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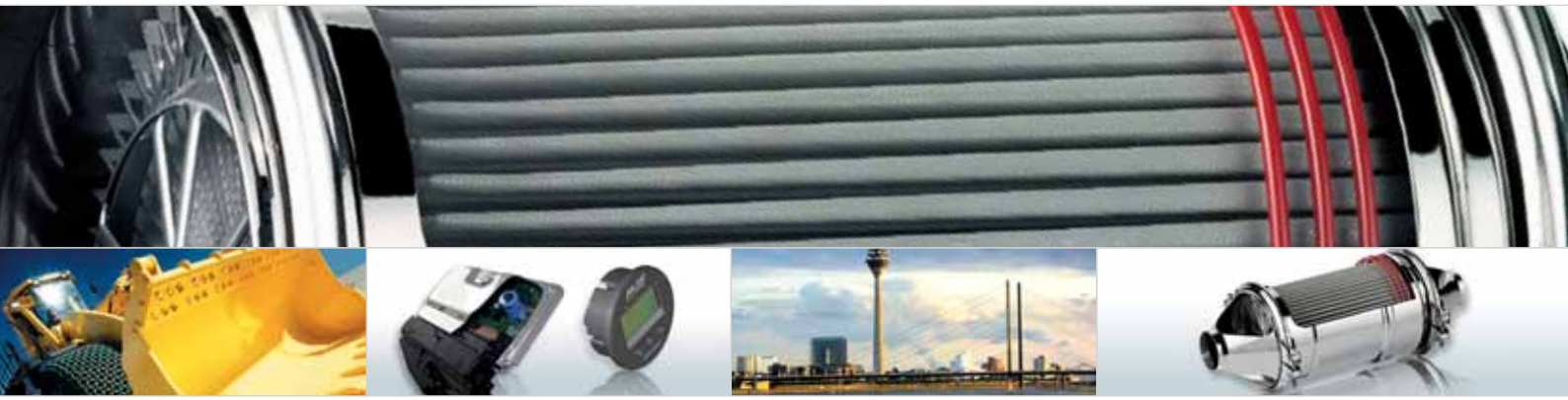
Non-Road Diesel Particulate Filter
Modular SMF®-AR System



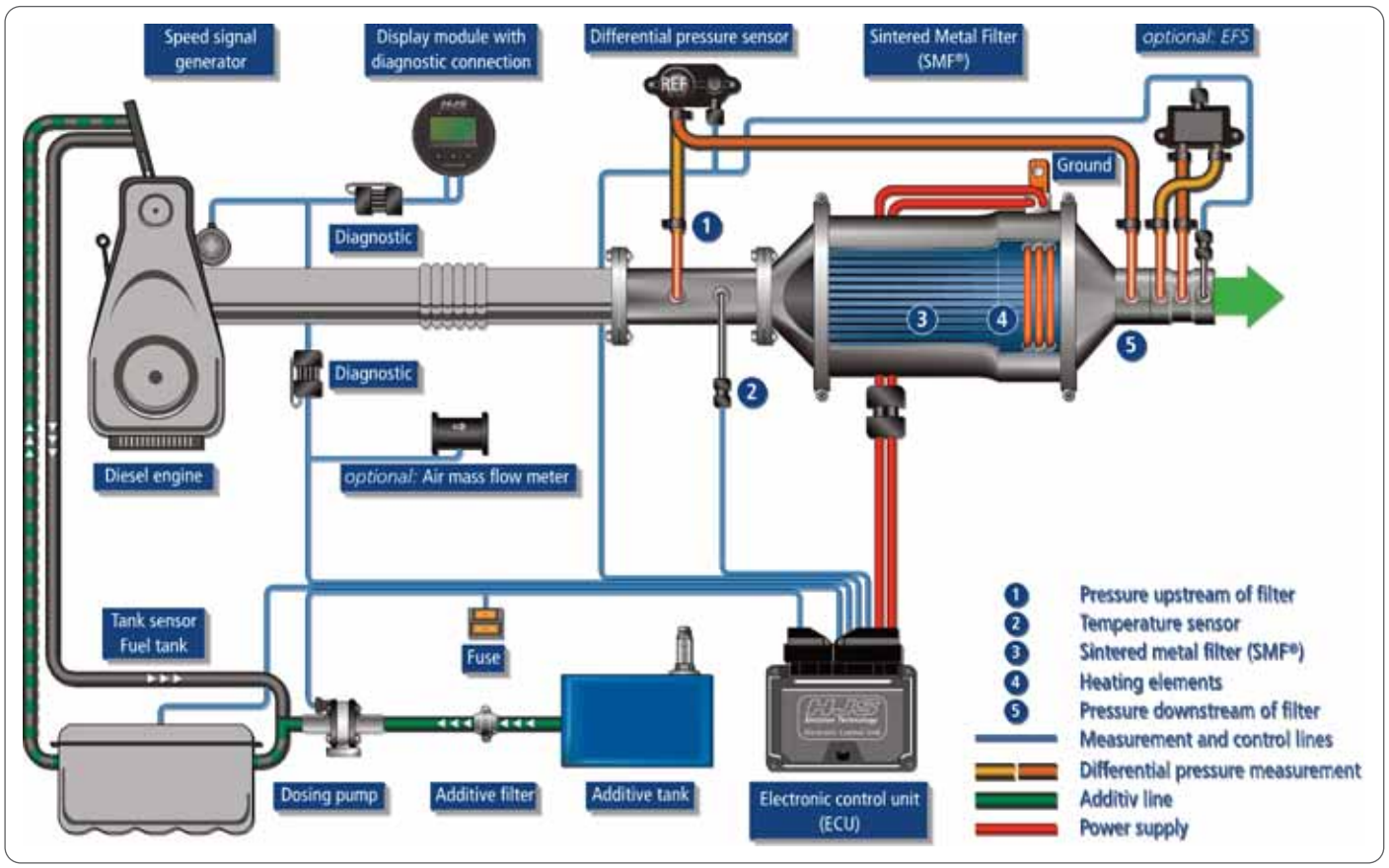
1,2 / 1,8 / 2,7 / 3,8 / 5,4 / 8,1m²

Installation Guidelines

HJS Emission Technology

Content

System overview



General Information

Please read these Installation Guidelines carefully before installing and putting the SMF®-AR system into service. It is intended solely as an instruction manual containing the installation procedures for modular SMF®-AR systems. The SMF®-AR system is to be used solely to filter the exhaust emissions of diesel engines and for no other purpose. The manufacturer shall accept no liability if the product is used other than in the manner intended.

The instructions described in these Installation Guidelines and stipulated by the manufacturer must be complied with. When installing the modular SMF®-AR system, always handle all components with great care because improper handling can cause permanent damage to the SMF®-AR system.

Non-compliance will result in the exclusion of all claims for warranty and of liability on the part of HJS Emission Technology GmbH & Co. KG for any form of personal injury and material damage. The SMF®-AR system must be installed by qualified staff of a vehicle workshop. General accident prevention regulations and all other generally recognised rules pertaining to safety and occupational health are to be complied with at all times. The high standards of safety and quality at HJS Emission Technology GmbH & Co KG are guaranteed by continuous ongoing development. However, this can result in differences between the description given in this document and the actual situation in the vehicle you are working on. Despite having taken great care while compiling this manual, we cannot exclude the possibility of errors. Please understand that no claims will be able to be made on the basis of the data and/or figures given in this manual.

Date: 03/2013

Functional Description

The SMF®-AR system from HJS comprises a sintered metal particulate filter (SMF®) with a fully automatic self-regeneration unit. The latter is able to oxidise the soot trapped by the filter without any assistance from the engine management system and without upstream catalytic converters, and to do so under any engine operating conditions. This means the system is also suitable for retrofitting to vehicles already in service.

The HJS sintered metal filter offers approximately 99% efficiency at trapping the particulates that arise when the engine is running. The sensors mounted on the filter constantly monitor the temperature of the exhaust gases and the backpressure in the filter. In this way, the increasing quantity of soot trapped by the filter the longer the engine runs is measured. Once an adequate quantity of soot has built up in the filter, the electronic control unit triggers regeneration.

To ensure the soot oxidises in a very short time and with the aid of a minimal level of external energy, an additive is added to the diesel by the automatic HJS dosing system. The regeneration procedure of the filter is initiated depending on the filter load. To this end, the electric heating elements are activated with an output of approx. 1000 W at 12 V or approx. 2200 W at 24 V for roughly two minutes.

When the vehicle is restarted after being filled up with fuel, the system automatically detects the amount of fuel filled up and injects an appropriately dosed amount of additive into the fuel return line. The measured value itself is a mean, so that sloshing of the fuel in the tank is compensated for. A piston pump is used as the dosing pump.

This pump meters and injects the additive into the fuel return line of the vehicle (that runs from the engine back to the fuel tank) while the engine is running. This premixed additive then flows into the fuel tank via the return line. The control unit monitors electrical operation of all the components of the dosing system. If a fault arises while the vehicle is in use, it is displayed on the ServiceCheck display module. The fault code can be read out by means of a PC/laptop with appropriate diagnostics software installed on it. This enables you to localise the fault.

Please also study the system overview at the beginning of these Installation Guidelines.

Important Information

Information about and conventions applied in these Installation Guidelines

These Installation Guidelines describe the installation procedures for a SMF®-AR system. Information on how to operate and maintain the system can be found in the relevant HJS documentation. The Maintenance Manual is available on request.

Explanation of symbols:

> Work instruction or listing

(1) / 1 Legend number in text or a figure/photo

Safety instructions and warnings

These safety instructions must be observed for the sake of your own safety and the safety of others.

General instructions and additional pieces of information must be observed in order to prevent damage to the vehicle or the SMF®/CSMF® system.

All work procedures must be carried out by qualified staff of a vehicle workshop.

The internal components of your electronics can become damaged by electrostatic discharges.

Hazard warnings concerning the additive

Xn Harmful substances: these substances are detrimental to health if they enter the body. How to handle: avoid contact with the body and inhaling the vapours. Should you start to feel sick, consult a physician immediately.

The additive used is detrimental to human health and is subject to specific hazard warnings (see below)!

Gesundheitsschädlich
Harmful
Nocivo

Hazard warnings/safety advice concerning the additive

R40	Possible risk of cancer.
R51	Toxic to aquatic organisms.
R53	May cause long-term adverse effects in the aquatic environment.
R65	Harmful: may cause lung damage if swallowed.
R66	Repeated exposure may cause skin dryness or cracking
R67	Vapours may cause drowsiness and dizziness.
S36	Wear suitable protective clothing.
S37	Wear suitable gloves.
S60	This material and its container must be disposed of as hazardous waste.
S61	Avoid release to the environment. Refer to special instructions/Safety data sheets.
S62	If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

The HJS system contains components (HJS ECU, HJS Service Unit, and sensors) that can be damaged or destroyed by electrostatic discharge (ESD). For this reason, whenever handling components of the HJS system, always take the necessary precautionary measures against electrostatic discharge (ESD) as laid down in EN 61340-5-1 and EN 61340-5-2. Always follow the ESD-related instructions when installing and putting the HJS system into operation, in order to prevent damage to the unit and the entire system.

The internal components of your electronics can become damaged by electrostatic discharges. To prevent such damage from occurring, you must conduct static electricity out of your body by, for example, touching an uncoated metal surface before you touch electronic components of the system (e.g. cables). This measure of touching uncoated metal surfaces must be repeated regularly while working on the system, in order to discharge static charges that may build up in the body in the interim periods. Measures taken in the electronics themselves against static discharges and electrical fields are described in EN 61340-5-1. Please follow all instructions strictly.

Choosing the System

Enquiry form

To be able to select precisely the right system and group of components required, you need to fill in the HJS enquiry first.

> Missing information can lead to complications in the workshop and delay installation.

> Furthermore, information about the engine and installation space conditions are crucial when selecting additional components and insulation materials.

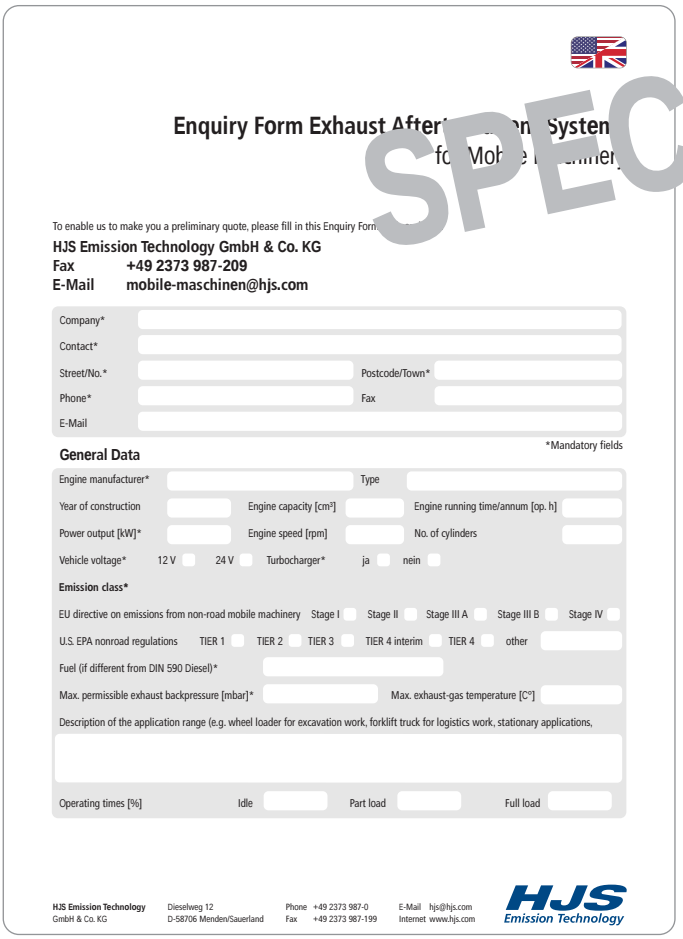
> HJS and its authorised partners offer a one-on-one consulting service to help customers configure specific systems.

The installation criteria described in the section entitled "Checklist Prior to Installing the SMF®-AR System" must be complied with in order to ensure the modular SMF®-AR systems from HJS function optimally.

If one or more of these criteria are not met, the SMF®-AR system cannot be installed.

The filter housing of the SMF®-AR system heats up during operation (Temperatures of up to 700°C) and may cause burns if touched. The hot filter housing poses a fire and ignition hazard.

The vehicle must always be parked in a location that ensures the diesel particulate filter does not come into contact with easily inflammable materials (e.g. dry grass).



Enquiry Form Exhaust After[illegible] System
for Mob[illegible]

To enable us to make you a preliminary quote, please fill in this Enquiry Form

HJS Emission Technology GmbH & Co. KG
Fax +49 2373 987-209
E-Mail mobile-maschinen@hjs.com

Company*
Contact*
Street/No.* Postcode/Town*
Phone* Fax
E-Mail

*Mandatory fields

General Data

Engine manufacturer* Type
Year of construction Engine capacity [cm³] Engine running time/annum [op. h]
Power output [kW]* Engine speed [rpm] No. of cylinders
Vehicle voltage* 12 V 24 V Turbocharger* ja nein

Emission class*

EU directive on emissions from non-road mobile machinery Stage I Stage II Stage III A Stage III B Stage IV
U.S. EPA nonroad regulations TIER 1 TIER 2 TIER 3 TIER 4 interim TIER 4 other
Fuel (if different from DIN 590 Diesel)*
Max. permissible exhaust backpressure [mbar]* Max. exhaust-gas temperature [C°]
Description of the application range (e.g. wheel loader for excavation work, forklift truck for logistics work, stationary applications,

Operating times [%] Idle Part load Full load

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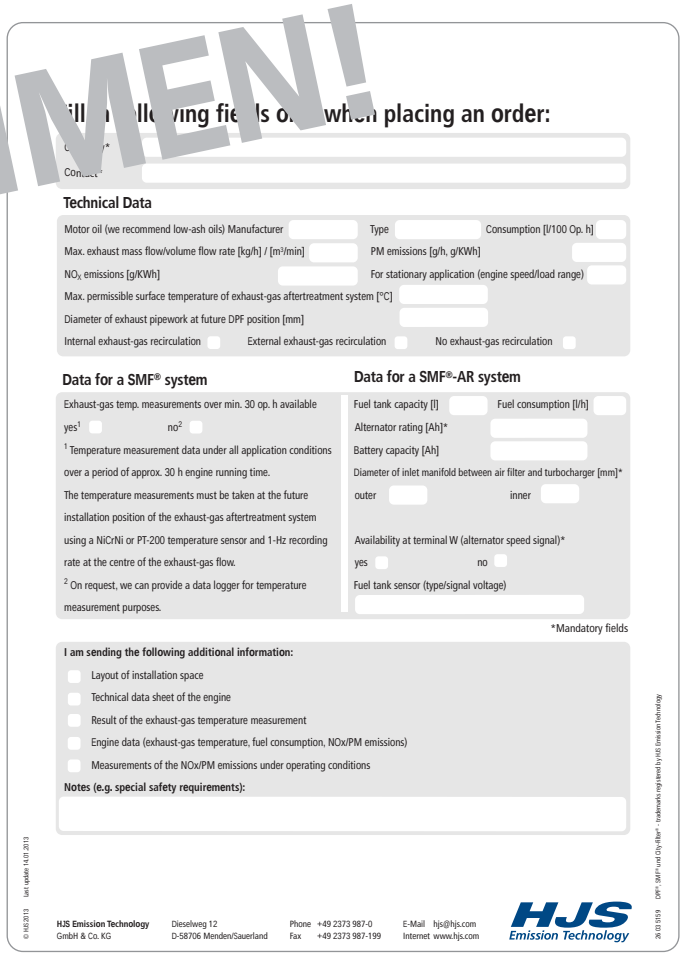

[illegible] following fields o[illegible] when placing an order:

[illegible]*
Contact*

Technical Data

Motor oil (we recommend low-ash oils) Manufacturer Type Consumption [l/100 Op. h]
Max. exhaust mass flow/volume flow rate [kg/h] / [m³/min] PM emissions [g/h, g/KWh]
NO_X emissions [g/KWh] For stationary application (engine speed/load range)
Max. permissible surface temperature of exhaust-gas aftertreatment system [°C]
Diameter of exhaust pipework at future DPF position [mm]
Internal exhaust-gas recirculation External exhaust-gas recirculation No exhaust-gas recirculation

Data for a SMF® system

Exhaust-gas temp. measurements over min. 30 op. h available
yes[1] no[2]
[1] Temperature measurement data under all application conditions over a period of approx. 30 h engine running time. 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.
[2] On request, we can provide a data logger for temperature measurement purposes.

