSMF® Filter (coated)	Outlet Module	System Mount	System Clamp	Gasket Set	Insulation Set
SMF® 1.8	AX - AX	93 02 4184	93 02 4954	-	93 02 6050	93 02 6051	93 02 4186	93 02 4365	93 02 4179	93 02 4189	94 10 3029
SMF® 1.8	AX - RAD	93 02 4184	93 02 4954	-	93026050	93 02 6051	93 02 4188	93 02 4365	93 02 4179	93 02 4189	94 10 3030
SMF® 1.8	RAD - AX	93 02 4190	93 02 4954	-	93026050	93 02 6051	93 02 4186	93 02 4365	93 02 4179	93 02 4189	94 10 3032
SMF® 1.8	RAD - RAD	93 02 4190	93 02 4954	-	93026050	93 02 6051	93 02 4188	93 02 4365	93 02 4179	93 02 4189	94 10 3031
SMF® 2.7	AX - AX	93 02 4184	-	93 02 4958	93 02 6052	93 02 6053	93 02 4186	93 02 4365	93 02 4179	93 02 4189	94 10 3033
SMF® 2.7	AX - RAD	93 02 4184	-	93 02 4958	93 02 6052	93 02 6053	93 02 4188	93 02 4365	93 02 4179	93 02 4189	94 10 3034
SMF® 2.7	RAD - AX	93 02 4190	-	93 02 4958	93 02 6052	93 02 6053	93 02 4186	93 02 4365	93 02 4179	93 02 4189	94 10 3036
SMF® 2.7	RAD - RAD	93 02 4190	-	93 02 4958	93 02 6052	93 02 6053	93 02 4188	93 02 4365	93 02 4179	93 02 4189	94 10 3035
SMF® 3.8	AX - AX	93 02 4196	94 62 4964	-	93 02 6054	93 02 6055	93 02 4197	93 02 4357	93 02 4201	93 02 4185	94 10 3037
SMF® 3.8	AX - RAD	93 02 4196	94 62 4964	-	93 02 6054	93 02 6055	93 02 4199	93 02 4357	93 02 4201	93 02 4185	94 10 3038
SMF® 3.8	RAD - AX	93 02 4198	94 62 4964	-	93 02 6054	93 02 6055	93 02 4197	93 02 4357	93 02 4201	93 02 4185	94 10 3040
SMF® 3.8	RAD - RAD	93 02 4198	94 62 4964	-	93 02 6054	93 02 6055	93 02 4199	93 02 4357	93 02 4201	93 02 4185	94 10 3039
SMF® 5.4	AX - AX	94 62 4006	94 62 2317	94 62 2034	93 62 4096	93 75 4096	94 11 2208	94 03 6275	94 62 2033	94 03 0006	94 10 3053
SMF® 5.4	AX - RAD	94 62 4006	94 62 2317	94 62 2034	93 62 4096	93 75 4096	94 11 4019	94 03 6275	94 62 2033	94 03 0006	94 10 3054
SMF® 5.4	RAD - AX	94 11 4012	94 62 2317	94 62 2034	93 62 4096	93 75 4096	94 11 2208	94 03 6275	94 62 2033	94 03 0006	94 10 3056
SMF® 5.4	RAD - RAD	94 11 4012	94 62 2317	94 62 2034	93 62 4096	93 75 4096	94 11 4019	94 03 6275	94 62 2033	94 03 0006	94 10 3055
SMF® 6.5	AX - AX	94 62 4006	94 62 2317	94 62 2034	93 62 4099	93 75 4099	94 11 2208	94 03 6275	94 62 2033	94 03 0006	94 10 3057
SMF® 6.5	AX - RAD	94 62 4006	94 62 2317	94 62 2034	93 62 4099	93 75 4099	94 11 4019	94 03 6275	94 62 2033	94 03 0006	94 10 3058
SMF® 6.5	RAD - AX	94 11 4012	94 62 2317	94 62 2034	93 62 4099	93 75 4099	94 11 2208	94 03 6275	94 62 2033	94 03 0006	94 10 3060
SMF® 6.5	RAD - RAD	94 11 4012	94 62 2317	94 62 2034	93 62 4099	93 75 4099	94 11 4019	94 03 6275	94 62 2033	94 03 0006	94 10 3059
SMF® 8.1	AX - AX	94 62 4006	94 62 2317	94 62 2034	93 62 3736	93 75 3736	94 11 2208	94 03 6275	94 62 2033	94 03 0006	94 10 3061
SMF® 8.1	AX - RAD	94 62 4006	94 62 2317	94 62 2034	93 62 3736	93 75 3736	94 11 4019	94 03 6275	94 62 2033	94 03 0006	94 10 3062
SMF® 8.1	RAD - AX	94 11 4012	94 62 2317	94 62 2034	93 62 3736	93 75 3736	94 11 2208	94 03 6275	94 62 2033	94 03 0006	94 10 3064
SMF® 8.1	RAD - RAD	94 11 4012	94 62 2317	94 62 2034	93 62 3736	93 75 3736	94 11 4019	94 03 6275	94 62 2033	94 03 0006	94 10 3063
SMF® 8.0	AX - AX	94 62 4242	94 62 2416	94 62 2006	93 62 4301	93 75 4301	94 11 4245	94 03 6276	94 62 1994	94 03 0005	94 10 3065
SMF® 8.0	AX - RAD	94 62 4242	94 62 2416	94 62 2006	93 62 4301	93 75 4301	94 11 4574	94 03 6276	94 62 1994	94 03 0005	94 10 3066
SMF® 8.0	RAD - AX	94 11 4565	94 62 2416	94 62 2006	93 62 4301	93 75 4301	94 11 4245	94 03 6276	94 62 1994	94 03 0005	94 10 3068
SMF® 8.0	RAD - RAD	94 11 4565	94 62 2416	94 62 2006	93 62 4301	93 75 4301	94 11 4574	94 03 6276	94 62 1994	94 03 0005	94 10 3067
SMF® 10.2	AX - AX	94 62 4242	94 62 2416	94 62 2006	93 62 4248	93 75 4248	94 11 4245	94 03 6276	94 62 1994	94 03 0005	94 10 3069
SMF® 10.2	AX - RAD	94 62 4242	94 62 2416	94 62 2006	93 62 4248	93 75 4248	94 11 4574	94 03 6276	94 62 1994	94 03 0005	94 10 3070
SMF® 10.2	RAD - AX	94 11 4565	94 62 2416	94 62 2006	93 62 4248	93 75 4248	94 11 4245	94 03 6276	94 62 1994	94 03 0005	94 10 3072
SMF® 10.2	RAD - RAD	94 11 4565	94 62 2416	94 62 2006	93 62 4248	93 75 4248	94 11 4574	94 03 6276	94 62 1994	94 03 0005	94 10 3071

3. Modular SMF®-AR System

Owing to greatly differing application profiles with exhaust-gas temperatures that are frequently too low, mobile machinery and stationary applications are usually fitted with active systems, such as the SMF®-AR (Sintered Metal Filter with thermoelectric self-regeneration) system developed by HJS. With this system, the particulate filter can be regenerated at almost any engine operating point, irrespective of exhaust-gas temperature. The heat necessary to burn off the particulate matter is generated by the SMF®-AR system itself.

Thanks to the compact and modular design of the SMF®-AR system, it can be put to use in many different applications. Pipes and brackets can be modified as required to match the different machines and vehicles. As a rule, SMF®-AR systems replace the original silencer.