Data for a SMF®-AR system

Fuel tank capacity [l] Fuel consumption [l/h]
Alternator rating [Ah]*
Battery capacity [Ah]
Diameter of inlet manifold between air filter and turbocharger [mm]*
outer inner
Availability at terminal W (alternator speed signal)*
yes no
Fuel tank sensor (type/signal voltage)

*Mandatory fields

I am sending the following additional information:

Layout of installation space
Technical data sheet of the engine
Result of the exhaust-gas temperature measurement
Engine data (exhaust-gas temperature, fuel consumption, NOx/PM emissions)
Measurements of the NOx/PM emissions under operating conditions

Notes (e.g. special safety requirements):

last update 14.07.2013

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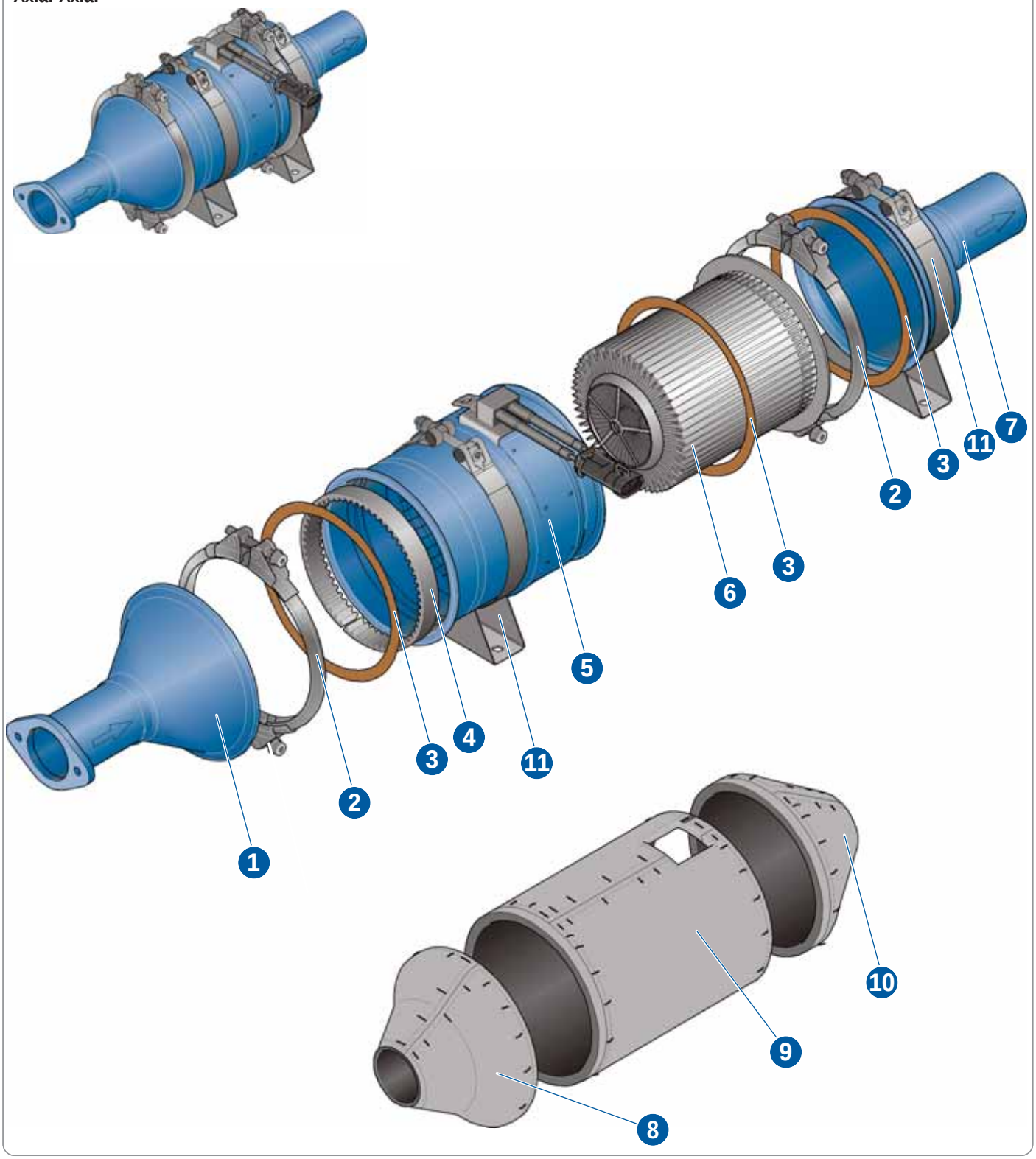
Example Configurations

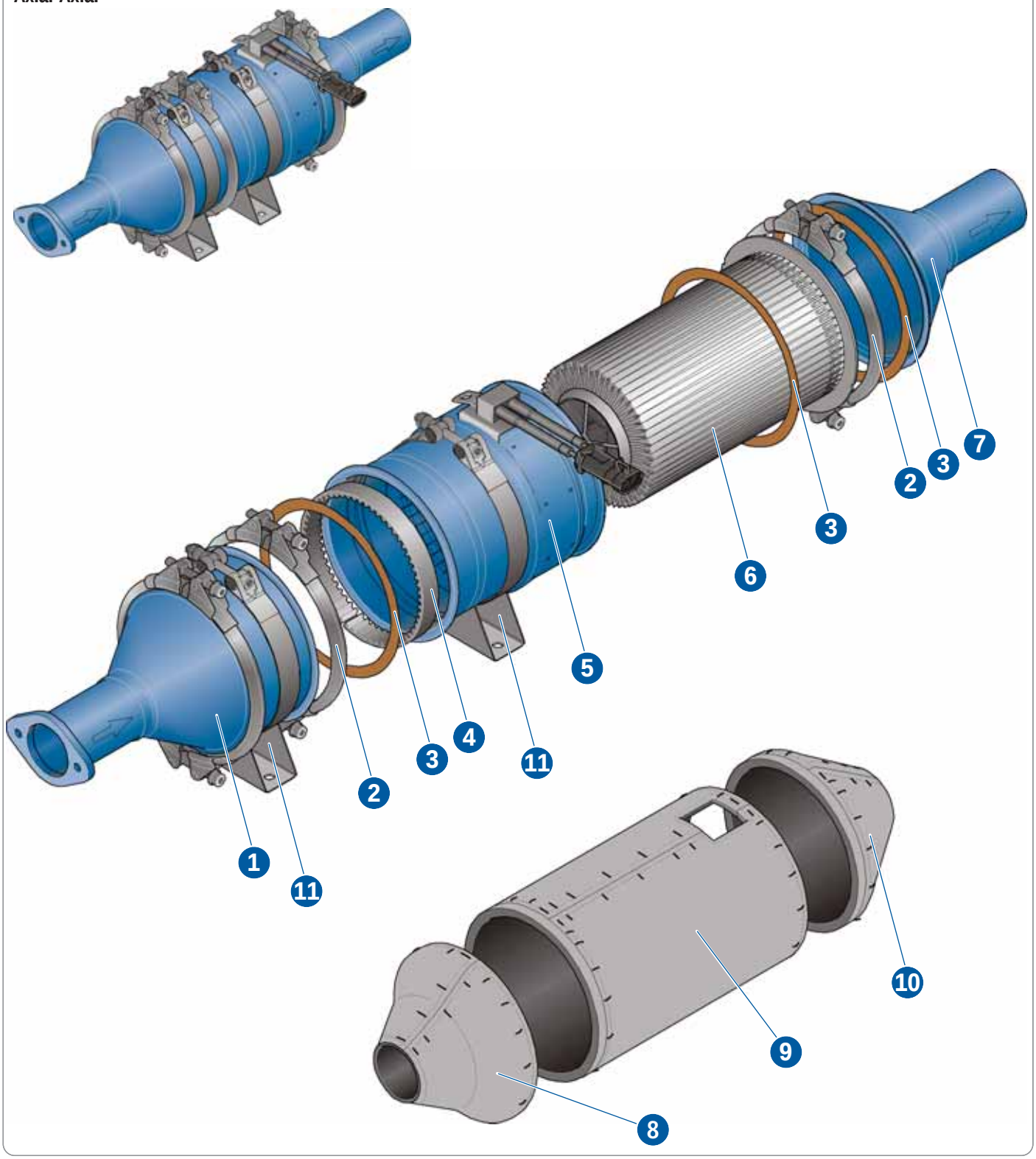
1.2 m² SMF®-AR filter unit
Axial-Axial



1 Axial inlet taper
2 Clamp
(tightening torque 15 Nm)
3 Gasket
4 Wire mesh
5 Filter unit with connection for heater
6 SMF® filter
7 Axial outlet taper
8 Axial inlet taper insulation
9 SMF® filter system insulation
10 Axial outlet taper insulation
11 1.2-m² system mount

Example Configurations

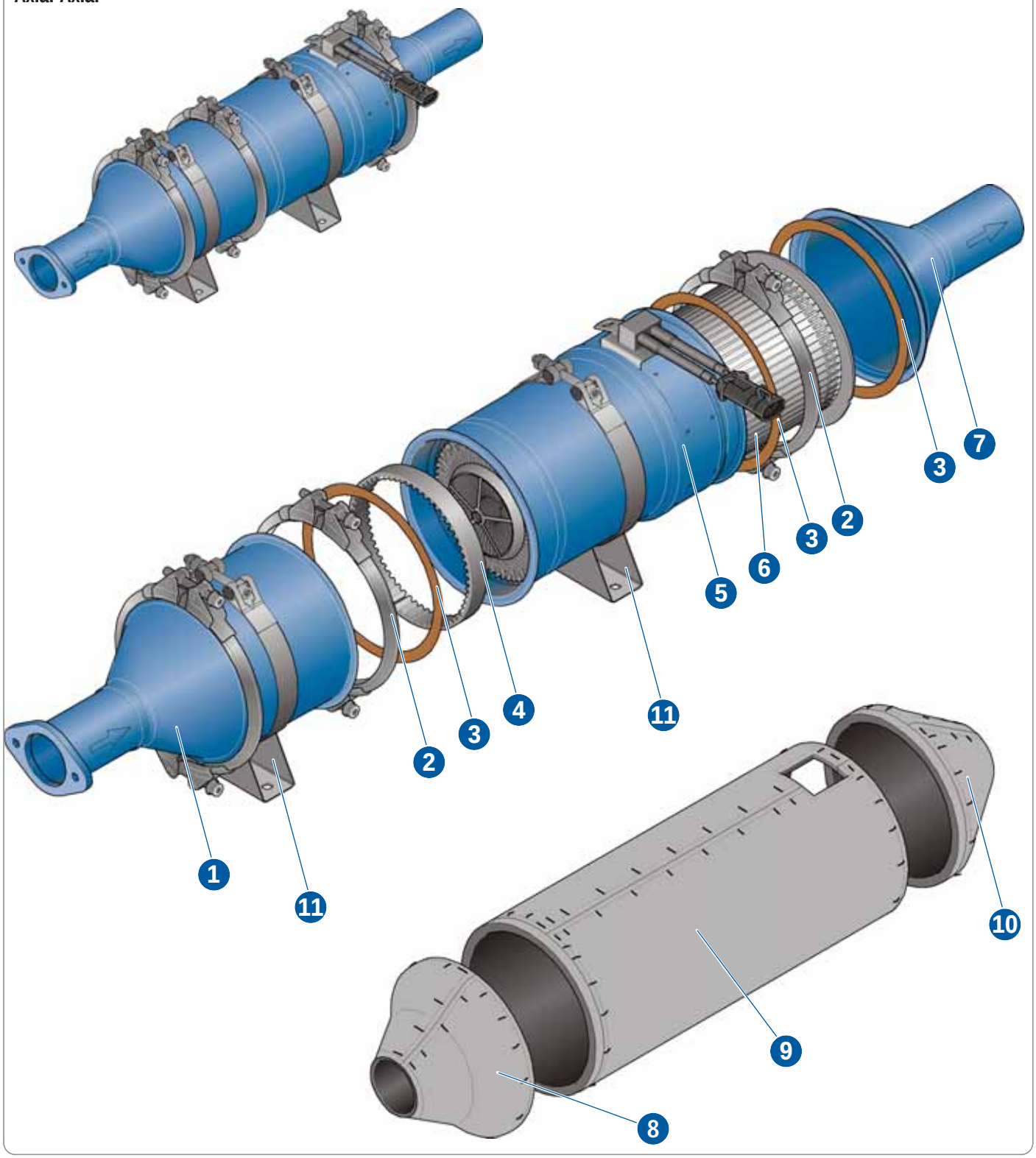
1.8 m² SMF®-AR filter unit
Axial-Axial



1 Axial inlet taper
2 Clamp (tightening torque 15 Nm)
3 Gasket
4 Wire mesh
5 Filter unit with connection for heater
6 SMF® filter
7 Axial outlet taper
8 Axial inlet taper insulation
9 SMF® filter system insulation
10 Axial outlet taper insulation
11 1.8-m² system mount

Example Configurations

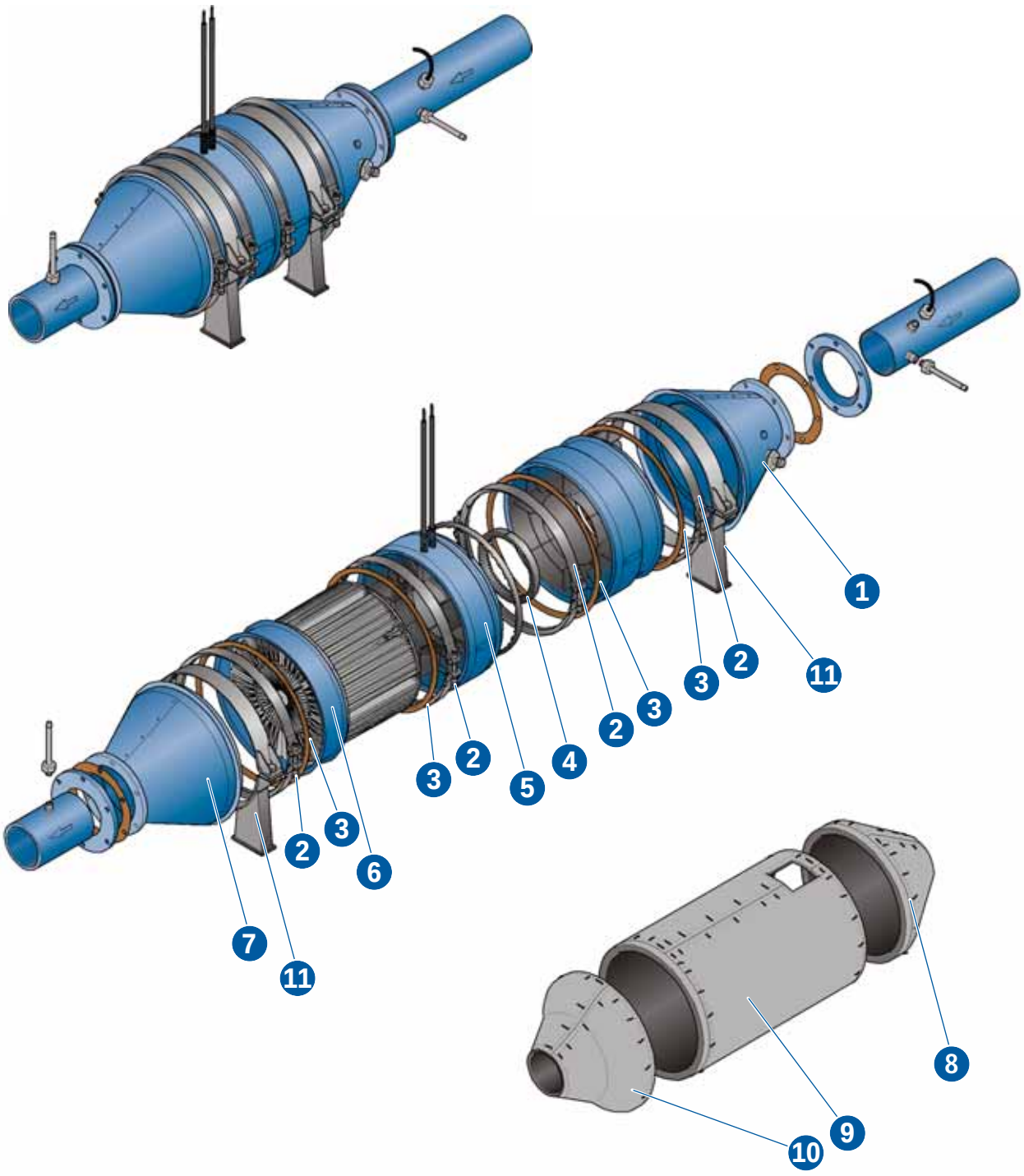
2.7 & 3.8 m² SMF®-AR filter units
Axial-Axial



1 Axial inlet taper
2 Clamp (tightening torque 15 Nm)
3 Gasket
4 Wire mesh
5 Filter unit with connection for heater
6 SMF® filter
7 Axial outlet taper
8 Axial inlet taper insulation
9 SMF® filter system insulation
10 Axial outlet taper insulation
11 2.7 & 3.8 m² system mount

Example Configurations

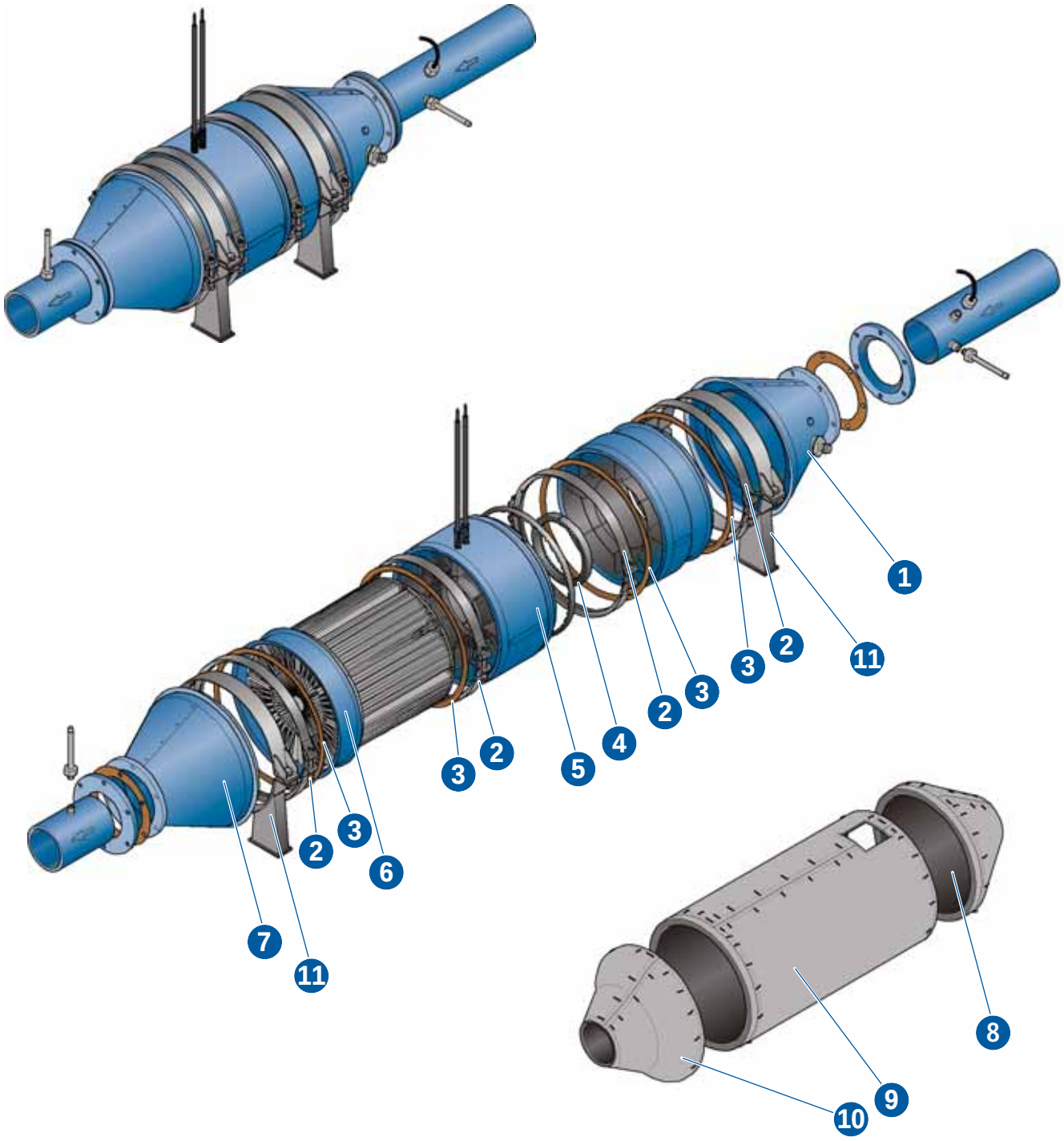
5.4 m² SMF®-AR filter unit
Axial-Axial



1 Axial inlet taper
2 Clamp
(tightening torque 15 Nm)
3 Gasket
4 Wire mesh
5 Filter unit with connection for heater
6 SMF® filter
7 Axial outlet taper
8 Axial inlet taper insulation
9 SMF® filter system insulation
10 Axial outlet taper insulation
11 5.4-m² system mount