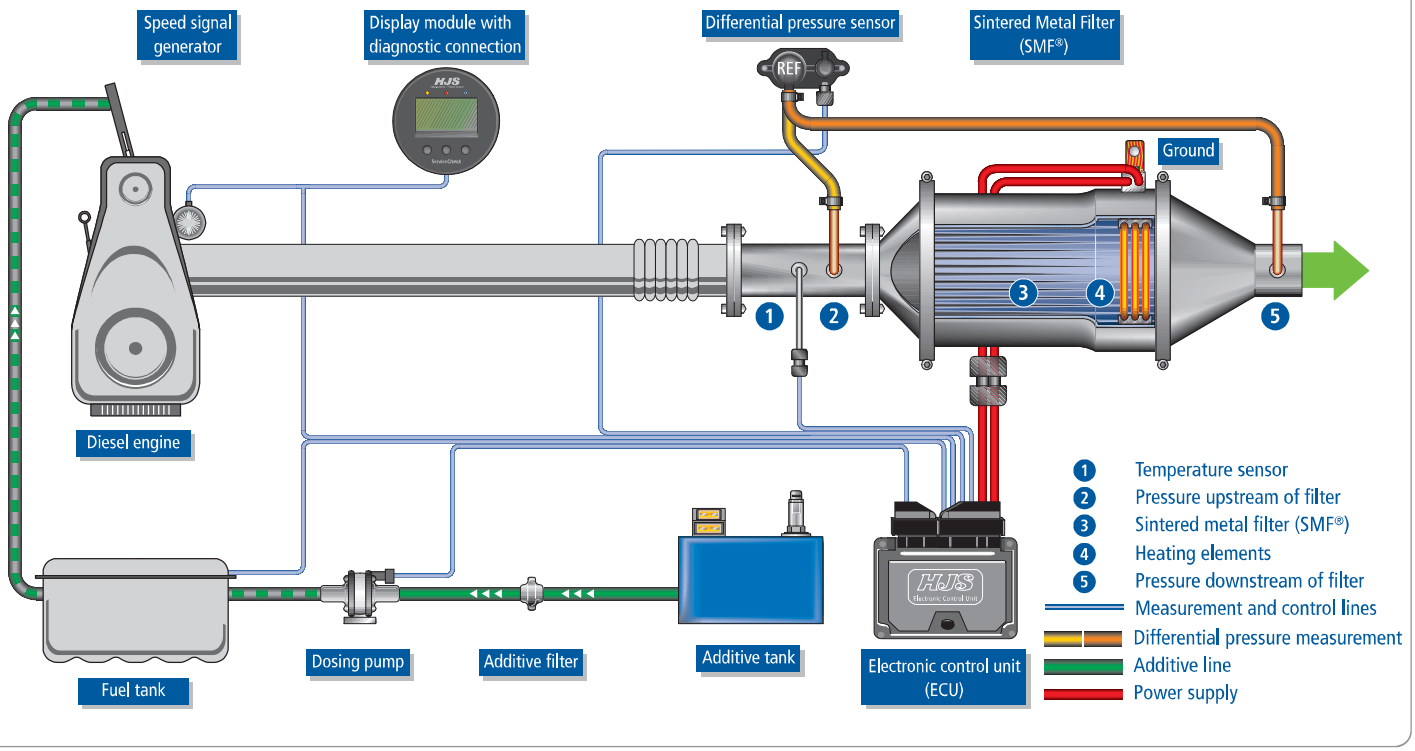
Application examples for SMF®-AR systems:

Construction machinery and construction equipment, such as forklift trucks, mini hydraulic excavators, wheel loaders, industrial trucks and power generating sets.

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

Functional description

The 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 increases its burn-off speed. The soot trapped in the filter can, therefore, be burned off automatically in a regeneration process when the exhaust-gas has a temperature of around 400°C. If, however, the necessary temperature is not reached – which is frequently the case in the low-load range – the system's active, thermoelectric regeneration function cuts in.



• Functional Principle SMF®-AR

Active, thermoelectric regeneration

The control unit triggers (active) regeneration by means of the heating elements that encircle the filter. The soot that has built up in the filter is ignited by the energy radiated by the heating elements. After the initial ignition of the soot layer, the regeneration process runs automatically until completed, that is, all the soot has been burned off. This occurs at regular intervals. However, 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 ensures that a regeneration cycle that has already started is not interrupted when the engine is switched off.

Thanks to the high soot holding capacity of the SMF®-AR system, there isn't just one single ideal moment for regeneration, rather regeneration takes place within a wide time slot. Terminating regeneration by switching off the engine therefore poses absolutely no problem to reliable, safe operation of the SMF®-AR system.

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

• Soot ignition following initial ignition

SMF®-AR advantages at a glance

- ✔ Suitable for OE and retrofitting applications
- ✔ Reduction of soot particles and fine particulate matter by more than 99%
- ✔ Particularly suitable for low-temperature applications
- ✔ Fully automatic, active regeneration
- ✔ Modular construction
- ✔ Reliable operation
- ✔ Low maintenance
- ✔ Longer service life
- ✔ NO_2-neutral regeneration
- ✔ Use of fuels with a high share of sulphur as well as other "special" fuels (e.g. kerosene)

Technical data and requirements

Max. safe temperature operation for SMF®*:
650°C exhaust-gas temperature

Filter material: high-temperature-resistant chrome-nickel steel

Filter housing material: 1.4301

Ash holding capacity: max. 50 g/l filter volume

Filtration efficiency rate: (number concentration in range from 20 – 300 nm) > 99%

Filtration efficiency rate: (in relation to soot mass) > 97%

Length of regeneration period: 3 – 7 minutes

Max. power consumption of heater: 1.2 - 3.8 m^2 SMF®-AR
1 kW with 12-V on-board supply system

Max. power consumption of heater: 5.4 - 8.1 m^2 SMF®-AR
2.2 kW with 24-V on-board supply system

Min. size alternator: 80 Ah

Particulate load before regeneration: 20 – 30 g/m^2

Surface temperature during regeneration without insulation: max. 800°C (peak)

Surface temperature during regeneration with insulation: max. 300°C

Additive consumption: 1 l/1700 l diesel (depending on volume of particulates emitted by engine)

Additive contents: organometallic iron compound

Additive pollutant categories: Xn; R48/22, R65, R66

Application and operating conditions

The following application and operating conditions must be complied with in order to ensure the modular SMF®-AR systems from HJS function optimally:

> Engine fulfils Stage II, Stage IIIA or B in Europe, Tiers II, III and IV in the USA

> Diesel fuel in compliance with DIN EN 590 and DIN 51628

> Low-ash engine oils

> Exhaust-gas temperatures from 150°C for regeneration

> Crucial factors when selecting the additive tank (sizes available: 2 l, 3 l, 5 l, 10 l, 15 l and 20 l) are the installation space available and the maintenance interval desired

> Tank size in line with the average consumption figure and annual mileage covered or number of operating hours

> Strain-free, vibration-isolated installation and secure, gas-tight connection to the existing exhaust system

> Systems never mounted on the engine-gearbox unit

> Only components approved and released by the system supplier are fitted

Perfect connection of the system pipework ensures the exhaust backpressure is low. HJS offers insulating components for all its systems to reduce their surface temperature. The systems are operated in conjunction with the HJS Service Unit (included in the delivery scope).

In order to ensure the systems operate as intended, HJS and its authorised partners offer a temperature-measurement service and one-on-one application consulting.

All application specifications, installation guidelines and maintenance manuals provided by HJS Fahrzeugtechnik GmbH & Co KG must be complied with.

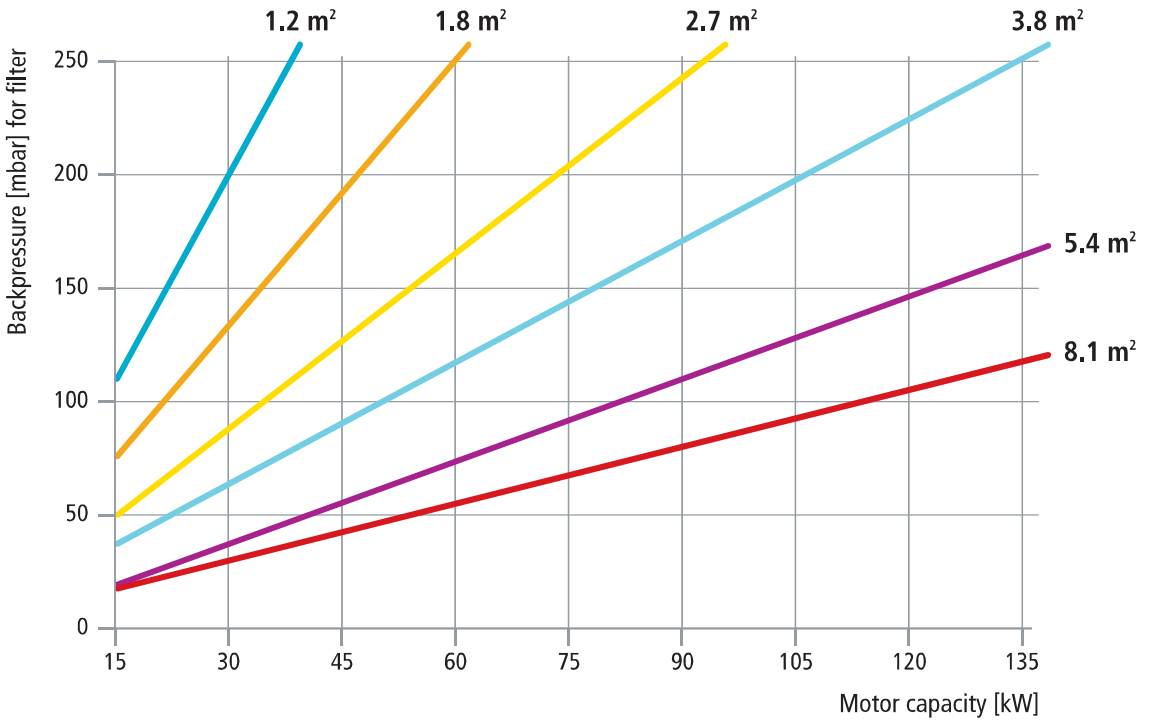
Dimensioning the filter

HJS offers SMF®-AR systems with filter surface areas ranging from 1.2 m^2 to 8.1 m^2.

To help you choose the right size of filter, the diagram below shows the exhaust backpressure generated by each size of filter (not taking the inlet and outlet modules into account).

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

Filter surface areas* from 1.2 m^2 to 8.1 m^2



*Refers to a filter module with a maximum temperature upstream of the DPF of 200°C

• Backpressure of the individual filter units

Example calculation

In the case of a construction machine with a power output of e.g. 250 kW and a maximum permissible exhaust backpressure of 150 mbar (as specified by the engine manufacturer), a filter with a surface area of 3.8 m^2 can be installed. In this simplified example, it should be noted that the backpressure flow of the inlet and outlet modules is disregarded. Radial modules tend to result in a slightly higher backpressure. Further technical data are required if the filter is to be dimensioned more precisely (see Section HJS Enquiry Form).

The following values can be taken as guide values in the initial steps of dimensioning the filter:

Filter surface area	Rated power output	On-board supply system
1.2 m^2	15 – 25 kW	12 V
1.8 m^2	30 – 45 kW	12 V
2.7 m^2	50 – 70 kW	12 V
3.8 m^2	75 – 85 kW	12 V
5.4 m^2	85 – 100 kW	24 V
8.1 m^2	100 – 135 kW	24 V

Considering the installation space available

After determining the size of the filter, it's time to see how much space is available for installing them.

As a rule, the filter system replaces the original silencer. Alternatively, the particulate filter system can be installed at a different position in the exhaust system.

When selecting the installation position, make sure that there is sufficient clearance between the filter and other components and that the filter can be removed easily for servicing and maintenance work.

The filter unit can be installed horizontally or vertically. The matching inlet and outlet modules must be selected in line with the amount of installation space available in the machine (AXIAL-AXIAL, AXIAL-RADIAL, RADIAL-AXIAL, RADIAL-RADIAL).

To secure the filter, system mounts must be used.

Dimension tables

The dimension tables contain all dimensions of relevance to installation. All dimensions are stated in millimetres (mm). This section describes and illustrates the different versions of filter systems with a surface area of 1.2 m^2 to 8.1 m^2.

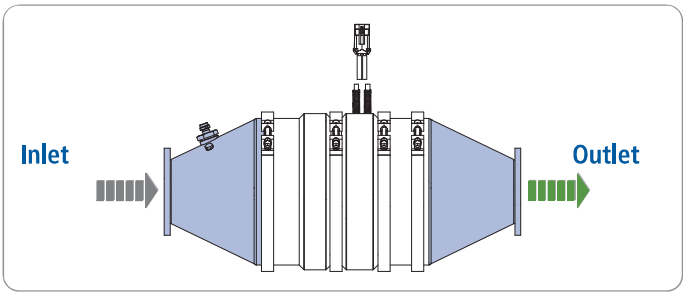
The dimension tables contain the data of the:

> Inlet module
> SMF®-AR
> Outlet module

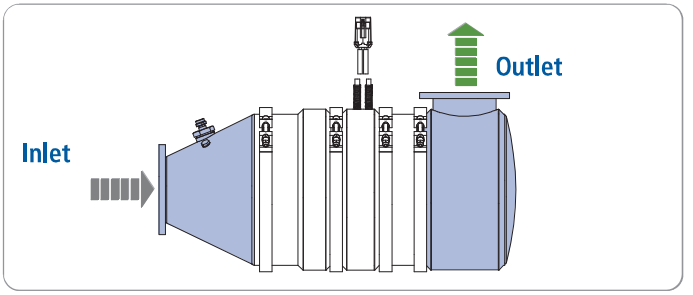
Scope of delivery

The item numbers listed describe fully assembled filter units with inlet and outlet module, regeneration unit, system clamp, gasket set, wire mesh set, insulation set and HJS Service Unit. In addition, all relevant technical documentations, such as the installation guidelines and maintenance manual, are included in the scope of delivery. The system mounts and additive must be ordered separately (see Section Individual components).