Example Configurations

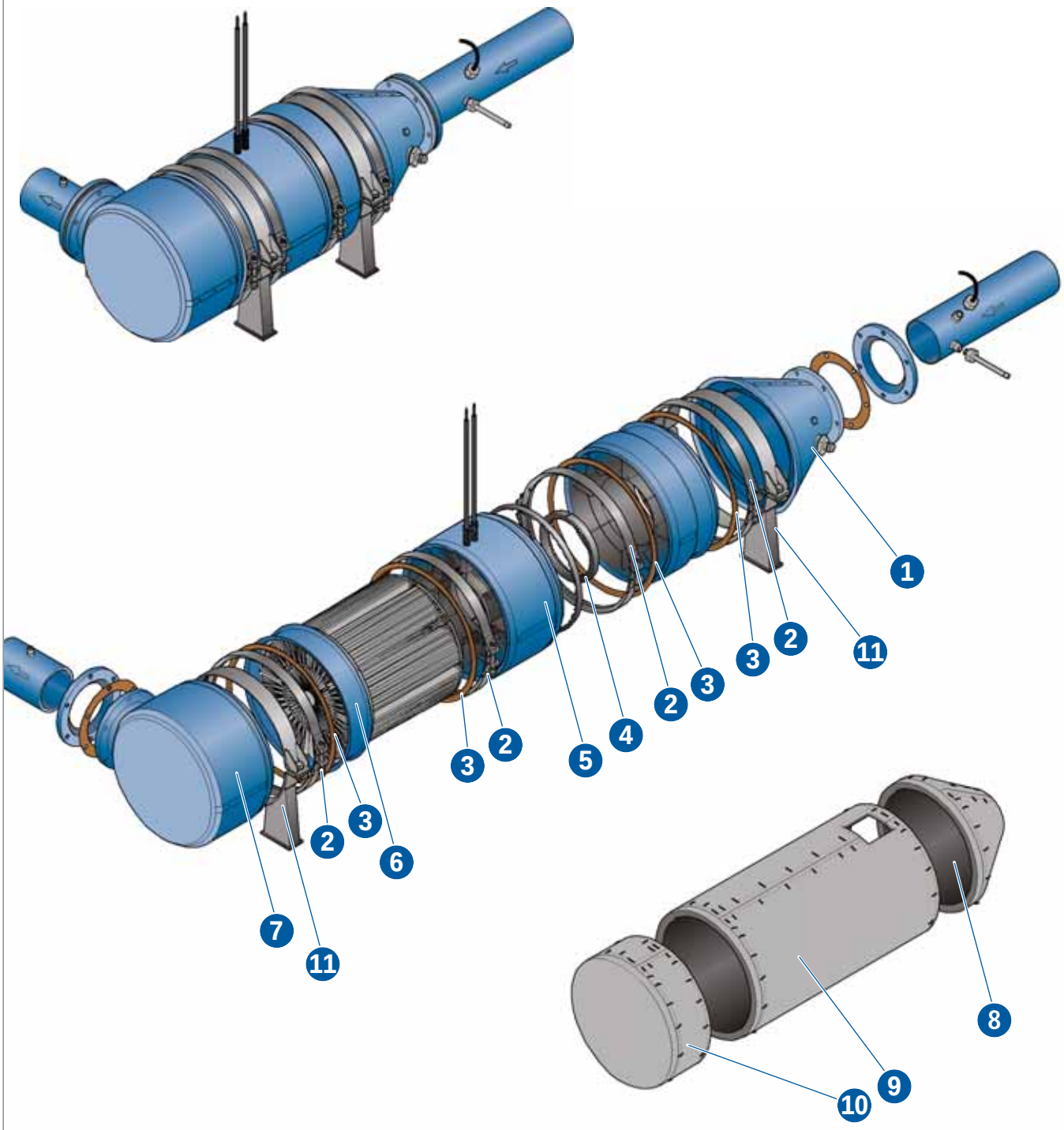
8.1 m² SMF®-AR filter unit
Axial-Axial



1 Axial inlet taper
2 Clamp (tightening torque 15 Nm)
3 Gasket
4 Wire mesh
5 Filter unit with connection for heater
6 SMF® filter
7 Axial outlet taper
8 Axial inlet taper insulation
9 SMF® filter system insulation
10 Axial outlet taper insulation
11 8.1-m² system mount

Example Configurations

8.1 m² SMF®-AR filter unit
Axial-Radial



1 Axial inlet taper
2 Clamp
(tightening torque 15 Nm)
3 Gasket
4 Wire mesh
5 Filter unit with connection for heater
6 SMF® filter
7 Axial outlet taper
8 Axial inlet taper insulation
9 SMF® filter system insulation
10 Axial outlet taper insulation
11 8.1-m² system mount

Checklist Prior to Installing the SMF®-AR System

Before you start installation work, you must first clarify all installation positions in accordance with the installation conditions!

If one or more of these criteria are not met, the SMF®-AR system cannot be installed.

The SMF®-AR system is not permitted to be installed and operated in applications that involve hazardous materials and explosion protection measures!

1. Checking system dimensioning

> Make sure the basic system dimensioning parameters are met (using the HJS Dimensioning Tool, etc.; see also table in figure on next page).

> Before you install a SMF®-AR system, make sure that the vehicle is in perfect working order in accordance with the vehicle manufacturer's specifications (oil consumption, turbocharger, engine bearings OK).

> You must be able to empty the diesel tank completely and then fill it again gradually in steps (discontinuous dosing).

> Permissible emission classes: Europe: Stage II, Stage III A or B

USA: Tiers II, III and IVi

2. Checking the engine-speed signal/alternator

> Availability of terminal W (see section entitled "Installation Guidelines – Speed Tap“) at the alternator (1).

> Alternator output >= 80 A

3. Checking the air mass flow meter / HJS EFS optional (see section "Installation Instructions Supplement – HJS EFS")

> Check the diameter of the intake section.

> The air mass flow meter (2) is required in order to be able to measure the filter load. The air mass flow meter must always be installed between the air filter and the turbocharger/intake manifold, upstream of any crankcase vent that may be present.

> Do not tap the signal of an air mass flow meter that is already installed.

> Only the air mass flow meter approved by HJS is allowed to be used!

> The air mass flow meter must be selected on the basis of the intake air mass and the measuring tube diameter (see section entitled "Installation Guidelines – Air Mass Flow Meter").

4. Checking the installation position of components/installation space dimensions

> Before you start installing the components, examine the installation conditions of the vehicle first.
The installation position must be chosen in accordance with the following component requirements:

Diesel particulate filter (see section entitled "Installation Guidelines – Diesel Particulate Filter with Differential Pressure Sensor/Temperature Sensor"):

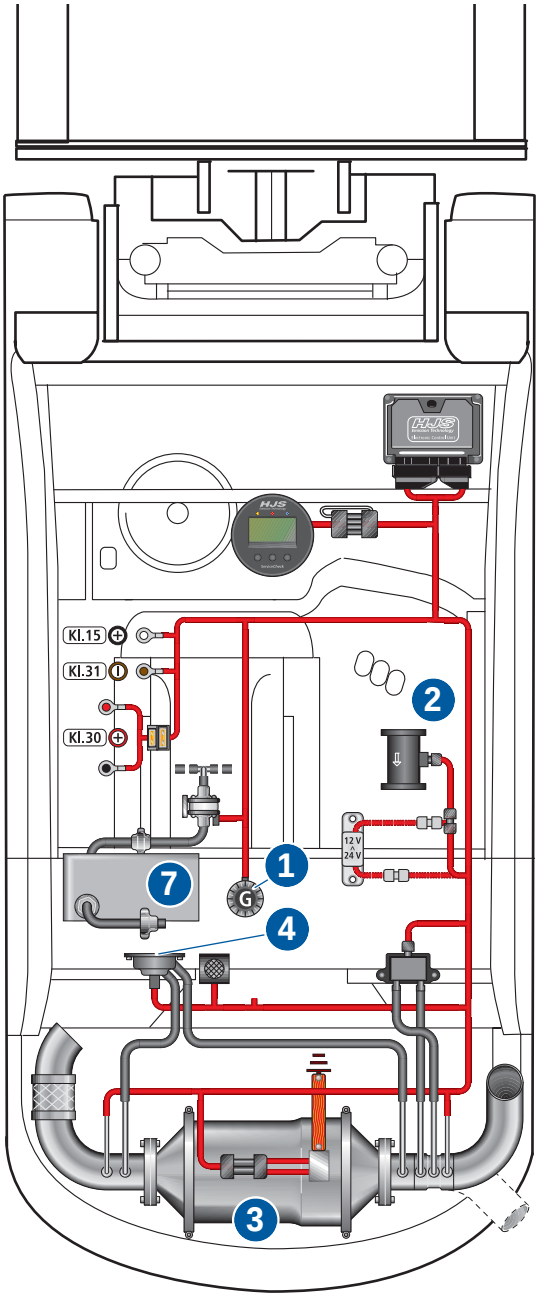
- The diesel particulate filter (3) must always be installed upstream of silencers.
- The filter is to be mounted to the vehicle frame or vehicle body by means of filter system brackets (2 pieces)
- The SMF®-AR system must always be fitted with a heat shield/contact shield. Optional insulation may also be fitted.
- Distance differential pressure sensor/temperature sensor must be installed downstream of bend in pipe or flexible tube: 2 x pipe diameter
- Distance differential pressure sensor/temperature sensor must be installed downstream of measuring points: 1 x pipe diameter

Differential pressure sensor (see section entitled "Installation Guidelines – Diesel Particulate Filter with Differential Pressure Sensor/Temperature Sensor"):

- The differential pressure sensor (4) must be installed higher than the system.
- The differential pressure hoses upstream (5) and downstream (6) of the filter unit must be run to the measuring points with a constant downward gradient and free of kinks.

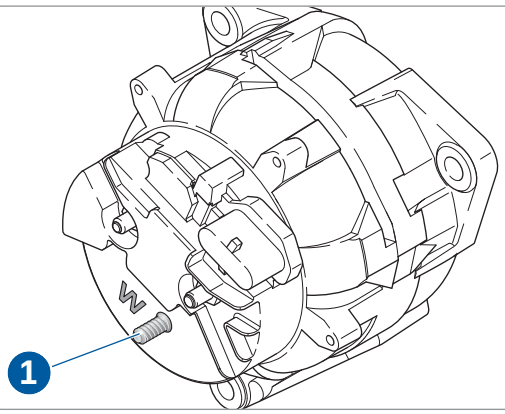
Additive tank (see section entitled "Installation Guidelines – Additive Dosing System"):

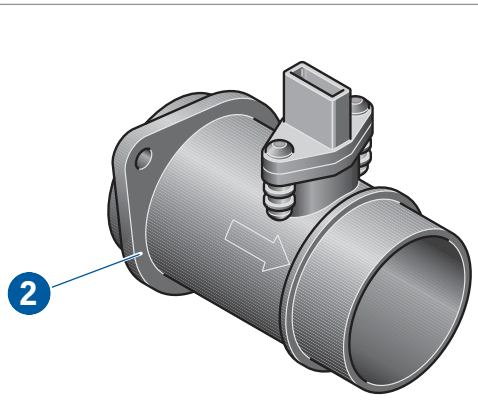
- The additive tank (7) must be installed in the engine compartment or underneath the vehicle, depending on the amount of space available.
- The additive tank must be positioned as close to the fuel return line as possible (additive connection).
- Make sure the installation position is easily accessible for maintenance purposes.
- If the vehicle is used on a daily basis, there is no relevant limitation to how long the additive will remain stable. However, the additive should be left in the vehicle tank for longer than 12 months.
- Line lengths: between the tank connection and pump = max. 300 mm (8); between the pump and T-piece = max. 50 mm (9)
- The return line can be extended up to the pump position.

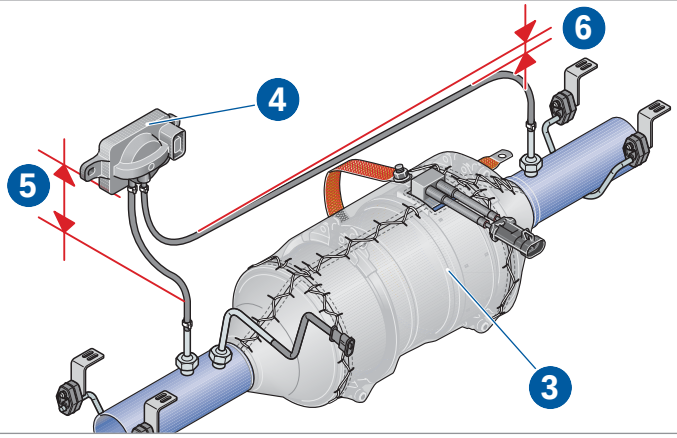


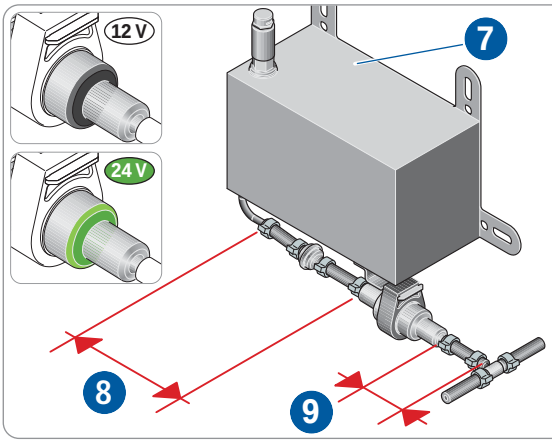
The dimensioning table is provided purely as a rough guideline. If the basic parameters differ from the above, the vehicle in question must first be examined by HJS to see if the system can be approved for installation in this vehicle.

Rated power output [KW]	On-board supply system [V]	Filter surface area [m²]	Air mass flow meter outside diameter [mm]
15-25	12	1.2	60; 70
30-45	12	1.8	60; 70; 80
50-70	12	2.7	70; 80; 86; 92
75-85	12	3.8	80; 86; 92
85-100	24	5.4	80; 86; 92
100-135	24	8.1	92









Checklist Prior to Installing the SMF®-AR System

4. Checking the installation position of components/installation space dimensions (continued)

HJS ECU (see sections entitled "Installation Guidelines –Electronics", "Cable Harness Diagram" and "Installation/Connection Instructions – Cable Harness"): ☐

- Check that the installation position of the HJS ECU matches the permissible cable lengths for the cables from the ECU to the heater and the battery.
- Signal cables in the cable harness are not permitted to be lengthened!
- The cable harness must be disconnected from the battery and be dead (no voltage) when installing and connecting the HJS ECU.

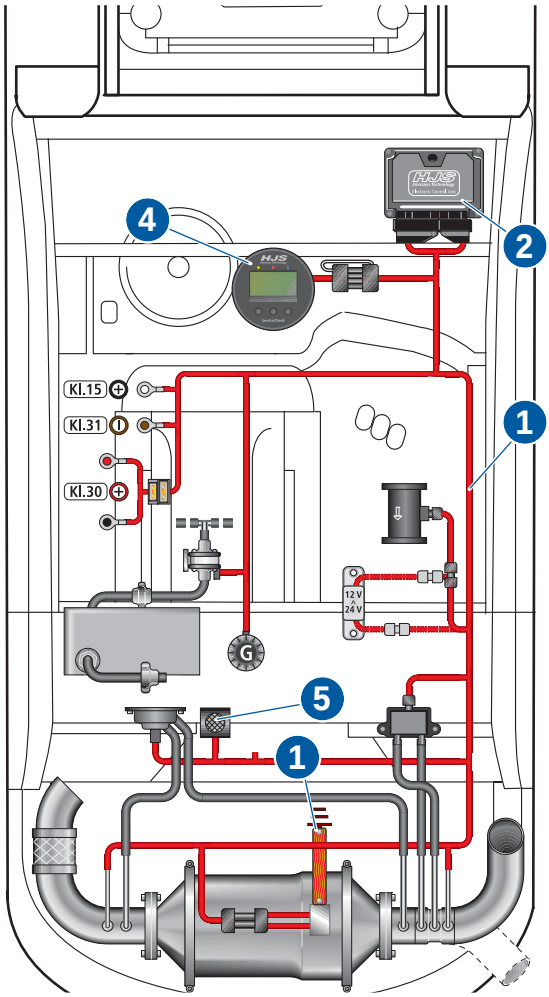
Cable harness (see sections entitled "Installation Guidelines –Electronics", "Cable Harness Diagram" and "Installation/Connection Instructions): ☐

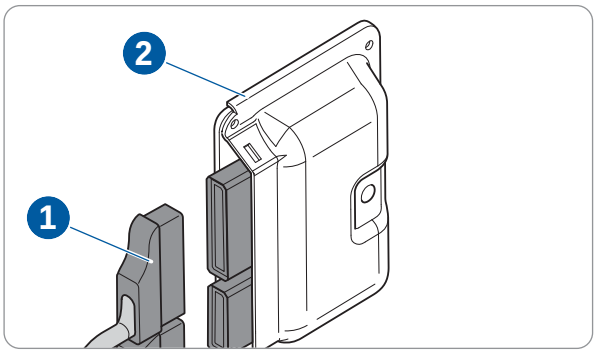
⚠ Do not mix up the connectors for terminals 30 and 31! If they are connected incorrectly, the ECU will be destroyed!