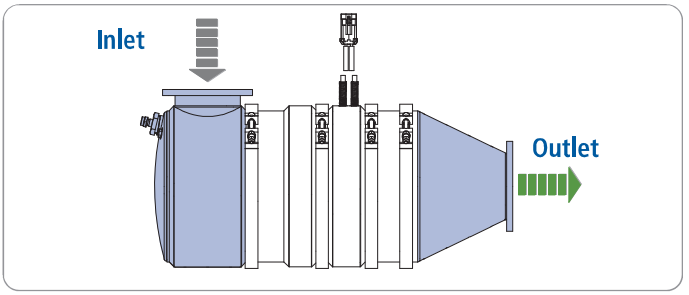
AXIAL - AXIAL



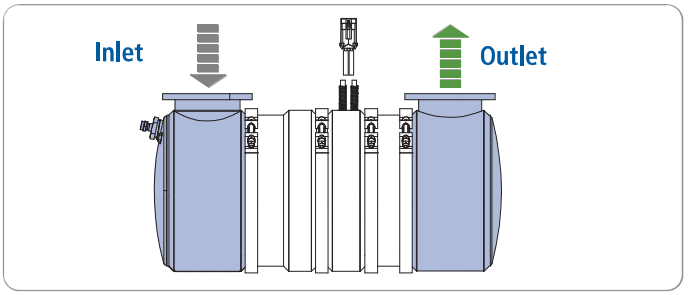
AXIAL - RADIAL



RADIAL - AXIAL

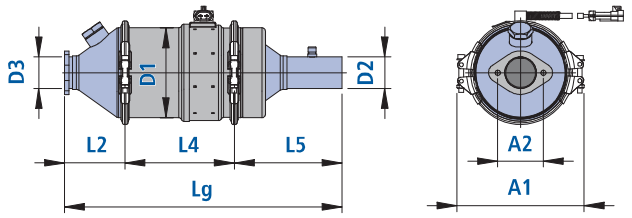


RADIAL - RADIAL

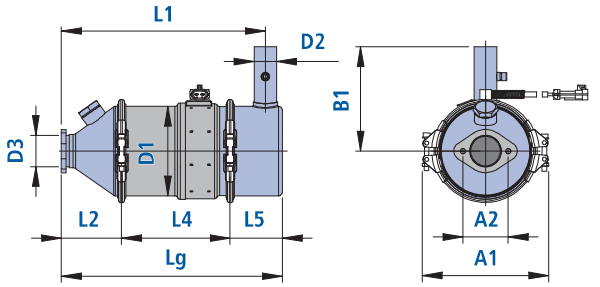


SMF®-AR – 1.2 m²

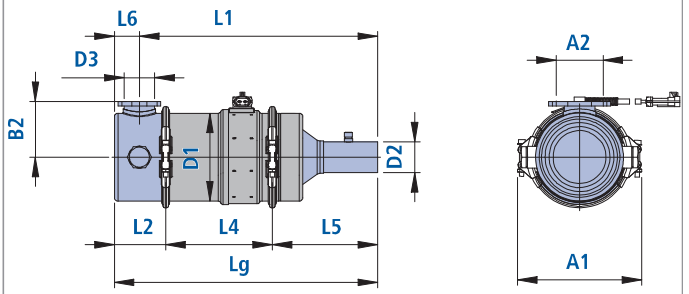
AXIAL - AXIAL



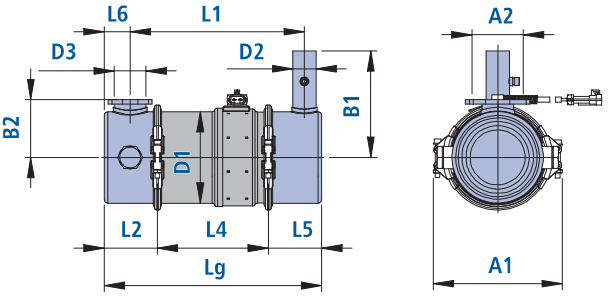
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



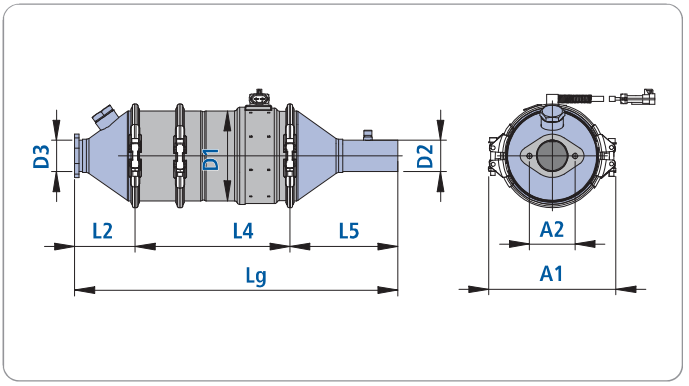
Measurement Table SMF®-AR – 1.2 m²

Item No*1	System*2 m²	Confi-guration	Lg	L1	L2	L3	L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
93 71 3001	SMF-AR 1.2	AX - AX	487	-	106	-	192	189	-	220	80	-	-	Ø 158	Ø 55	Ø 55
93 71 3002	SMF-AR 1.2	AX - RAD	390	360	106	-	192	92	-	220	80	184	-	Ø 158	Ø 40	Ø 55
93 71 3003	SMF-AR 1.2	RAD - AX	473	428	92	-	192	189	45	220	80	-	100	Ø 158	Ø 55	Ø 55
93 71 3004	SMF-AR 1.2	RAD - RAD	367	301	92	-	192	92	45	220	80	184	100	Ø 158	Ø 40	Ø 55

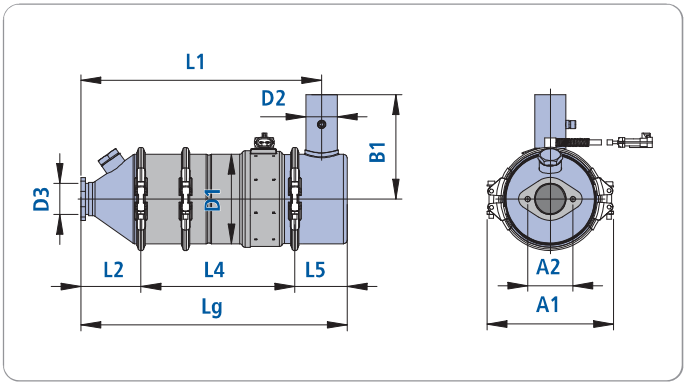
*1 Item no. without system mount and additive; please order separately - see section Individual components; *2 SMF® = uncoated filter; CSMF® = coated filter
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

SMF®-AR – 1.8 m²

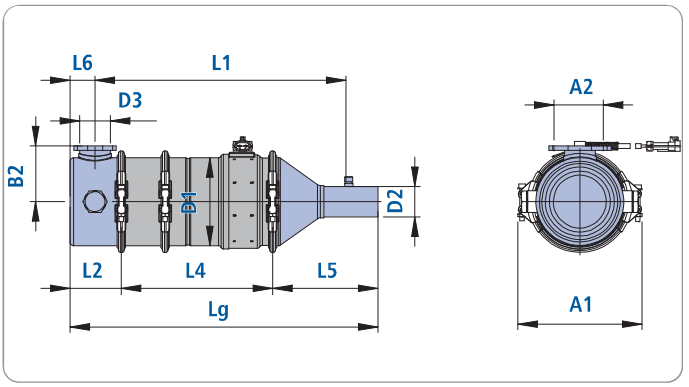
AXIAL - AXIAL



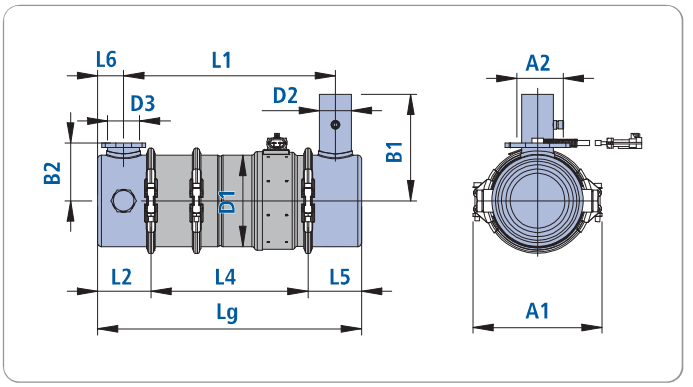
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



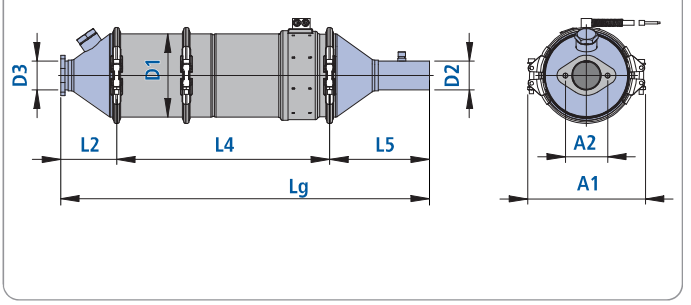
Measurement Table SMF®-AR – 1.8 m²

Item No*1	System*2 m²	Confi-guration	Lg	L1	L2	L3	L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
93 71 3005	SMF-AR 1.8	AX - AX	567	-	106	-	272	189	-	220	80	-	-	Ø 158	Ø 55	Ø 55
93 71 3006	SMF-AR 1.8	AX - RAD	470	424	106	-	272	92	-	220	80	184	-	Ø 158	Ø 55	Ø 55
93 71 3007	SMF-AR 1.8	RAD - AX	553	508	92	-	272	189	45	220	80	-	100	Ø 158	Ø 55	Ø 55
93 71 3008	SMF-AR 1.8	RAD - RAD	456	366	92	-	272	92	45	220	80	184	100	Ø 158	Ø 55	Ø 55

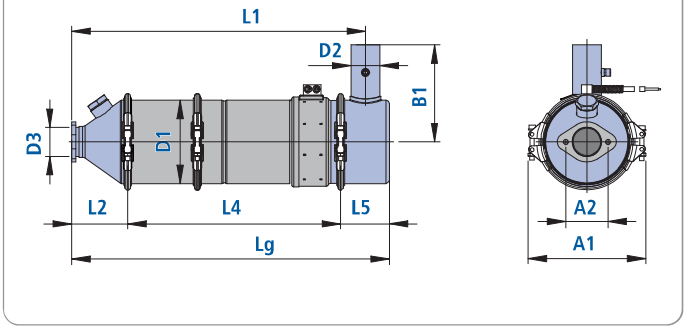
*1 Item no. without system mount and additive; please order separately - see section Individual components; *2 SMF® = uncoated filter; CSMF® = coated filter
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

SMF®-AR – 2.7 m²

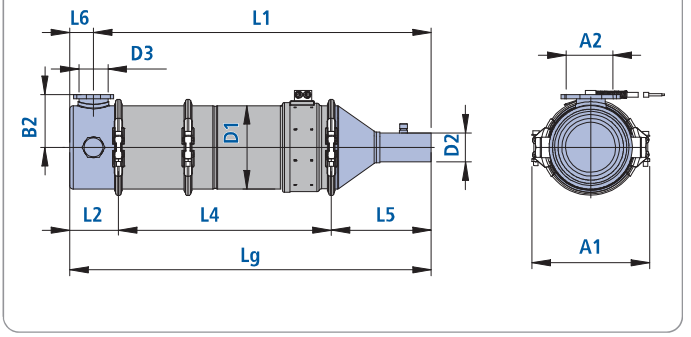
AXIAL - AXIAL



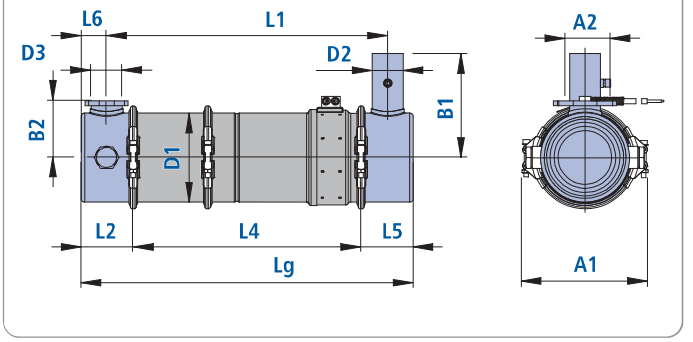
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



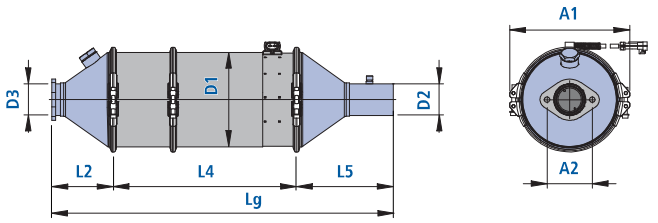
Measurement Table SMF®-AR – 2.7 m²

Item No*1	System*2 m²	Confi-guration	Lg	L1	L2	L3	L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
93 71 3009	SMF-AR 2.7	AX - AX	699	-	106	-	404	189	-	220	80	-	-	Ø 158	Ø 55	Ø 55
93 71 3010	SMF-AR 2.7	AX - RAD	602	557	106	-	404	92	-	220	80	184	-	Ø 158	Ø 55	Ø 55
93 71 3011	SMF-AR 2.7	RAD - AX	685	680	92	-	404	189	45	220	80	-	100	Ø 158	Ø 55	Ø 55
93 71 3012	SMF-AR 2.7	RAD - RAD	588	498	92	-	404	92	45	220	80	184	100	Ø 158	Ø 55	Ø 55

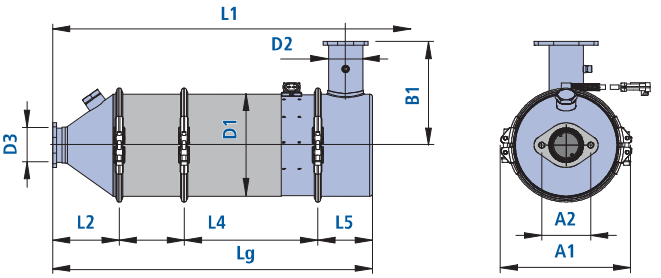
*1 Item no. without system mount and additive; please order separately - see section Individual components; *2 SMF® = uncoated filter; CSMF® = coated filter
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

SMF®-AR – 3.8 m²

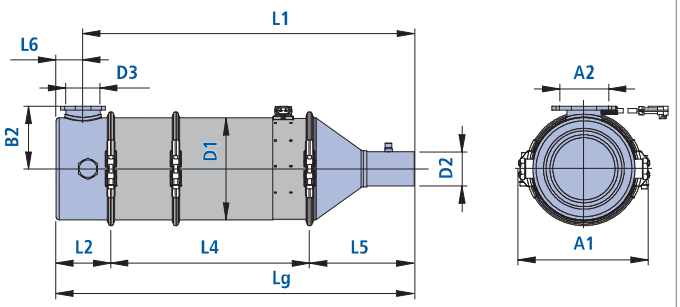
AXIAL - AXIAL



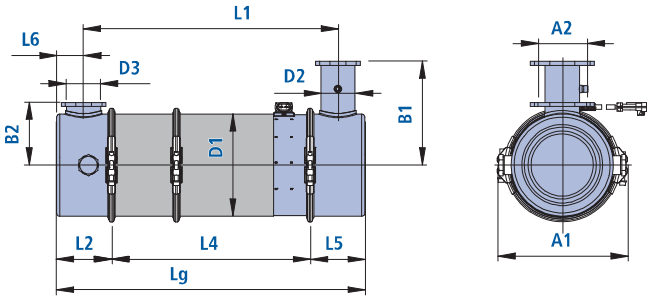
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