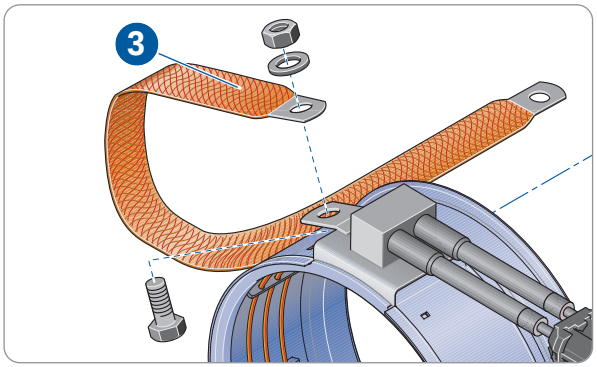
- When installing the cable harness (1), always make sure cables/leads do not rub against vehicle components.
- Insulate cables/leads when running them close to hot parts.
- Make sure you are able to connect the HJS ECU (2) to the cable harness (cable lengths/connectors).
- The cable harness must be disconnected from the battery and be dead (no voltage) when installing and connecting the HJS ECU.
- Make sure you connect the earthing strap (3) properly and securely.
- An HJS cable harness extension for connecting the heater of the SMF®-AR system is available separately.
- Only one HJS cable harness extension for connecting the heater of the SMF®-AR system is allowed to be used!

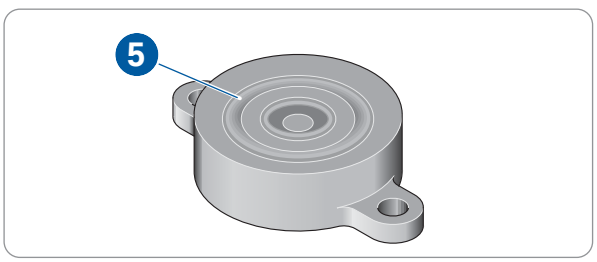
ServiceCheck (see section entitled "Installation/Connection Instructions – Cable Harness"): ☐

- Position the ServiceCheck display module (4) in the driver's field of vision.
- Position the warning buzzer (5) within earshot of the driver.

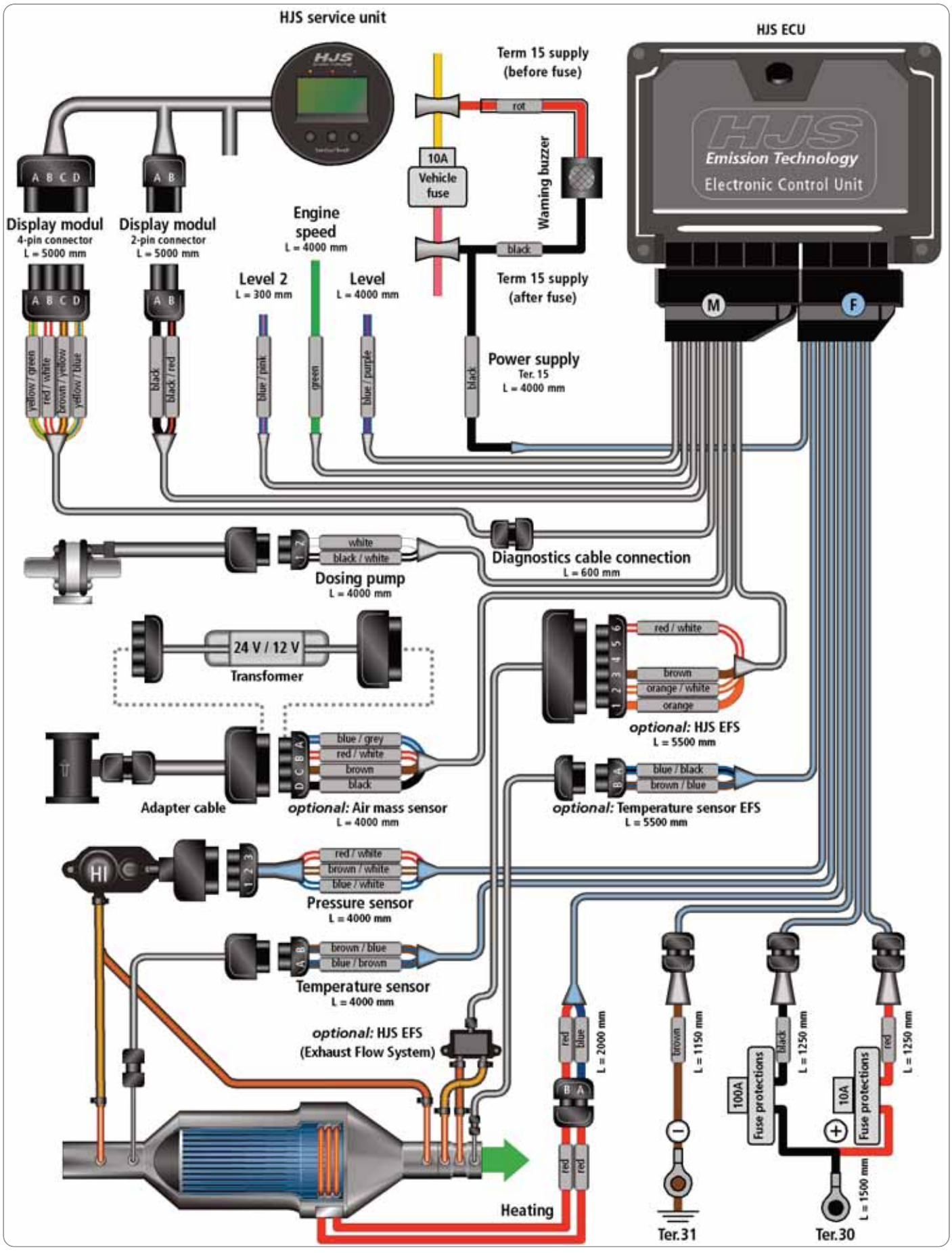








Cable lengths (ab 14 03 0479 Rev. 3)



Installation Guidelines – General Information

Before you start installation work, you must first clarify all installation positions in accordance with the installation conditions!

If one or more of these criteria are not met, the SMF®-AR system cannot be installed.

The workshop in which the installation work is to be carried out must be appropriately and well equipped. The workshop must be equipped to drain the diesel tank completely.

All work procedures must be carried out by qualified staff of a workshop.

Application and operating conditions

General information

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

> Vehicles/engines with particulate matter (PM = soot) emissions of no more than 1 g of PM per litre of fuel can be fitted with a SMF®-AR system. These emissions levels are complied with by vehicles classified as Euro II/III or higher. The actual emissions levels when the vehicle is being driven are definitive.

> Low-ash engine oils must be used.

> Exhaust-gas temperatures of 150 °C and higher are required for regeneration.

> Crucial factors to be considered when selecting the additive tank (sizes available: 2 l, 3 l and 5 l) are the amount of installation space available and the maintenance interval desired.

> Select the size of additive tank in line with the average consumption figure and annual mileage covered with the vehicle.

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

> Never mount systems on the engine-gearbox unit.

> Only fit components approved and released by the system supplier.

Fuel

The modular SMF®-AR systems are permitted to be operated only in conjunction with the following fuels:

> DIN EN 590 – Diesel (incl. 10 % biodiesel component)

> The use of biodiesel in conjunction with the additive is not approved by HJS because it can cause the fuel to decompose.

> Fuels with a high sulphur content may be approved by HJS as an option.

Engine oil

> The amount of oil consumed by the engine is not permitted to exceed the limit specified by the manufacturer.

Battery and alternator

> The vehicle's on-board supply system must be capable of supplying filter systems with a surface area of 1.2 m², 1.8 m², 2.7 m² and 3.8 m² with 1 kW of power, or systems with a surface area of 5.4 m² and 8.1 m² with 2.2 kW, over a period of 3 minutes within the space of one hour.

> HJS recommends using an alternator with an output of at least 80 A. If the vehicle is equipped with larger electrical consumers (air-conditioning system, special or high-output lighting), an alternator with a higher output rating must be used.

> The battery must be dimensioned to match the alternator, in line with the manufacturer's specifications.

The following points must also be observed:

> The SMF®-AR systems from the modular range are to be used solely to filter the exhaust emissions of diesel engines and for no other purpose.

> The manufacturer shall accept no liability if the product is not used in the manner intended.

> SMF®-AR systems are not explosion-proof.

> SMF®-AR systems are not permitted to be installed and operated in applications that involve hazardous materials and explosion protection measures!

> Please check that you have the correct version of SMF®-AR system for installation in the vehicle in question.

> Please read these Installation Guidelines carefully before installing and putting the SMF®-AR system into service. Adapt the sequence of installation procedures to the actual conditions prevailing in the vehicle.

> Always use the installation materials supplied with the filter.

> The SMF®-AR system must be installed by qualified workshop staff.

> The workshop must be equipped to completely drain the diesel tank and all associated components. It must also be equipped to store diesel fuel safely and to fill the diesel tank gradually in steps.

> The general accident prevention regulations and generally recognised rules pertaining to safety and occupational health are to be complied with at all times.

Exhaust system very hot! Do not touch!

> Make sure the system is installed free from strain and that the connection to the existing exhaust system is secure and gas-tight.

> Make sure that all cables are free of kinks, will not rub against other parts, and have been run so they are protected against overheating.

> Fix all cables, leads and hoses securely and free from strain using cable ties every 10 to 15 cm.

> Make sure there is adequate clearance from the vehicle body and other components.

> Despite being insulated, certain parts of the system's outer surface may still become hot. Fitters must make sure that adjacent and close-by components cannot become damaged as a result of this.

> Complete the enclosed installation certificate in full and return it to HJS.

Installation Guidelines – Speed Tap

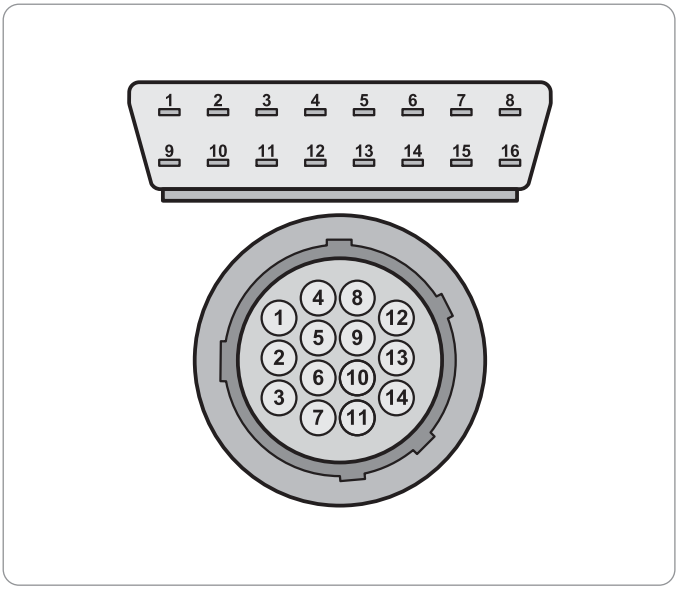
Checking the speed tap connection

The SMF®-AR system requires an engine-speed signal. This signal can be tapped by means of a number of different methods. One method is to tap the signal via the vehicle's diagnostics socket. With the engine running, the pin assignments can be checked as follows:

Check using an oscilloscope: After starting the engine, use an oscilloscope to check there is a frequency signal (square-wave signal with an amplitude of min. 10 V) at the individual pins of the diagnostics connector.

Check using a multimeter: After starting the engine, set a multimeter to test voltages and test the individual pins of the diagnostics connection to ground. The voltage reading should be between 5 and 9 V for 12-V systems (between 10 and 17 V for 24-V systems). The voltage must drop to 0 V when the engine is switched off.

> When installing later, the engine-speed signal tapped from the diagnostics socket is connected to the engine-speed connector of the HJS cable harness (see also section entitled "Cable Harness Diagram").



Alternative method of tapping speed signal via vehicle's alternator

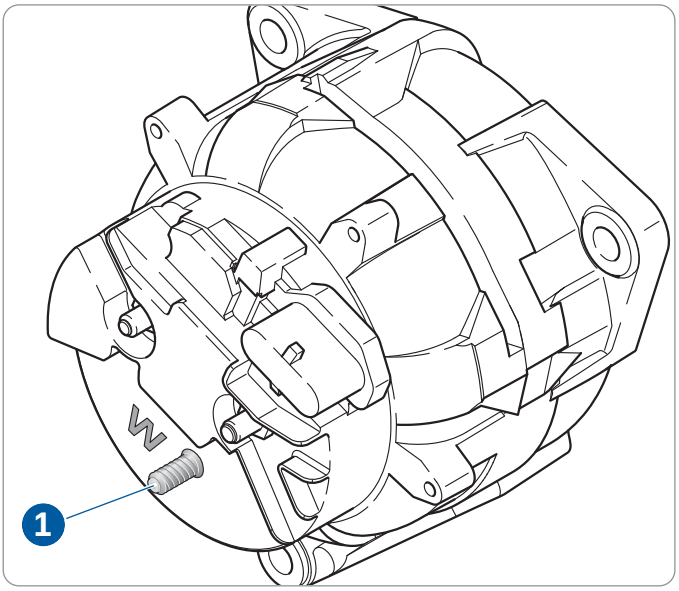
> The alternator must have a rating of at least 80 A.

> Make sure that terminal W (1) is available at the alternator so that you can make the speed tap connection to the HJS cable harness when installing later (see also section entitled "Cable Harness Diagram").

> Square-wave signal, minimum voltage:

10 V (with multimeter set to RMS: 5 – 9 V) for 12-V systems

10 / 20 V (with multimeter set to RMS: 10 – 17 V) for 24-V systems



Alternative method with alternator with no terminal W

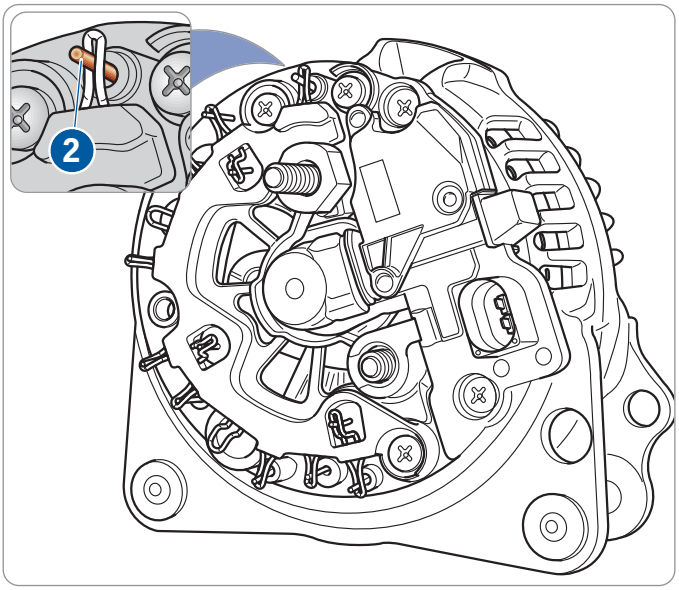
Three output terminals of the alternator winding are located at the rear of the alternator. How to find the engine-speed signal:

> Remove the cover of the alternator.

> Attach all electric connections and start the engine.

> Connect a multimeter to any of the winding (2) terminals and to ground.

> Once you have found the speed signal, fabricate a cable connection and connect the HJS cable harness to this connection (see also section entitled "Cable Harness Diagram").



Make sure the connection functions reliably and is safe!

Installation Guidelines –
Diesel Particulate Filter with Differential Pressure Sensor/Temperature Sensor

Checking the vehicle and installation components

> Before you install a SMF®-AR system, make sure that the vehicle is in perfect working order in accordance with the vehicle manufacturer's specifications.

> Before you start installing the components, examine the installation conditions of the vehicle first. The installation position must be chosen in accordance with the requirements of the system's components.

Further information on the design and dimensions of the system can be found in the HJS product catalogue.

Installation position of the filter system

> The filter system can replace the OE silencer. Alternatively, the particulate filter system can be installed at a different position in the exhaust system, but you must make sure that there is sufficient clearance between the filter and other components. The filter unit can be installed horizontally or vertically, that is, upright or hanging.

> Choose the installation position of the differential pressure sensor such that the sensor itself is higher than the pressure measuring point and the pressure hose can be run to the measuring point with a downward gradient. To prevent condensation from forming in the pressure sensor, the pressure connection must point vertically downwards.

> The heater connection cable from the HJS ECU to the filter housing must be no longer than 4 m.

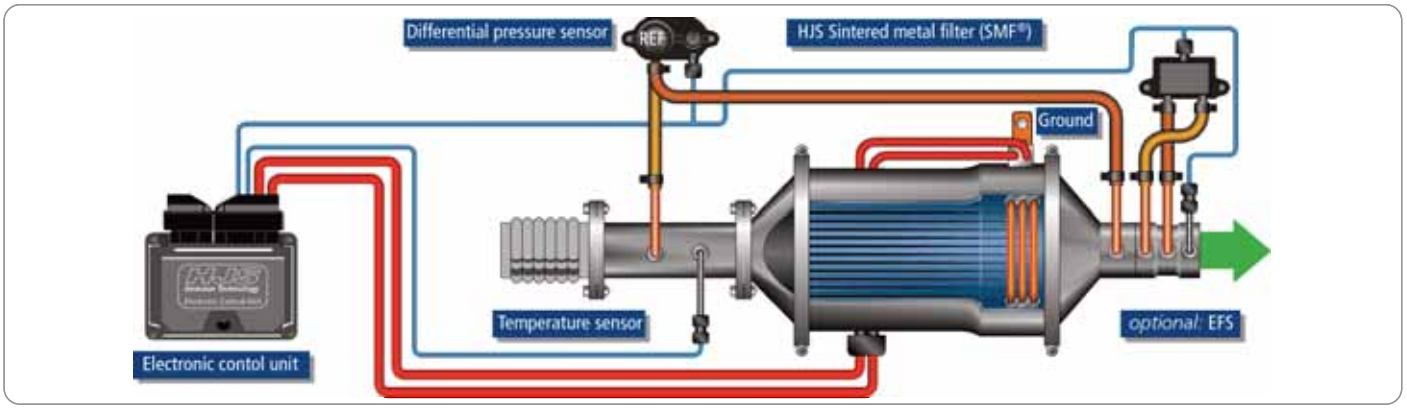
> The hoses to the differential pressure sensor must be no longer than 1.5 m.

> The earthing strap must be connected to the filter system.

> Use additional brackets to mount the filter system and take these into account when selecting the installation position (see also section entitled "Installation Guidelines – Mounting Diesel Particulate Filter).

> Always install a heat and contact shield.

The filter system must be insulated.



Installing a SMF-AR® system

> The sintered metal filter is installed in the vehicle as an additional component. Make sure that the filter is isolated from the rest of the vehicle with regard to vibration by installing a flexible tube between the engine and the filter.

> If it is not possible to integrate the filter into the exhaust system because of a lack of space, the system can replace the OE silencer as long as the permitted noise emission levels are complied with. In case of doubt, the noise emissions should be measured before and after installation of the system.

> HJS does not recommend installing a DPF® downstream of the silencer. Complaints about clogging of the filter that can be traced back to rust or fibres from the silencer ingressing into the filter will not be accepted by HJS.