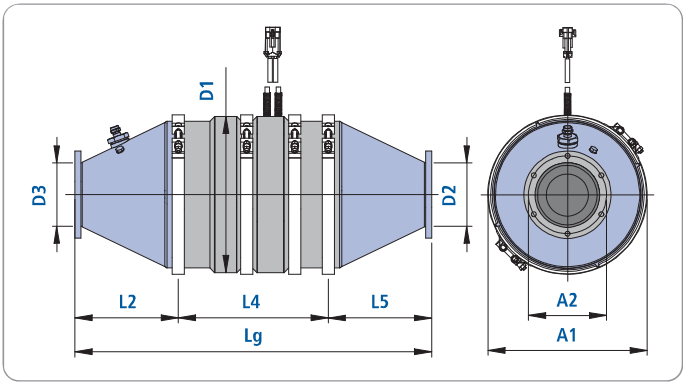
Measurement Table SMF®-AR – 3.8 m²

Item No*1	System*2 m²	Confi-guration	Lg	L1	L2	L3	L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
93 71 3013	SMF-AR 3.8	AX - AX	755	-	135	-	405	215	-	266	100	-	-	Ø 208	Ø 70	Ø 70
93 71 3014	SMF-AR 3.8	AX - RAD	653	598	135	-	405	113	-	266	100	212	-	Ø 208	Ø 70	Ø 70
93 71 3015	SMF-AR 3.8	RAD - AX	731	643	111	-	405	215	55	266	100	-	123	Ø 208	Ø 70	Ø 70
93 71 3016	SMF-AR 3.8	RAD - RAD	629	519	111	-	405	113	55	266	100	212	123	Ø 208	Ø 70	Ø 70

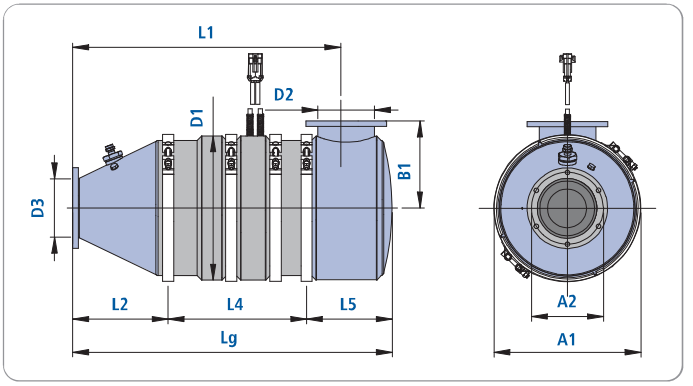
*1 Item no. without system mount and additive; please order separately - see section Individual components; *2 SMF® = uncoated filter; CSMF® = coated filter
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

SMF®-AR – 5.4 m²

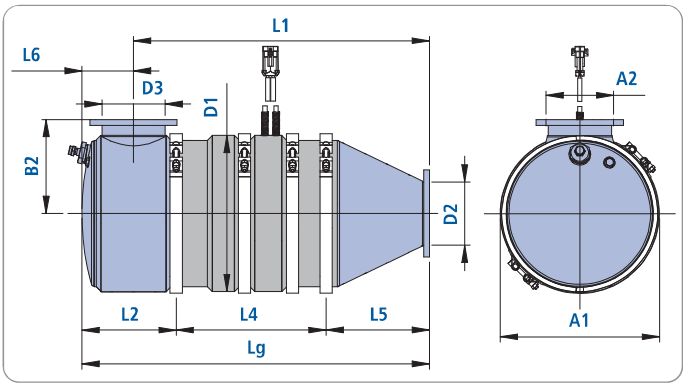
AXIAL - AXIAL



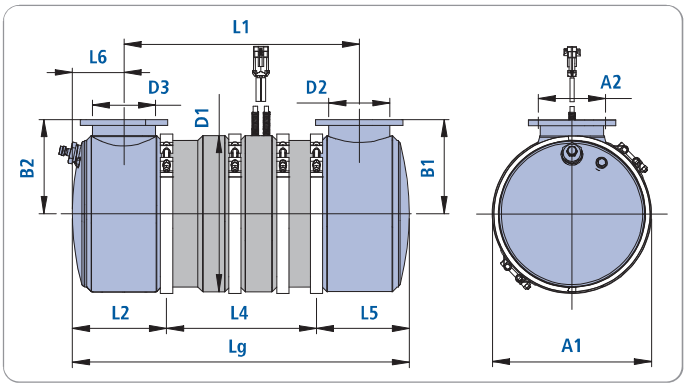
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



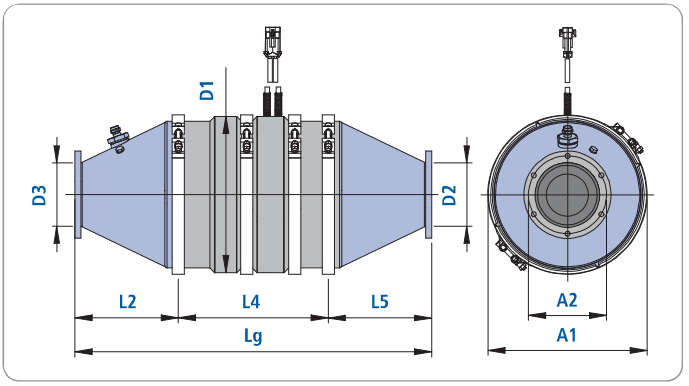
Measurement Table SMF®-AR – 5.4 m²

Item No*1	System*2 m²	Confi-guration	Lg	L1	L2	L3	L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
93 71 3017	SMF-AR 5.4	AX - AX	728	-	211	-	306	211	-	Ø 325	Ø 159	-	-	Ø 319	Ø 129	Ø 129
93 71 3018	SMF-AR 5.4	AX - RAD	706	605	211	-	306	189	-	Ø 325	Ø 159	192	-	Ø 319	Ø 129	Ø 129
93 71 3019	SMF-AR 5.4	RAD - AX	709	604	192	-	306	211	105	Ø 325	Ø 159	-	192	Ø 319	Ø 129	Ø 129
93 71 3020	SMF-AR 5.4	RAD - RAD	687	480	192	-	306	189	105	Ø 325	Ø 159	192	192	Ø 319	Ø 129	Ø 129

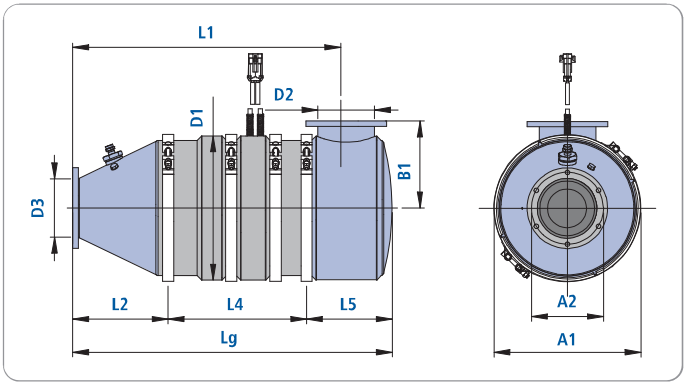
*1 Item no. without system mount and additive; please order separately - see section Individual components; *2 SMF® = uncoated filter; CSMF® = coated filter
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