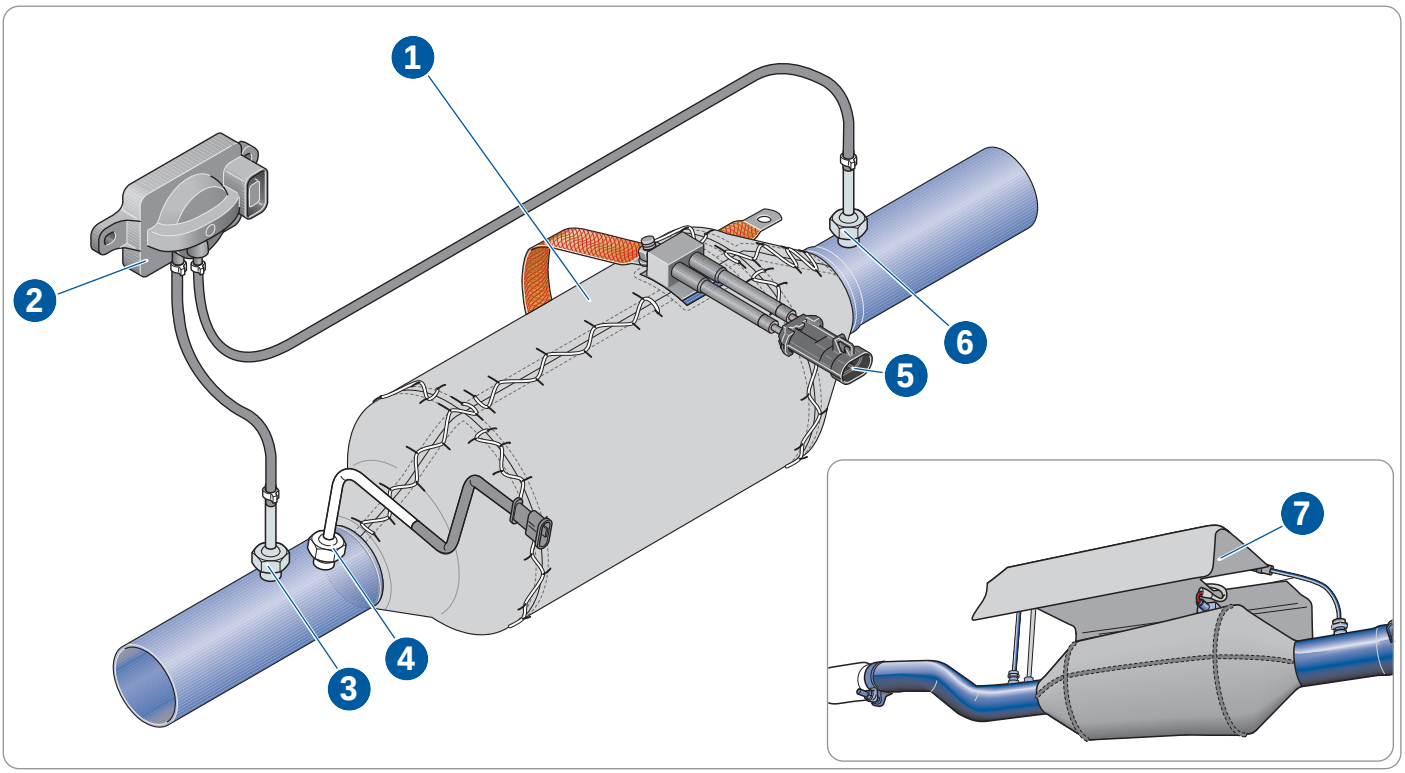
> The installation position must be chosen such that no deposits of combustible materials can build up in the area of the filter/insulation (e.g., grass, etc.).

> Make sure that the sensors are installed correctly into a measuring section upstream of the filter.

> The filter and sensors (differential pressure sensor, temperature sensor) connected must be protected against environmental influences.

> The exhaust-gas temperatures during the regeneration process (> 650 °C) and the surface temperatures of the filter (> 800 °C) must be taken into consideration when choosing the installation position. This also applies to pipework downstream of the filter.

Diesel Particulate Filter with Differential Pressure Sensor/Temperature Sensor



1 SMF®-AR filter system with insulation
2 Differential pressure sensor
3 Pressure measuring point upstream of filter
4 Temperature sensor
5 Heater connector
6 Pressure measuring point downstream of filter
7 Heat shield (installation example)

Checking the installation conditions

> The engine-gearbox unit must be isolated from the supporting frame by a suitable isolating element. The condition of the engine must be checked before the exhaust-gas aftertreatment system is installed. Worn or aged engine mounts must be replaced, because otherwise impermissible vibrations may be transmitted to the exhaust system.
> A flexible corrugated hose is installed between the engine and the filter, which acts as a non-load-bearing isolating element. See the section entitled "**Pipework and isolating**" for information on selecting the corrugated hoses.
> Always ensure an adequate minimum clearance from low-melting, combustible or medium-carrying components. During operation, the filter can over short periods reach surface temperatures higher than the temperature of the exhaust gases. In case of doubt, adequate thermal insulation must be provided for the exhaust-gas aftertreatment system or endangered components.
> No other components may be mounted to the exhaust system that have not been approved by HJS for this purpose.
> Observe the instructions given in the section entitled "Installation positions of the pressure sensor/temperature sensor measuring points".
> Care should be taken to ensure that water cannot ingress into the exhaust system via the tailpipe.

The SMF®-AR system is not permitted to be installed and operated in applications that involve hazardous materials and explosion protection measures!

Pipework and isolating

Every SMF®-AR system must be installed isolated from the engine and the exhaust system.

> The inside diameter of the corrugated hose must be the same as the pipe diameter of the exhaust system. Deviations of up to 5 % are permissible.
> The length of the corrugated hose must be at least 2.5 times its diameter.
> "Self-supporting" corrugated hoses – that can transmit static forces – must not be used owing to their poor isolating characteristics.
> Wound metal hoses are not permitted to be used owing to the fact that they tend to harden during operation.

Manufacturer	Type
Witzenmann	Hydra universal expansion joint for low pressure (exhaust gas), stainless steel
BOA	Exhaust-gas thermal compensator
Senior Flexonics	Bellows-shaped products

Diesel Particulate Filter with Differential Pressure Sensor/Temperature Sensor

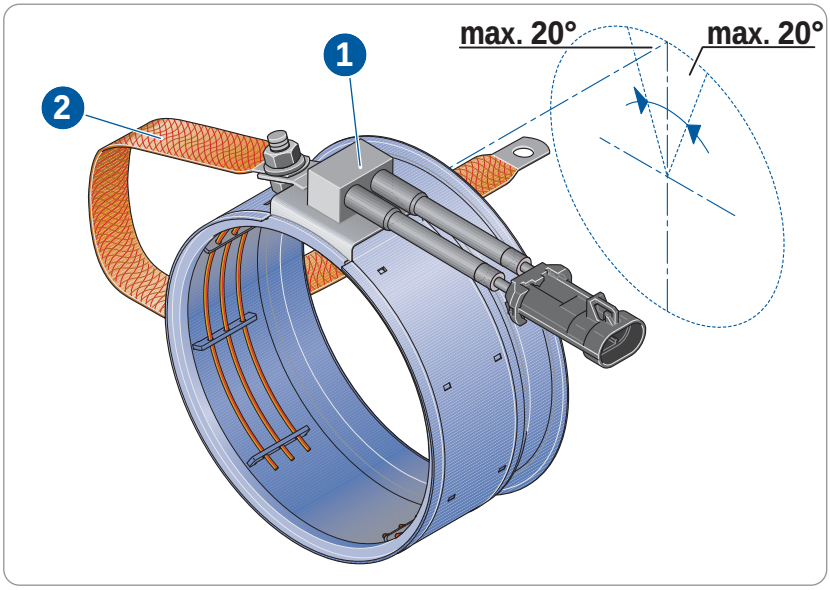
Installation position of the SMF®-AR system

Positioning the heater connector

> To prevent the heating elements from being damaged by falling soot/ash particles, select the installation position of the SMF®-AR filter system in accordance with the illustration. The heater connector (1) can be used as a reference point for positioning the components.

> Connect the earthing strap supplied (2) between the filter housing and a ground point on the vehicle chassis. The resistance between the filter housing and chassis must be no higher than 0.0 ohms.

Make sure you install the cables without any kinks: The heater cable and HJS heater extension lead must not be installed in loops.



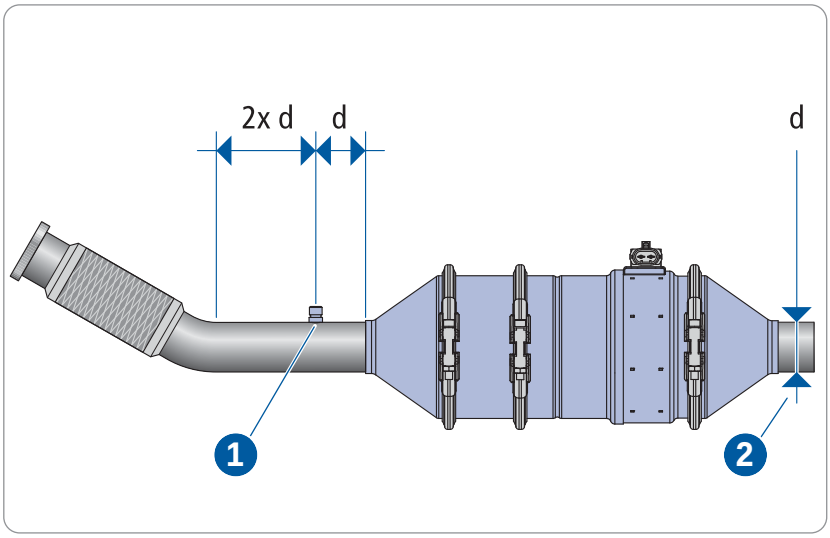
Installation positions of the pressure sensor/ temperature sensor measuring points

> To install the pressure and temperature sensors, install two weld-in sleeves in the pipework section upstream of the filter system and another weld-in sleeve downstream of the system. When doing so, make sure that you leave a stretch of pipe upstream of the filter in which the exhaust-gas flow is 'calm'.

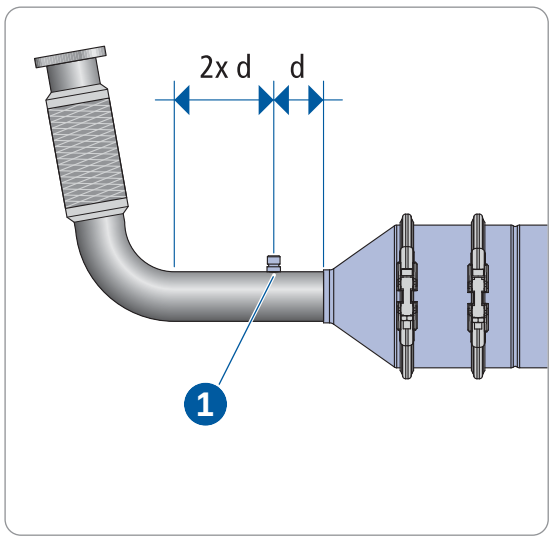
> The connections must be installed in a straight section of pipe, immediately upstream of the inlet taper of the system.

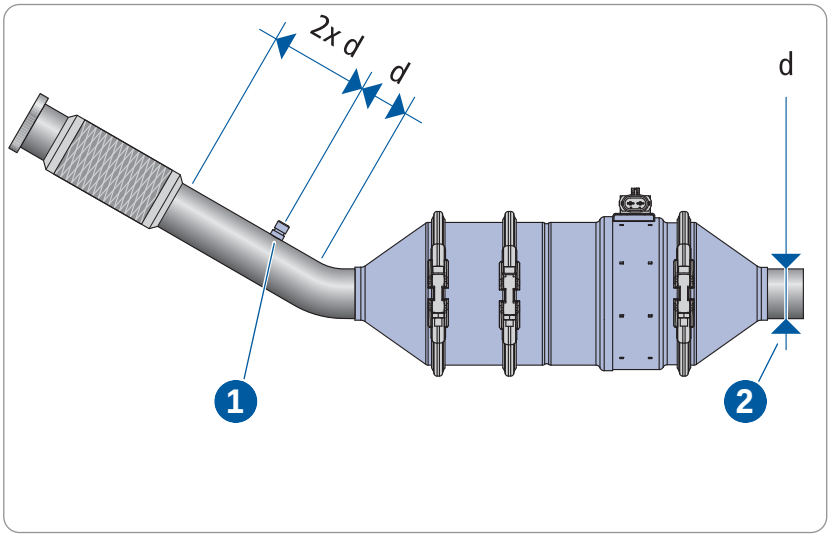
> In the event of interference caused by pipe bends tighter than 90°, the distance between the measuring point and the pipe bend must be at least twice (2x) the pipe diameter and the distance to the next interference downstream at least 1x the pipe diameter (for an exact description, see graphics below).

> Mount the pressure sensor and temperature sensor connections an adequate distance from bends.



1 Positions of pressure measuring point and temperature sensor 2 Pipe diameter d



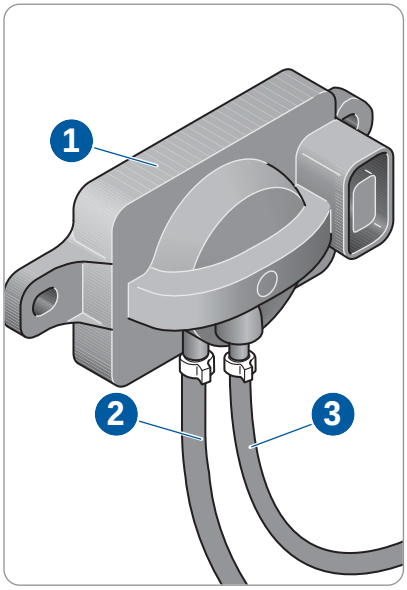


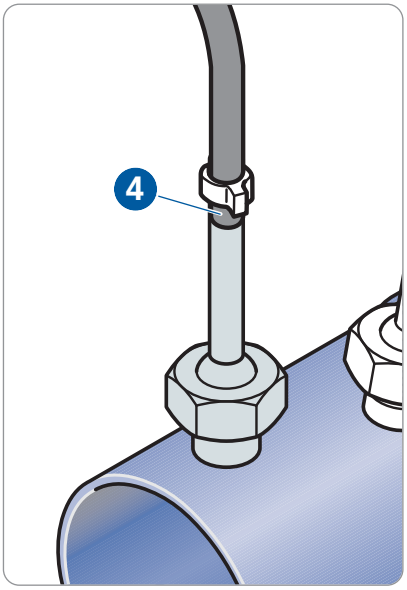
Diesel Particulate Filter with Differential Pressure Sensor/Temperature Sensor

Checking the differential-pressure/ temperature sensors

Differential pressure sensor

> The differential pressure sensor (1) has two connections that must be connected as follows:
Hi – Ø 8 mm connection (2) upstream of filter (7)
Ref – Ø 6 mm connection (3) downstream of filter (8)
> If no other components are installed downstream of the filter in the exhaust system, the Ref connection can be left unassigned and just the Hi connection upstream of the filter connected.
> Only ever use the hose supplied by HJS.
> Connect the hoses to the ends of the pressure sampling probes (4). (Do not push the hoses a long way down the pipes towards the nuts, because they get very hot.)
> The pipes and hoses must be cleaned as part of the maintenance work (see Maintenance Manual).

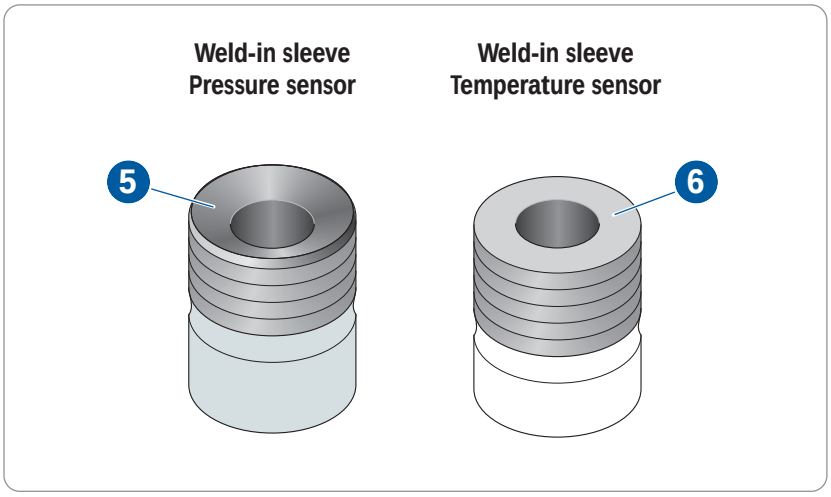


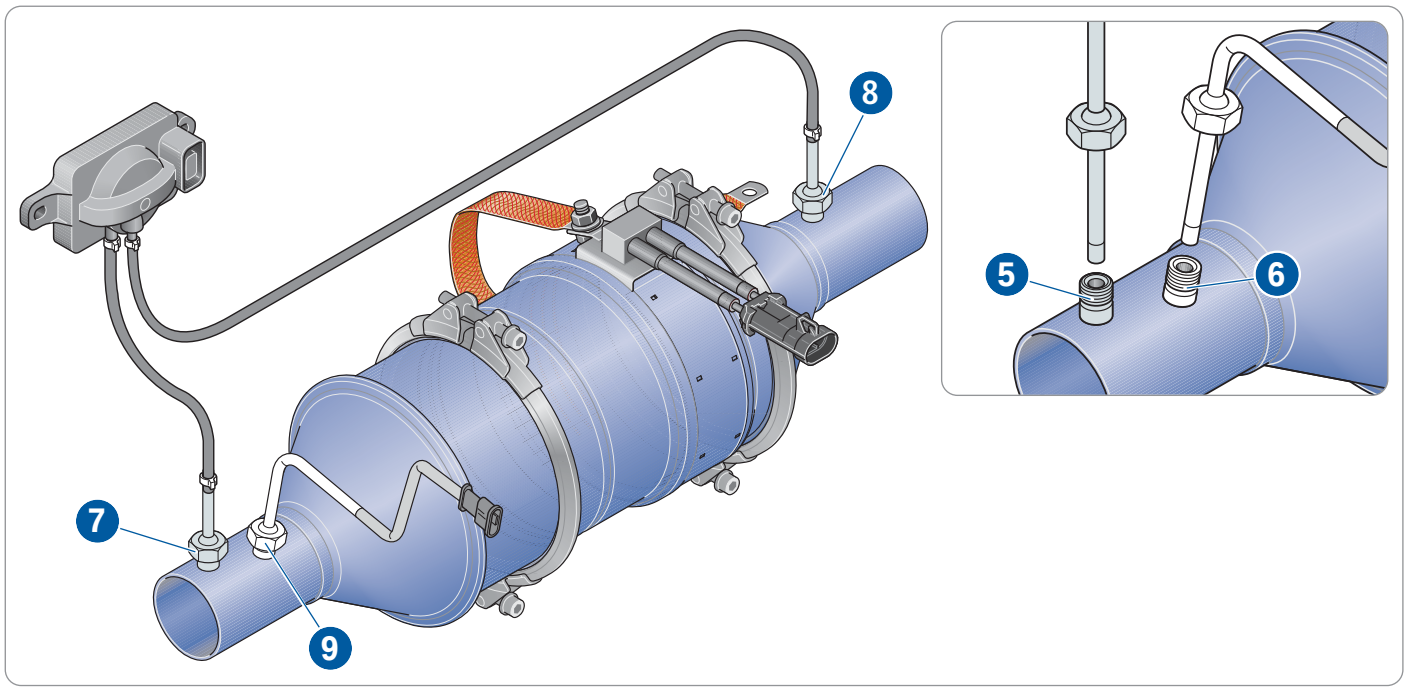


Do not mix up the weld-in sleeves for the pressure sensor (5) and temperature sensor (6)!

PT-200 temperature sensor

> The temperature sensor (9) measures the exhaust-gas temperature upstream of the particulate filter. The sensor is installed in the exhaust pipe upstream of the filter system.
> Tightening torque: 35 Nm
Operating temperature: -40 °C to 800 °C
> Do not bend or snap off the temperature sensor.





Installation Guidelines – Electronics

Checking installation of the electronics

> Every set of dimensions selected for a SMF®-AR system must always be checked using the HJS Dimensioning Tool.

SMF®-AR system	On-board supply system
1.2 m²	12 V
1.8 m²	12 V
2.7 m²	12 V
3.8 m²	12 V
5.4 m²	24 V
8.1 m²	24 V

> Position the ServiceCheck display module in the driver's field of vision. Install the warning buzzer within earshot of the driver.

Extension leads with a signal amplifier can be ordered through HJS.

> You may shorten cables/leads as long as you use crimp/shrink connectors.

Cables for sensors are not permitted to be lengthened!

> Make sure that all cables are free of kinks, will not rub against other parts, and have been run so they are protected against overheating.

Before you start work, disconnect the negative pole of the battery!

Do not mix up the connectors for terminals 30 and 31! If they are connected incorrectly, the ECU will be destroyed!

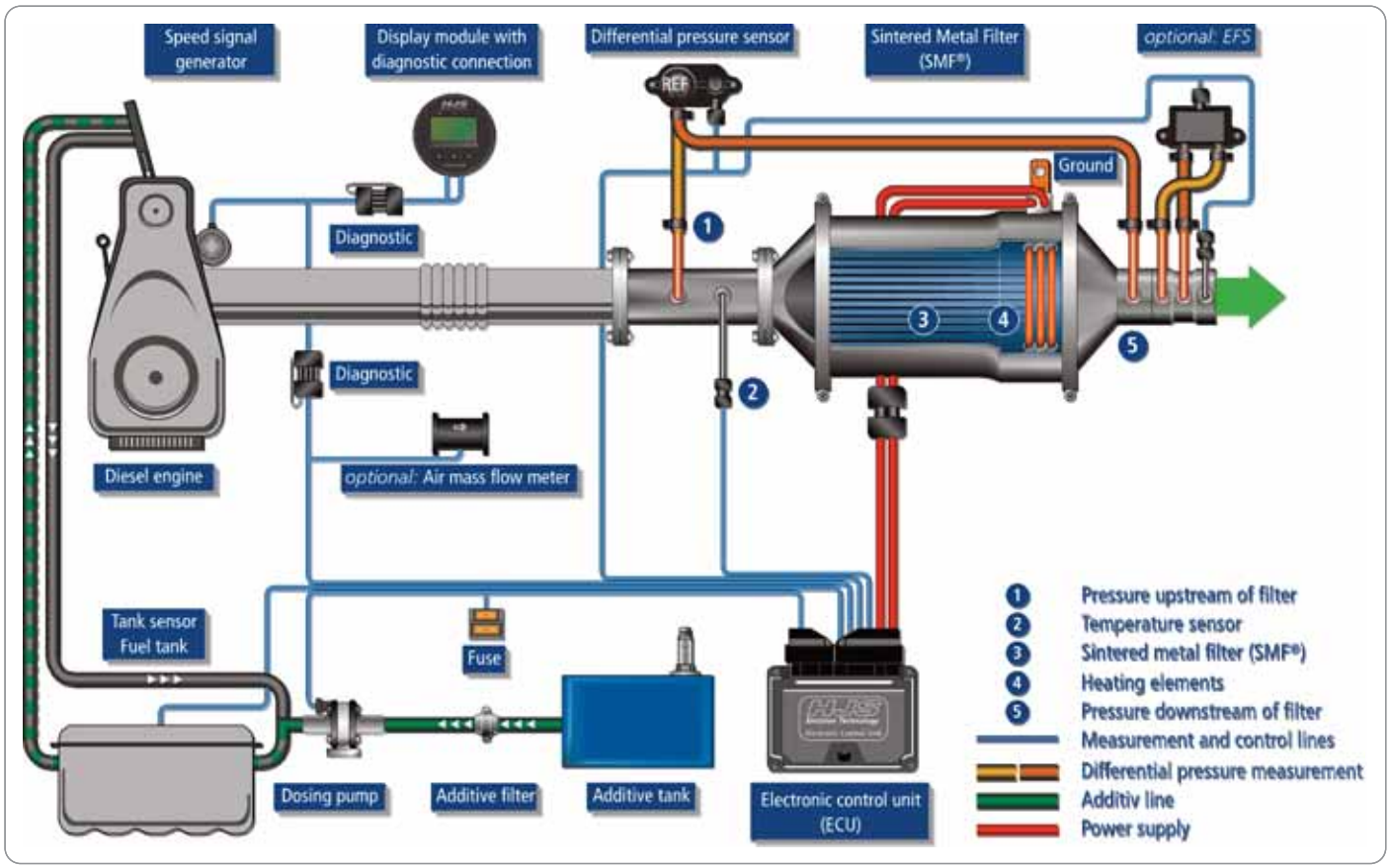
> Fix all cables/leads securely and free from strain using cable ties every 10 to 15 cm.

> The power lead for the filter system heater may only be lengthened using an HJS extension lead.

> HJS extension leads can be ordered separately (available lengths: 1, 2 or 3 m).

> When connecting the HJS system to the power supply, make sure that the HJS ECU continues to be supplied with power for a further 2 minutes after the engine has been switched off. Take account of battery disconnectors if fitted.

The driver/operator must be instructed to monitor the display of the ServiceCheck display module regularly. Excess temperature or pressure levels can cause serious damage to the system and/or vehicle.



Installation Guidelines – Air Mass Flow Meter

Preliminary dimensioning of the air mass flow meter

The dimensioning table is provided purely as a rough guideline.

Rated power [KW]	On-board supply system [V]	Filter surface [m²]	Air mass flow meter outside diameter [mm]
15 - 25	12	1.2	60, 70
30 - 45	12	1.8	60, 70, 80
50 - 70	12	2.7	70, 80, 86, 92
75 - 85	12	3.8	80, 86, 92
85 - 100	24	5.4	80, 86, 92
100 - 135	24	8.1	92

In the case of 24-V systems, always use the transformer supplied by HJS when connecting the air mass flow meter!

Checking the air mass flow meter

The air mass flow meter is required in order to be able to measure the filter load. The air mass flow meter must always be installed between the air filter and the turbocharger/intake manifold, upstream of any engine vent that may be present.

> You are not permitted to tap the signal of an air mass flow meter already installed in the vehicle.

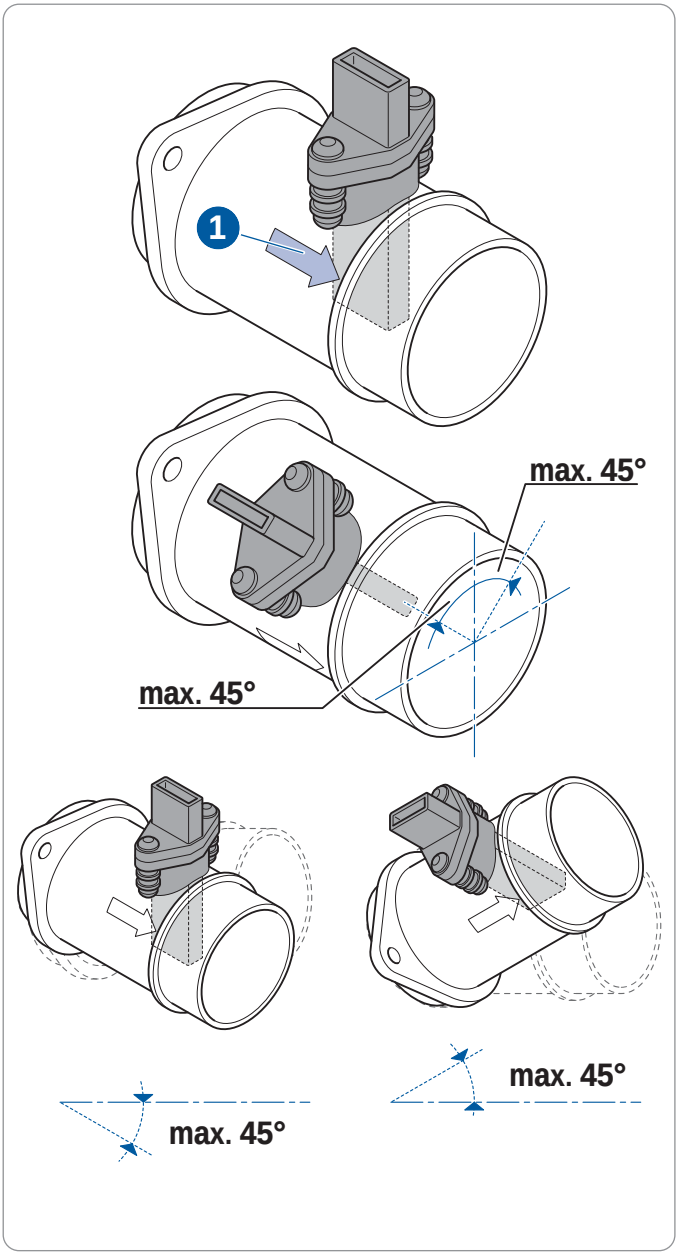
Only the air mass flow meter approved by HJS is allowed to be used!

> The air mass flow meter must be selected on the basis of the intake air mass and the measuring tube diameter.

> Pay attention to the flow direction (1) of the air mass flow meter to make sure you install it the right way round.

> The air mass flow meter must be installed in a horizontal position so that its electrical connection stands upright. Make sure the installation position is correct, as shown in the illustration.

> Install the air mass flow meter in the intake duct between the air filter and the engine. In vehicles fitted with a turbocharger, install the air mass flow meter (MAF) between the air filter and the turbocharger.



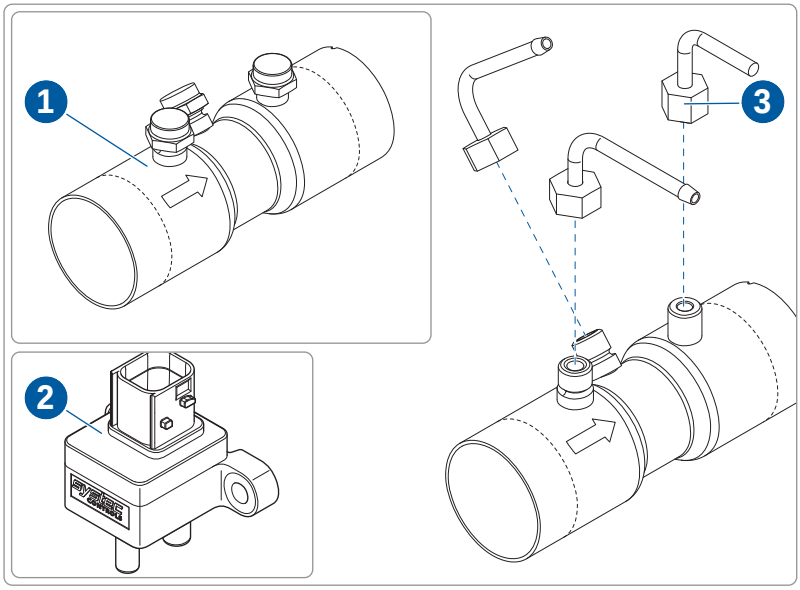
HJS Order no.	Order no. of MAF	ID of MAF*	OD of MAF**	Min. mass flow rate [kg/h]	Max. mass flow rate [kg/h]	Engine power [KW]
93 02 0133	0 280 218 119	50	60	65	430	10 – 70
93 02 4404	0 281 002 216	60	70	50	580	10 – 95
93 02 0132	0 280 218 113	62	70	105	540	15 – 90
93 02 0130	0 280 218 087	71	80	170	795	25 – 135
93 02 0131	0 280 218 089	78	86	230	860	35 – 145
93 02 0134	0 281 002 421	82	92	250	1140	40 – 195

* Inside diameter of air mass flow meter ** Outer diameter of air mass flow meter

Installation Instructions Supplement – HJS EFS

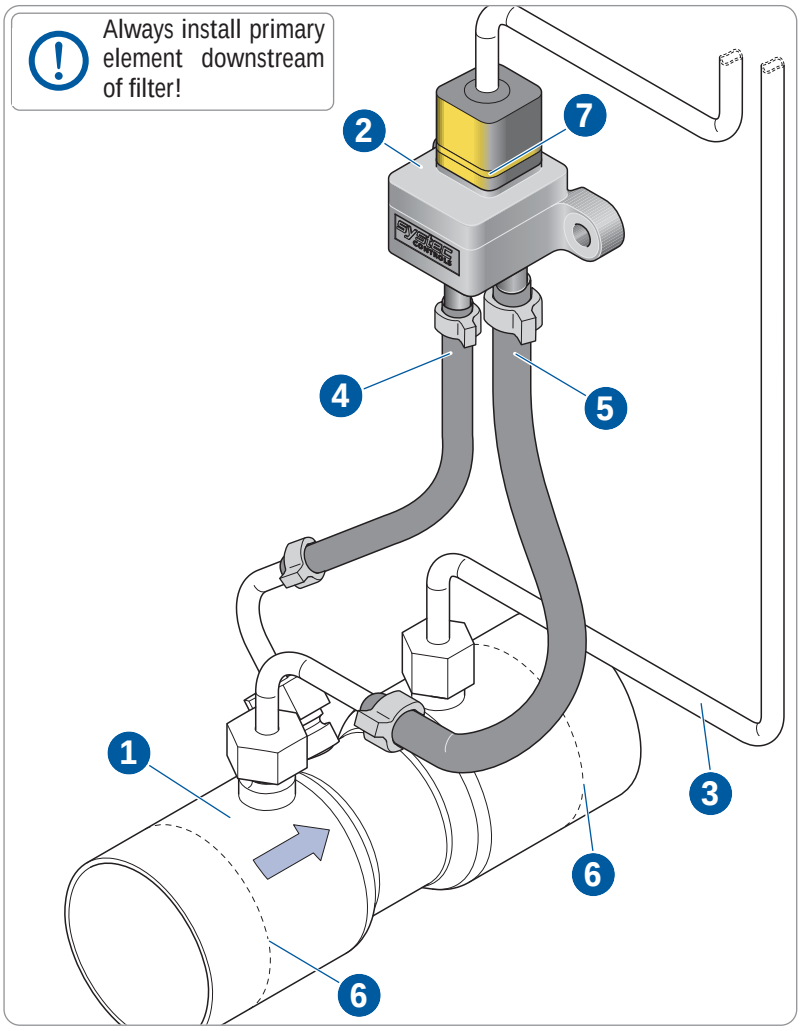
Technical description

The HJS EFS (Exhaust Flow Sensor) uses the pressure difference in a Venturi nozzle to measure the exhaust-gas volumetric flow or mass flow that flows through this nozzle. The Venturi nozzle is designated as the primary element (1). The pressure sensor, which is designated as the secondary element (2), communicates with the ECU via the CAN bus. With the aid of a temperature sensor (3), the exhaust-gas volumetric flow is converted to a mass flow.



Installing the primary element

The primary element is available in different diameters and must be installed in the exhaust line downstream of the filter. When installing the primary element, make sure you observe the direction of flow, which is marked by an arrow on the primary element. The diameter must be selected based on the circumstances of the installation position. Any transition in the diameter of the exhaust pipework leading to the primary element must be continuous. Matching primary elements are available for the outlet tapers supplied by HJS. The pressure measurement connections "L" (4) and "H" (5) must be positioned such that any condensation that forms in the pressure hose can flow back into the Venturi nozzle. A straight section of pipe at least as long as the diameter of the exhaust pipe must be left upstream and downstream of the sensor to allow the flow to calm down. At the very most, the primary element may be shortened up the marking (6) and no further. Before you install, note down the k-value embossed on the sensor because you will have to enter it in the diagnostics software at a later point.



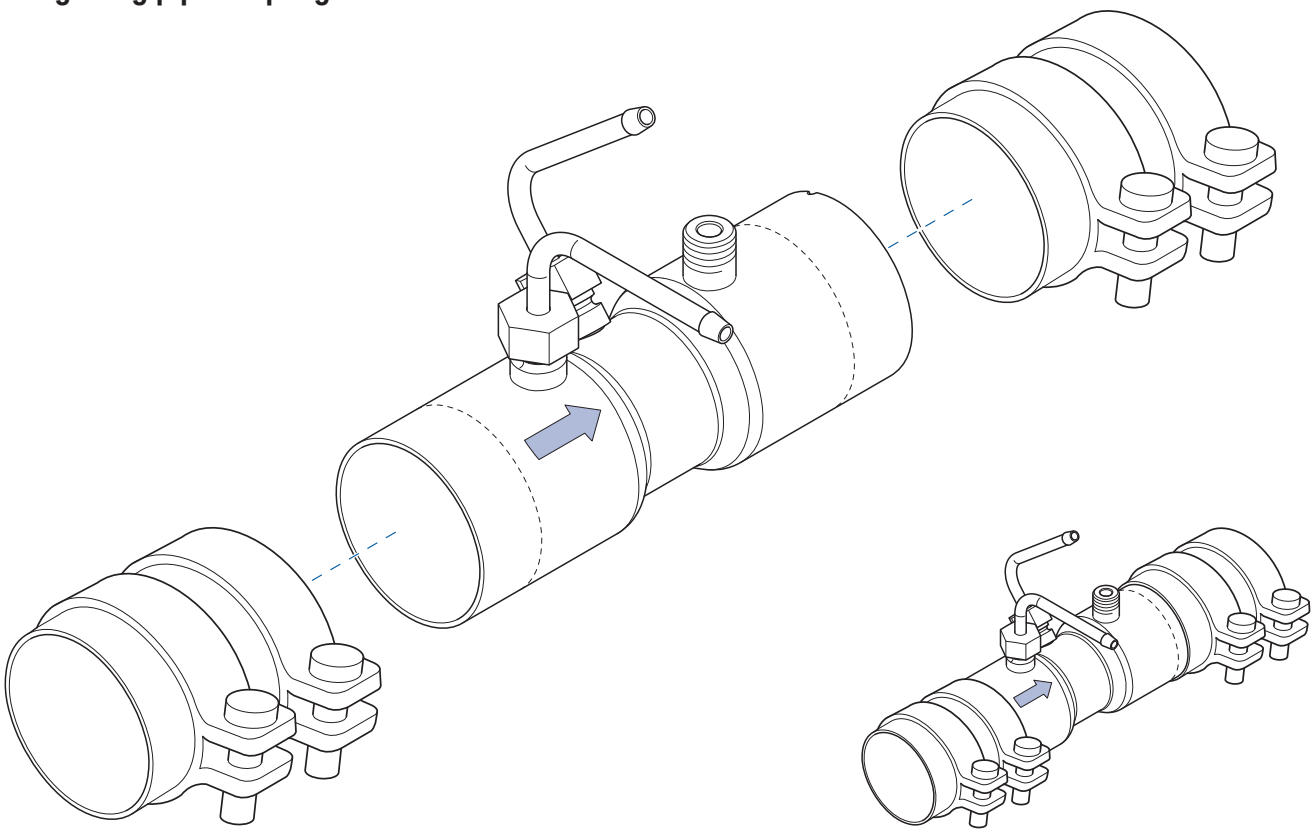
Installing the secondary element

The secondary element must always be installed with the measurement connections pointing downwards in order to allow condensation to flow off. Secure the pressure sensor to a vertical wall with the aid of two M6 bolts. Tightened the bolts to 15 Nm. After pushing on the connector, lock it in position by completely sliding in the yellow slide (7). Secure the cable connected to the connector somewhere close to the sensor in such a way that no strain caused by the cable acts on the sensor. Likewise, secure the measuring hoses upstream of the sensor so that no strain or force of any kind can be transferred to the sensor. Align the hose clamps that must be used to secure the hoses to the sensor such that the clamps sit at the side of the hose in order avoid a collision with the surface to which the sensor is bolted.