SMF®-AR – 8.1 m²

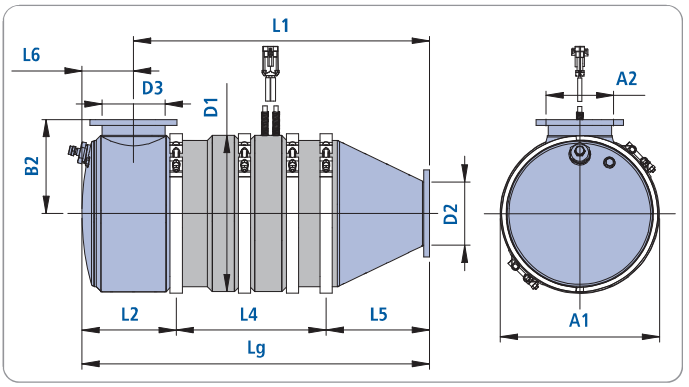
AXIAL - AXIAL



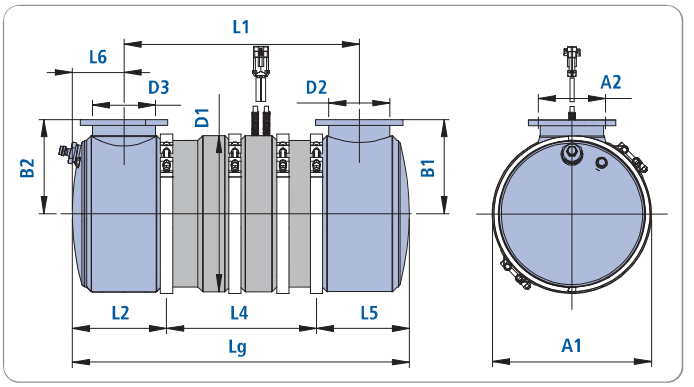
AXIAL - RADIAL



RADIAL - AXIAL



RADIAL - RADIAL



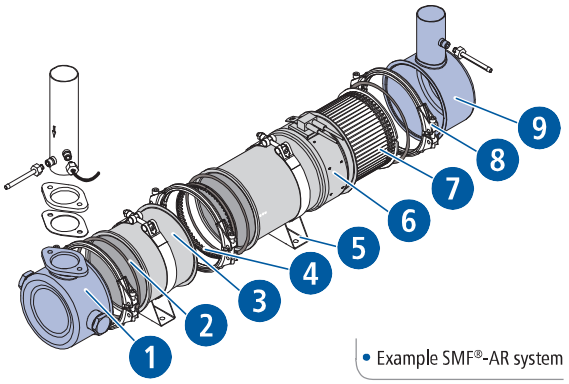
Measurement Table SMF®-AR – 8.1 m²

Item No*1	System*2 m²	Confi-guration	Lg	L1	L2	L3	L4	L5	L6	A1	A2	B1	B2	ø D1	ø D2	ø D3
93 71 3021	SMF-AR 8.1	AX - AX	863	-	211	-	441	211	-	Ø 325	Ø 159	-	-	Ø 319	Ø 129	Ø 129
93 71 3022	SMF-AR 8.1	AX - RAD	842	740	211	-	441	189	-	Ø 325	Ø 159	192	-	Ø 319	Ø 129	Ø 129
93 71 3023	SMF-AR 8.1	RAD - AX	844	739	192	-	441	211	105	Ø 325	Ø 159	-	192	Ø 319	Ø 129	Ø 129
93 71 3024	SMF-AR 8.1	RAD - RAD	823	616	192	-	441	189	105	Ø 325	Ø 159	192	192	Ø 319	Ø 129	Ø 129

*1 Item no. without system mount and additive; please order separately - see section Individual components; *2 SMF® = uncoated filter; CSMF® = coated filter
Comment: The specified dimensions [in mm] are subject to tolerances. Precise dimensions on request.

Individual components

The table below contains the data of the individual components of a SMF®-AR system.



• Example SMF®-AR system

1. Inlet Module
2. Gasket
3. Middle Module
4. Wire Mesh
5. System Mount
6. Heating cabinet
7. SMF® Filter
8. System Clamp
9. Outlet Module

Additive (1 liter)
94 60 0251

System m²	Confi-guration	Inlet Module	Middle Module	Heating cabinet	SMF Filter	Outlet Module	Regeneration Unit	System Mount	System Clamp	Gasket Set	Wire Mesh Set	Insulation Set
SMF®-AR 1.2	AX - AX	93 02 4184	-	93 02 6001	93 02 4378	93 02 4215	93 02 6020	93 02 4365	93 02 4179	93 02 4189	-	93 02 4352
SMF®-AR 1.2	AX - RAD	93 02 4184	-	93 02 6001	93 02 4378	93 02 4218	93 02 6020	93 02 4365	93 02 4179	93 02 4189	-	93 02 4353
SMF®-AR 1.2	RAD - AX	93 02 4190	-	93 02 6001	93 02 4378	93 02 4215	93 02 6020	93 02 4365	93 02 4179	93 02 4189	-	93 02 4351
SMF®-AR 1.2	RAD - RAD	93 02 4190	-	93 02 6001	93 02 4378	93 02 4218	93 02 6020	93 02 4365	93 02 4179	93 02 4189	-	93 02 4354
SMF®-AR 1.8	AX - AX	93 02 4184	93 02 6010	93 02 6002	93 02 4177	93 02 4186	93 02 6020	93 02 4365	93 02 4179	93 02 4189	93 02 4178	93 02 4315
SMF®-AR 1.8	AX - RAD	93 02 4184	93 02 6010	93 02 6002	93 02 4177	93 02 4188	93 02 6020	93 02 4365	93 02 4179	93 02 4189	93 02 4178	93 02 4316
SMF®-AR 1.8	RAD - AX	93 02 4190	93 02 6010	93 02 6002	93 02 4177	93 02 4186	93 02 6020	93 02 4365	93 02 4179	93 02 4189	93 02 4178	93 02 4317
SMF®-AR 1.8	RAD - RAD	93 02 4190	93 02 6010	93 02 6002	93 02 4177	93 02 4188	93 02 6020	93 02 4365	93 02 4179	93 02 4189	93 02 4178	93 02 4318
SMF®-AR 2.7	AX - AX	93 02 4184	93 02 4193	93 02 6003	93 02 4175	93 02 4186	93 02 6020	93 02 4365	93 02 4179	93 02 4189	93 02 4178	93 02 4319
SMF®-AR 2.7	AX - RAD	93 02 4184	93 02 4193	93 02 6003	93 02 4175	93 02 4188	93 02 6020	93 02 4365	93 02 4179	93 02 4189	93 02 4178	93 02 4320
SMF®-AR 2.7	RAD - AX	93 02 4190	93 02 4193	93 02 6003	93 02 4175	93 02 4186	93 02 6020	93 02 4365	93 02 4179	93 02 4189	93 02 4178	93 02 4322
SMF®-AR 2.7	RAD - RAD	93 02 4190	93 02 4193	93 02 6003	93 02 4175	93 02 4188	93 02 6020	93 02 4365	93 02 4179	93 02 4189	93 02 4178	93 02 4321
SMF-AR® 3.8	AX - AX	93 02 4196	93 02 4211	93 02 6004	93 02 4174	93 02 4197	93 02 6021	93 02 4357	93024201	93 02 4202	93 02 4204	93 02 4323
SMF-AR® 3.8	AX - RAD	93 02 4196	93 02 4211	93 02 6004	93 02 4174	93 02 4199	93 02 6021	93 02 4357	93024201	93 02 4202	93 02 4204	93 02 4324
SMF-AR® 3.8	RAD - AX	93 02 4198	93 02 4211	93 02 6004	93 02 4174	93 02 4197	93 02 6021	93 02 4357	93024201	93 02 4202	93 02 4204	93 02 4326
SMF-AR® 3.8	RAD - RAD	93 02 4198	93 02 4211	93 02 6004	93 02 4174	93 02 4199	93 02 6021	93 02 4357	93024201	93 02 4202	93 02 4204	93 02 4325
SMF®-AR 5.4	AX - AX	94 62 4006	93 02 4166	93 02 6005	93 02 4164	93 02 4167	93 02 6022	93 02 4358	94 62 2033	94 03 0006	93 02 4345	93 02 4331
SMF®-AR 5.4	AX - RAD	94 62 4006	93 02 4166	93 02 6005	93 02 4164	93 02 4169	93 02 6022	93 02 4358	94 62 2033	94 03 0006	93 02 4345	93 02 4331
SMF®-AR 5.4	RAD - AX	94 11 4012	93 02 4166	93 02 6005	93 02 4164	93 02 4167	93 02 6022	93 02 4358	94 62 2033	94 03 0006	93 02 4345	93 02 4331
SMF®-AR 5.4	RAD - RAD	94 11 4012	93 02 4166	93 02 6005	93 02 4164	93 02 4169	93 02 6022	93 02 4358	94 62 2033	94 03 0006	93 02 4345	93 02 4331
SMF®-AR 8.1	AX - AX	94 62 4006	93 02 4166	93 02 6006	93 02 4162	93 02 4167	93 02 6023	93 02 4358	94 62 2033	94 03 0006	93 02 4345	93 02 4332
SMF®-AR 8.1	AX - RAD	94 62 4006	93 02 4166	93 02 6006	93 02 4162	93 02 4169	93 02 6023	93 02 4358	94 62 2033	94 03 0006	93 02 4345	93 02 4332
SMF®-AR 8.1	RAD - AX	94 11 4012	93 02 4166	93 02 6006	93 02 4162	93 02 4167	93 02 6023	93 02 4358	94 62 2033	94 03 0006	93 02 4345	93 02 4332
SMF®-AR 8.1	RAD - RAD	94 11 4012	93 02 4166	93 02 6006	93 02 4162	93 02 4169	93 02 6023	93 02 4358	94 62 2033	94 03 0006	93 02 4345	93 02 4332