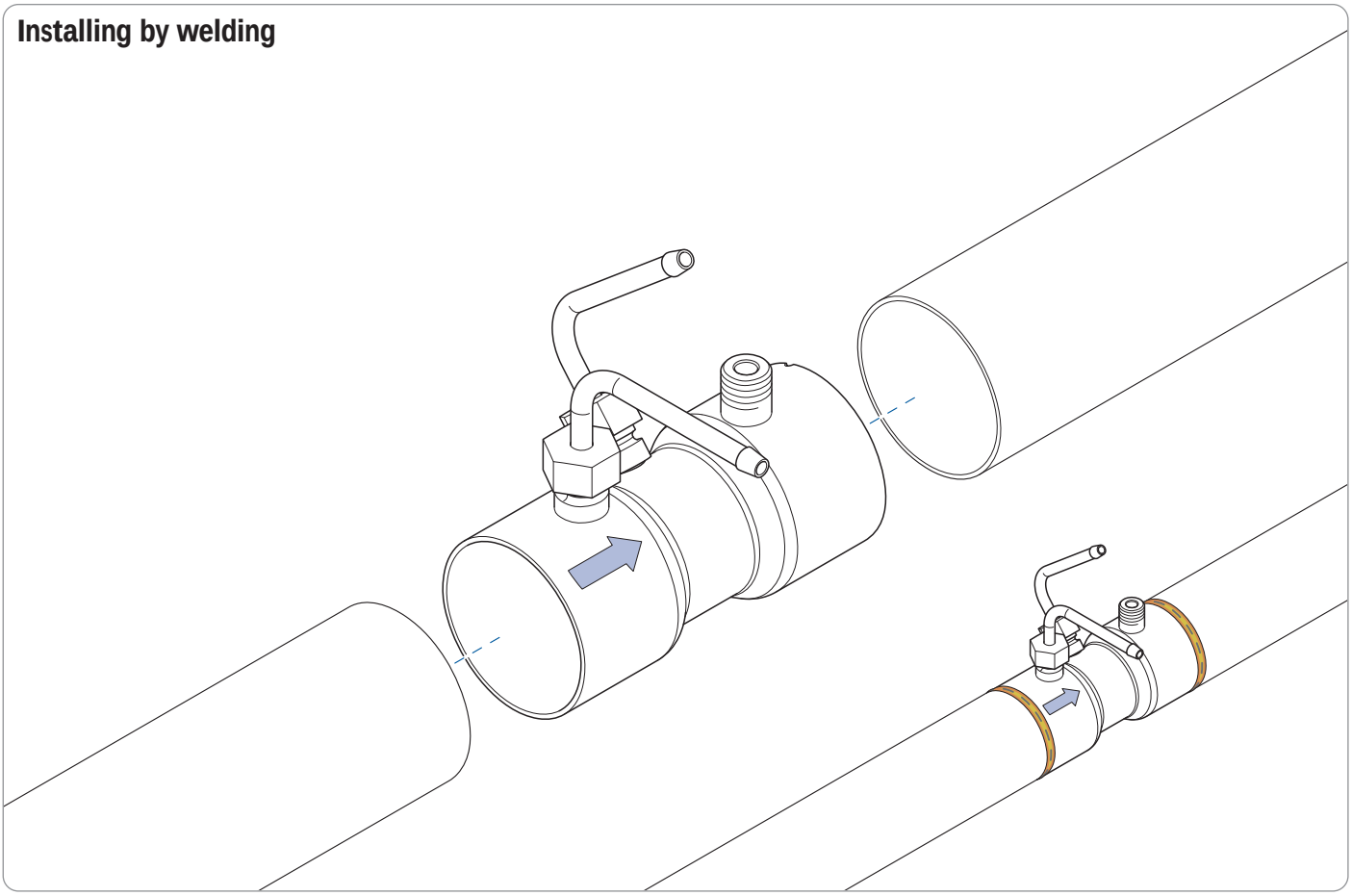
The HJS cable harness connections are marked as follows:
Temperature sensor at primary element: "temperature EFS"
Connector at secondary element: "Venturi"

EFS diameter [mm]			Mass flow rate range [kg/h]	
Inside diam.	Outside diam., inlet end	Outside diam., outlet end	Min.	Max.
52	55	55	60	500 (90 kW)
57	60	60	75	600 (100 kW)
67	70	70	90	900 (155 kW)
100	104	104	150	1200 (210 kW)

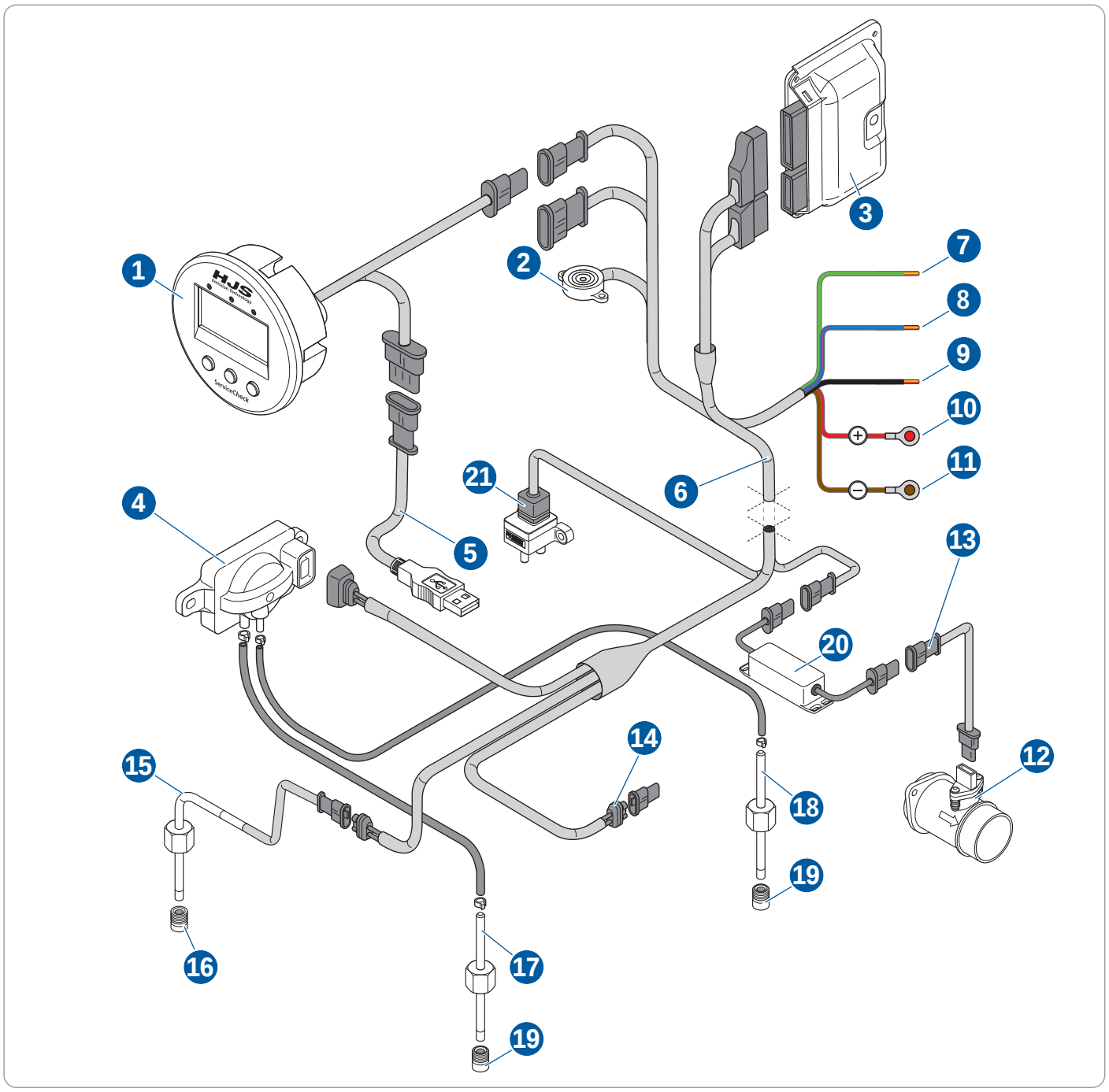
Installing using pipe couplings



Installing by welding



Installation Guidelines – Monitoring Sensors

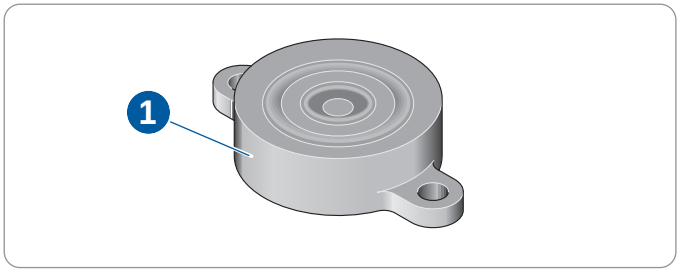


1 Display module „ServiceCheck“
2 Warning buzzer
3 HJS ECU
4 Differential pressure sensor
5 Diagnostics cable
6 HJS cable harness
7 Connection, engine speed term. W
8 Connection, level sensor
9 Connection, term. 15
10 Connection, term. 30
11 Connection, term. 31
12 Air mass flow meter
13 Adapter cable, air mass flow meter
14 Connection, additive dosing system
15 Temperature sensor
16 Weld-in sleeve, temperature sensor
17 Pressure measuring point upstream of SMF® filter
18 Pressure measuring point downstream of SMF® filter
19 Weld-in sleeve, pressure measuring points
20 24/12 V transformer
21 EFS (Exhaust Flow Sensor)

Installation Guidelines – Monitoring Sensors

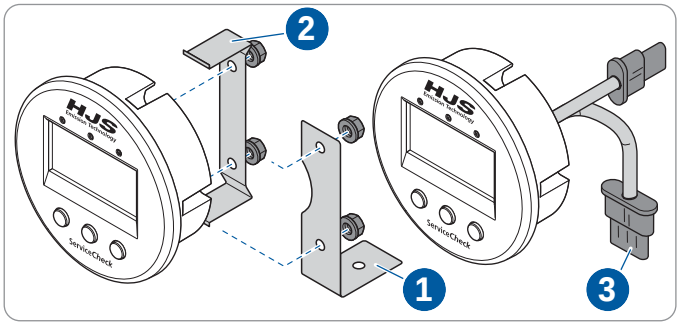
Warning buzzer

> A warning buzzer (1) is installed with every system in order to warn the driver in the event of the fuse for terminal 15 (switched ignition current (+)) blowing.
> See the cable harness diagram in the installation guidelines.
> Install within earshot of the driver.



Display module „Service*Check*“

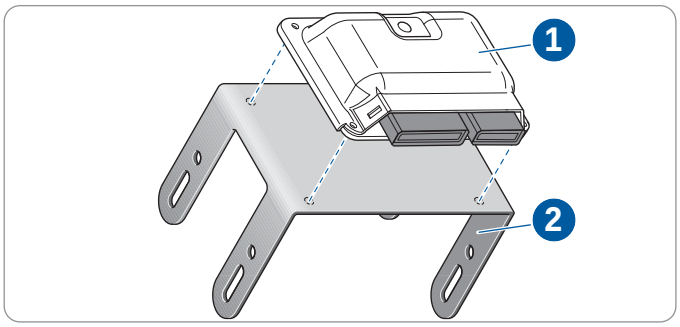
> Install the display module in the field of vision of the driver, using the brackets (1) or clips (2) supplied with the kit.
> Make sure the diagnostics (3) port is easily accessible.
> Operating temperature: -20 °C to +70 °C
> IP safety class: IP65
> Pin assignment in accordance with the section entitled "Cable Harness Diagram".



HJS ECU

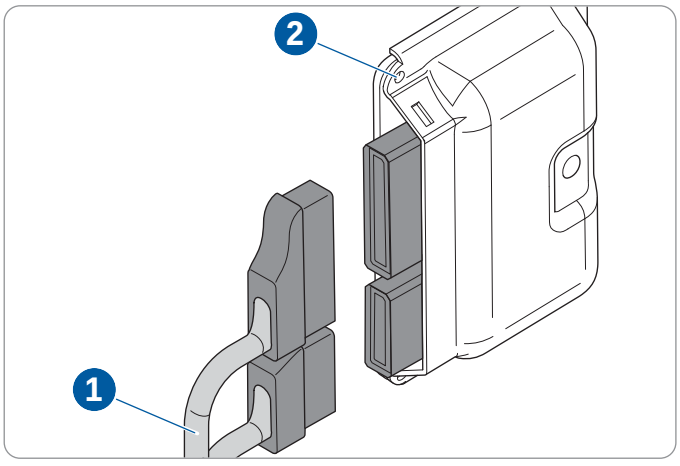
> The ECU (1) should be installed at a location protected against spraywater.
> The retaining lugs (2) of the bracket also supplied with the kit can be used to adjust the installation position.

Protect the HJS ECU against moisture and dust.



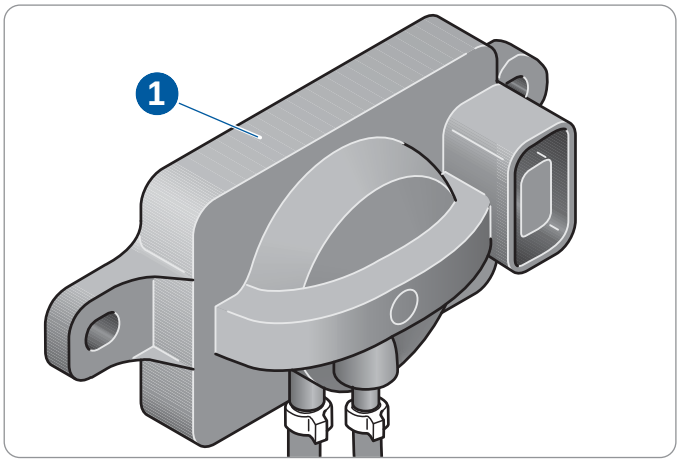
> Select the installation position of the ECU such that the connectors point downwards or to the side with the terminals pointing downwards.
> Operating temperature: -40 °C - +85 °C / Safety class: IP65
> Power consumption of SMF®-AR heater during operation:
1.2 – 3.8 m² SMF®-AR: 1 kW with 12 V on-board supply system
5.4 + 8.1 m² SMF®-AR: 2.2 kW with 24 V on-board supply system

Make sure that the ECU enclosure does not become damaged! Do not drill out any of the 4 hollow rivets (2)!

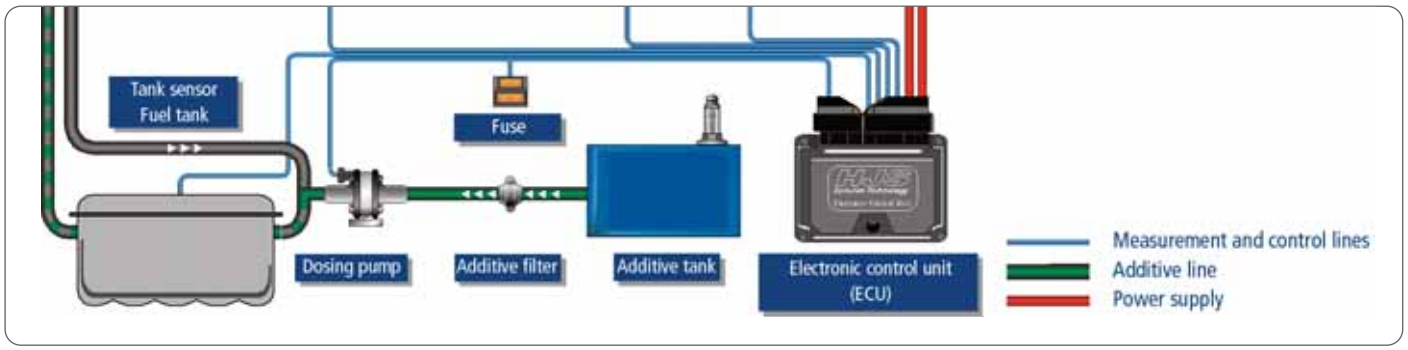


Differential pressure sensor

> Choose the installation position of the differential pressure sensor (1) such that the sensor itself is higher than the pressure measuring points and the pressure hose can be run to the measuring points with a downward gradient.
> The hose to the differential pressure sensor must be no longer than 1.5 m.
> To prevent condensation from forming in the pressure sensor, the pressure connections must point vertically downwards.
> Avoid creating a siphon-like or 'hairpin' bend when running the hose.
> Connect the 8 mm "HI" connection of the differential pressure sensor to the pressure measuring point upstream of the filter.



Installation Guidelines – Additive Dosing System



Checking the additive dosing system

> Connect the "Level sensor" connection of the HJS cable harness to the tank sensor of the diesel fuel tank (see section entitled "Cable Harness Diagram"). The "Level sensor 2" connection is only required in the case of a vehicle not fitted with a fuel level indicator and a tank sensor is to be retrofitted. The HJS ECU supports pulsed and unpulsed tank sensor signals.

> Before installing the SMF®-AR system, make sure that the diesel tank is completely drained and can be filled in order to draw up the tank curve.

> The cable between the HJS ECU and the dosing pump must under no circumstances be lengthened.

> The additive system must be positioned close to the fuel return line in the engine compartment or on the vehicle. Alternatively, the diesel return line can be run to the installation position of the dosing pump.

> Choose the installation position of the additive tank such that the tank can easily be filled via its filler neck with the aid of a funnel.

> The dosing pump and additive filter must be installed lower than the additive tank.

Pay attention to the flow direction. See the arrows on the dosing pump and additive filter!

Make sure you install the correct type of dosing pump for the vehicle (12 or 24 V)!

Filter size [m²]	Additive tank size	Additiv reserve	Additive tank capacity sufficient for x litres diesel (approx.)
1.2 1.8 2.7	2 L	0.2 L	4000 L
3.8	3 L	0,3 L	6000 L
5.4 8.1	5 L	0.5 L	10000 L
./.	10 L	1.0 L	20000 L
./.	15 L	1.5 L	30000 L
./.	20 L	2.0 L	40000 L

Additive consumption of an Off-Road System

Use a dipstick in the filler neck!