6. Enquiry Form

To ensure an HJS exhaust-gas aftertreatment system is dimensioned correctly for a particular application, please fill in the enquiry form below in full and send it to HJS or one of our authorised partners.

Enquiry Form for Dimensioning an Exhaust-gas Aftertreatment System

To send by:
Fax: +49 2373 987-209

Company: _____

Address: _____

Contact: _____

Phone: _____ Fax: _____

E-Mail: _____

You need to provide the following vehicle data to enable us to calculate the correct size and dimensions of the exhaust-gas aftertreatment system you require:

General information

Vehicle manufacturer _____

Vehicle type _____

Year of construction/No. of operating hours _____

Engine designation _____ Engine power [kW] _____

Displacement [cc] _____ No. of cylinders _____

Turbocharger (yes/no) _____ Emission class _____

Max. mass flow rate [kg/h] _____ PM emissions [g/h, g/KWh] _____

Description of application area (light duty truck, bus, non-road mobile machine, stationary application, etc.)

_____

Operating point (for stationary operation) _____

Fuel (standard, sulphur, phosphor and alkali concentrations) _____

Fuel consumption in application area [l/h or l/100 km] _____

Engine oil (manufacturer, grade, consumption) _____

Type of exhaust-gas recirculation system (internal, external, cooling, high/low pressure, etc.) _____

Max. permissible exhaust backpressure [mbar] _____

Max. permissible noise emissions [dB] _____

Max. permissible surface temperature of exhaust-gas aftertreatment system _____

Data specific to SMF® system

NO_X emissions [g/h, g/KWh] _____

Fuel (sulphur, alkali and phosphor concentrations) _____

Temperature distribution at SMF® system position under operating conditions _____

Data specific to SMF®-AR system

On-board supply voltage (12 V/24 V) _____ Alternator rating [A] _____

Battery capacity [Ah] _____ Availability at terminal W _____

Fuel tank sensor (type/signal voltage) _____

The following data sheets/data must be enclosed with the enquiry form:

Required:

☐ Exhaust-gas temperatures under all application conditions over a period of approx. 1 – 2 weeks. The temperature measurements must be taken at the future installation position of the exhaust-gas aftertreatment system using a NiCrNi or PT-200 temperature sensor and 1-Hz recording rate at the centre of the exhaust-gas flow.

☐ Drawing of the exhaust system and of the OE silencer, or documents relating to the installation space conditions in the vehicle.

Optional:

☐ Technical data sheet of the engine

☐ Engine data (exhaust-gas temperature, fuel consumption, NO_X/PM emissions)

☐ Measurements of the NO_X/PM emissions under operating conditions

Note: _____

7. Extended Guarantee Applicable to HJS Systems for Mobile Machinery and Stationary Applications

HJS grants a guarantee of 2 years or 2,000 operating hours – whichever occurs first – on the systems it supplies, as long as the systems are used for the purpose and in the manner intended.

All products of HJS Fahrzeugtechnik GmbH & Co KG are built to a very high quality standard and are covered by the following extended guarantee conditions:

1. The vehicle/machine is in its standard, series-production configuration and has been serviced and maintained as specified by the manufacturer at the time the systems and components are fitted.
2. The systems and components have been fitted properly and in full by an authorised specialist workshop (see also installation certificate).
3. The installation certificate has been filled in in full and returned.
4. The user manual and maintenance instructions have been complied with.

Any modifications to the system, to the components and/or to the system configuration, as well as the fitting of any components not approved by HJS, will immediately render all claims made under warranty or extended guarantee invalid.

The HJS Application Guidelines valid at any given time form the basis of the technical application and operating conditions.

Filter cleaning procedures are not covered by the terms of the statutory warranty and extended guarantee.

In the event of a valid warranty or guarantee claim, HJS will either remedy the defect or exchange the defective system or system components/assemblies originally supplied by HJS.

Warranty and guarantee claims must be made in writing to HJS and include all the data that can be read out of the HJS Service Unit that belongs to the system. To enable HJS to analyse potentially damaged components with as little delay as possible and as conveniently as possible for the customer, we asks customers to contact us as quickly as possible, either by telephone or in writing, before they disassemble any system components.

Our Terms and Conditions of Sales and Delivery can be found on our website at www.hjs.com.

Notes

A medium-sized company founded in 1976 and based in Menden in central Germany, HJS Fahrzeugtechnik GmbH & Co KG boasts many years of experience and expertise in the field of exhaust-gas aftertreatment. Some 500 employees are engaged in the development, production and marketing of modular systems for reducing pollutant emissions. These innovative environmental protection technologies can be used either as original equipment or for retrofitting in passenger cars, light- and heavy-duty trucks and mobile and stationary applications in the non-road sector. In addition to systems for spark-ignition engines, HJS specialises in systems for diesel engines – especially for reducing the emissions of soot particles (PM) and nitrogen oxides.

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




HJS Technology portfolio for OE- and Retrofit-Applications

> Diesel Particulate Filter (DPF®)
Reduction of soot particle emissions

> SCR-Systems
Reduction of nitrogen oxide emissions

> SCRT®-Systems
Simultaneous reduction of soot particle and nitrogen oxide emissions

A clean future with HJS!

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hjs@hjs.com
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Abgas-Systeme • Exhaust Systems

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