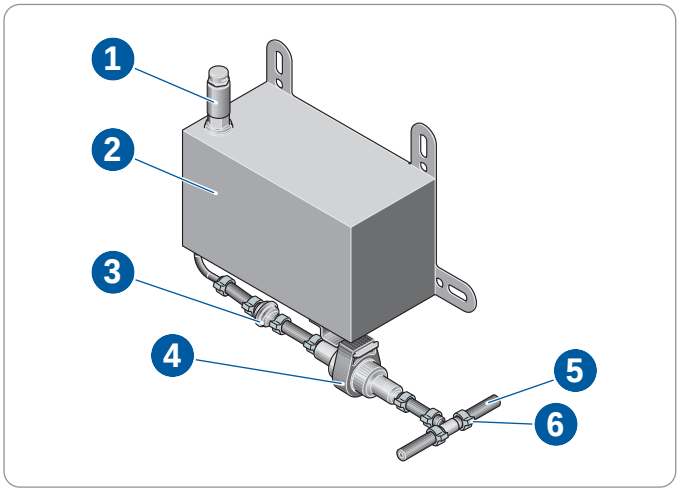
> The hose from the additive tank to the dosing pump, including the section to the additive filter, must be no longer than 30 cm.

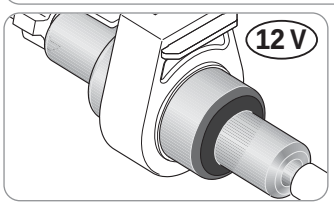
> The hose from the dosing pump to the T-piece must be **no longer than 5 cm**. The dosing calculation performed by the ECU relates to the maximum permissible hose length of 5 cm as determined by HJS. To guarantee accurate additive dosing by the SMF®-AR system, the number of pulses is matched to this length. By specifying this maximum length for this hose, we can also prevent additive from mixing with fuel while the vehicle is being operated.

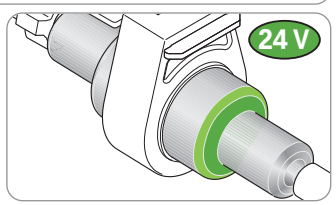
> Install the T-piece in the diesel return line. Connect the 5-cm hose from the dosing pump to the T-piece.

> Secure all hose connections in place with clamps. Make sure that the additive lines and the diesel return line are leak-tight.

> If the vehicle is used on a daily basis, there is no relevant limitation to how long the additive will remain stable. However, the additive should be left in the vehicle tank for longer than 12 months.





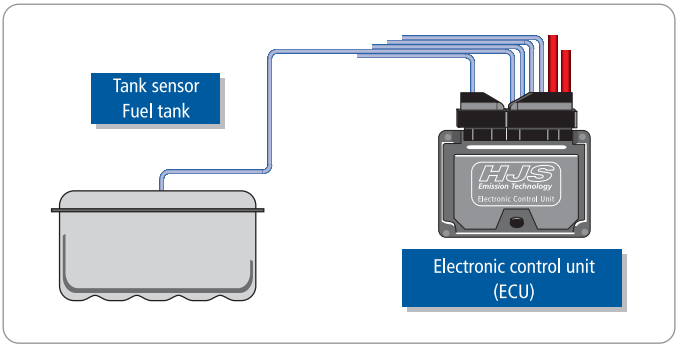


1 Vent/filler neck
2 Additive tank
3 Additive filter
4 Additive dosing pump - Safety class: IP54
5 Connection, diesel return line
6 Clamp

Installation Guidelines – Additive Dosing System

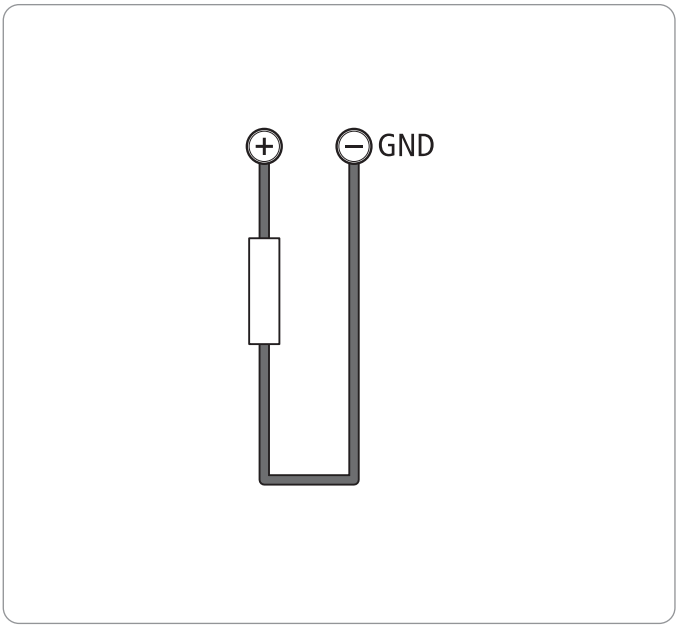
Checking the tank sensor

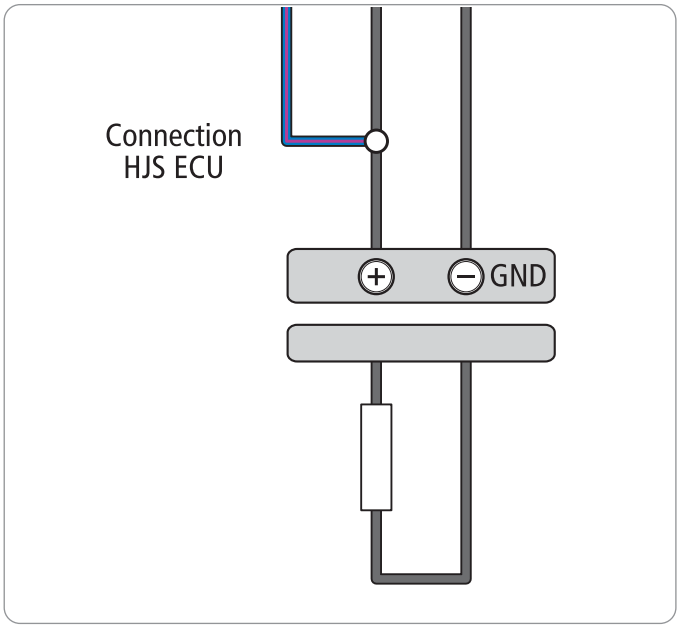
The tank level is measured by tapping the signal at the tank sensor and recording the tank curve.



Tank sensor with 2 connectors

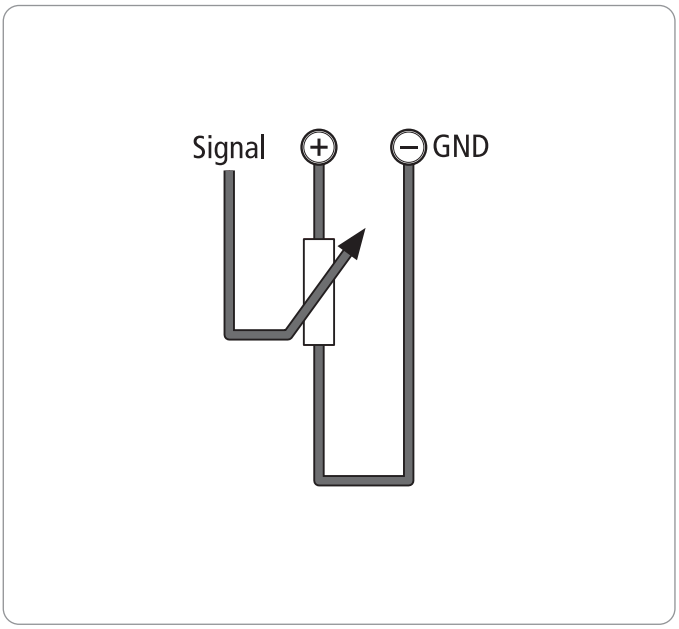
> The tank level signal is tapped from the **live signal lead** of the tank sensor.

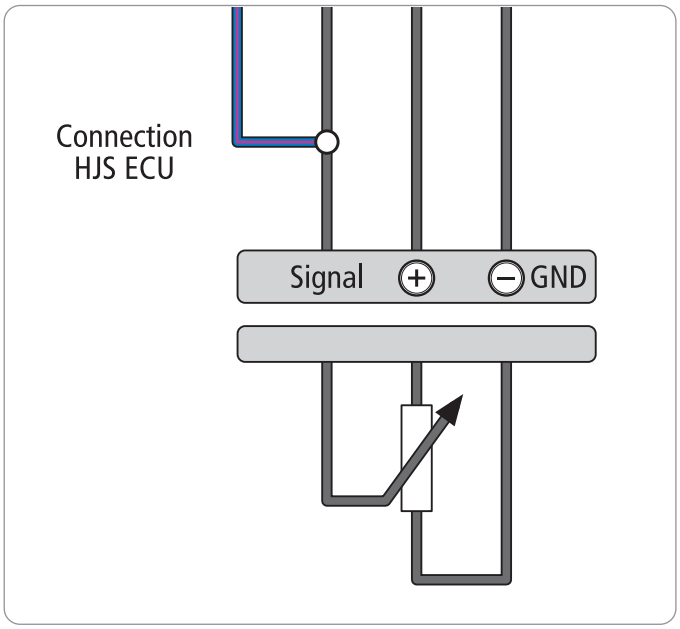




Tank sensor with 3 connectors

> The tank level signal is tapped from the **signal lead** of the tank sensor.





Installation Guidelines – Mounting Diesel Particulate Filter

Substructure for mounting the filter

Brackets have to be mounted to the vehicle frame or vehicle body and to the SMF®-AR filter system so that the filter system can be installed.

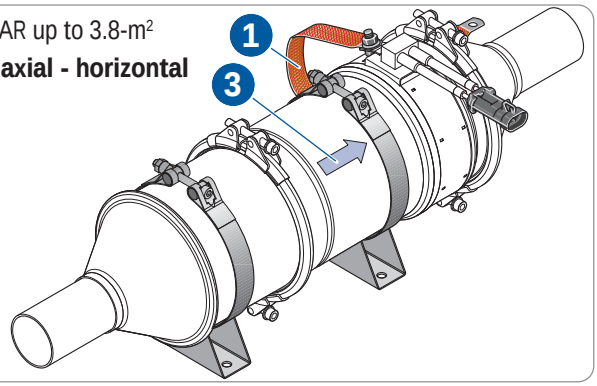
Do not use vibration dampers when mounting to the chassis (no silent block bushes, no rubber pads, etc.).

Information about mounting the filter

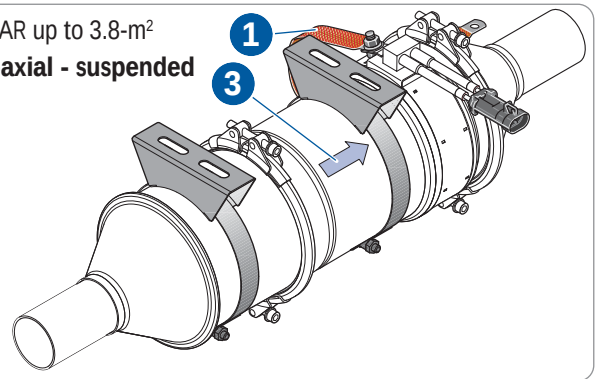
> In the case of the systems with a filter area of up to 3.8 m², attach the earthing strap to the connection (1) provided. In the case of 5.4-m² systems and larger, secure the earthing strap to the bracket (2).

Note the direction of flow of the exhaust gases! See arrow on the system (3).

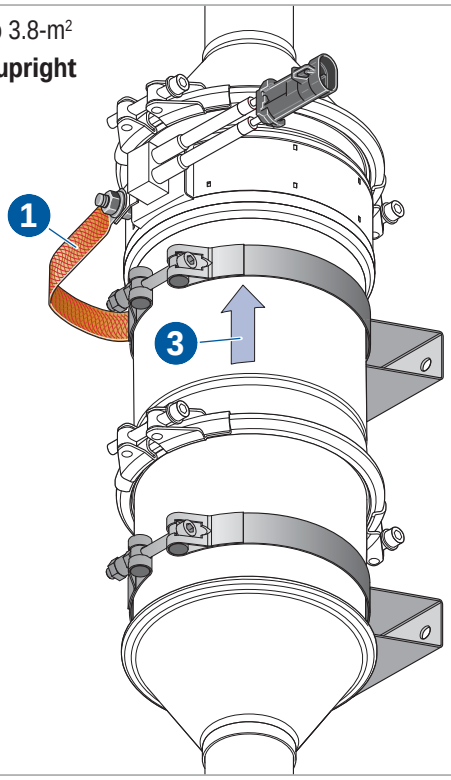
SMF®-AR up to 3.8-m²
Axial-axial - horizontal



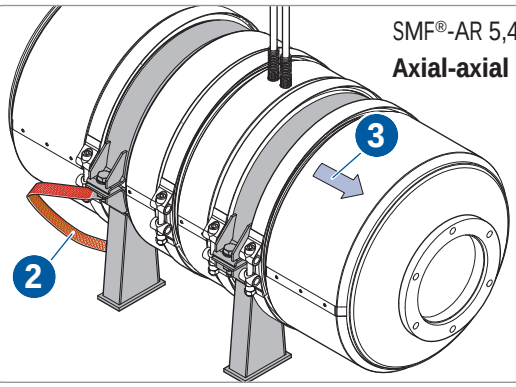
SMF®-AR up to 3.8-m²
Axial-axial - suspended



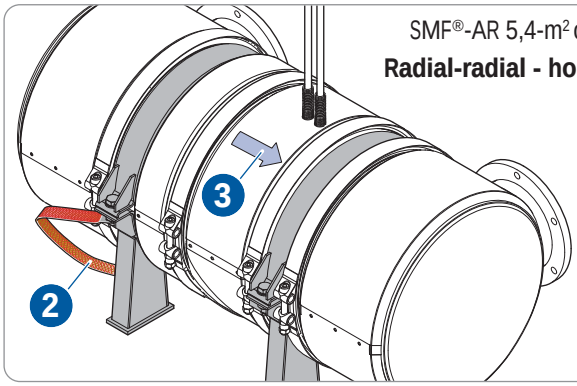
SMF®-AR up to 3.8-m²
Axial-axial - upright



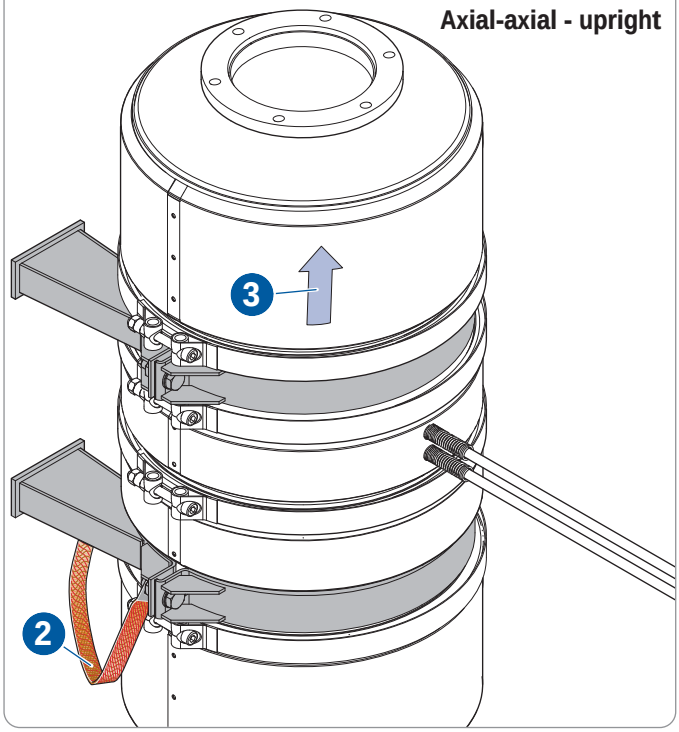
SMF®-AR 5,4-m² or higher
Axial-axial - horizontal



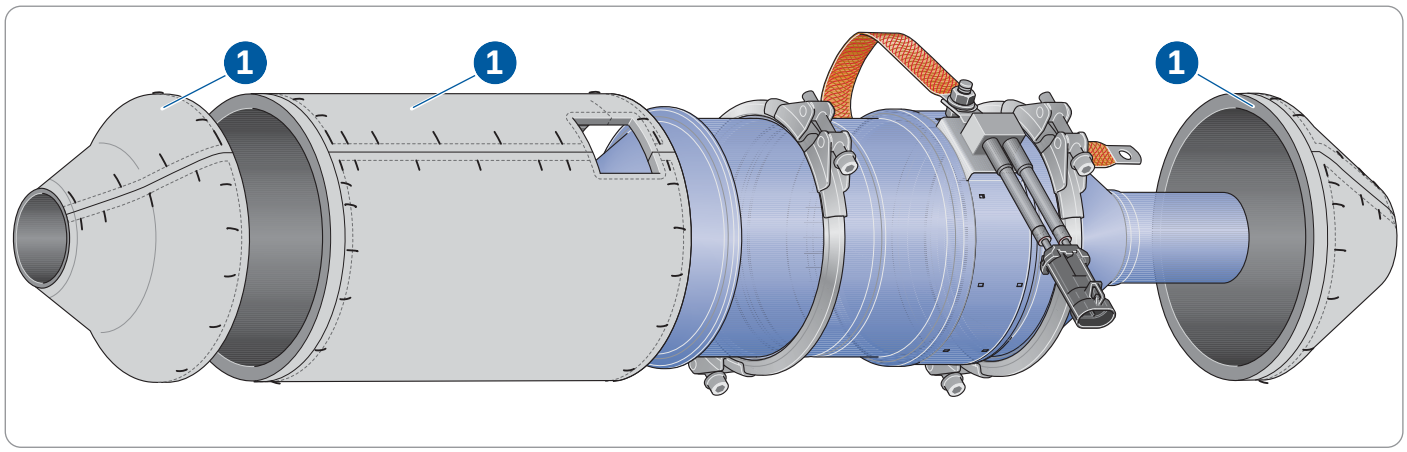
SMF®-AR 5,4-m² or higher
Radial-radial - horizontal



SMF®-AR 5,4-m² or higher
Axial-axial - upright



Installation Guidelines – Diesel Particulate Filter Heat Shield and Insulation



Heat shield and Insulation

> If the system is being installed in an enclosed space – at least 2 of 6 walls –, the system must be insulated with insulation from HJS.

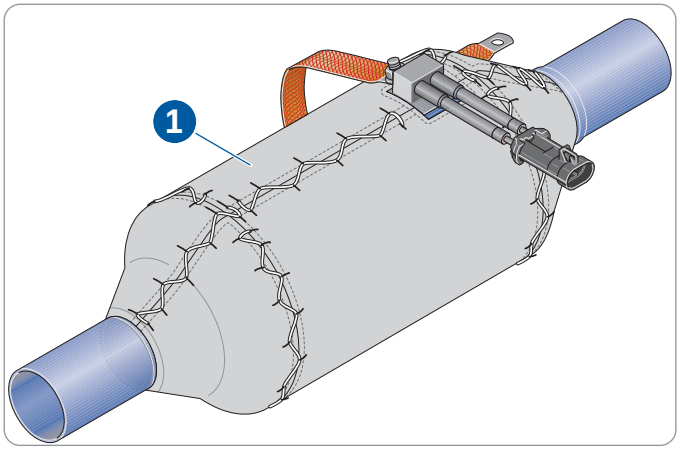
> To protect the components in the immediate vicinity, the filter housing as well as the inlet and outlet tapers are clad with the HJS insulating jacket (1).

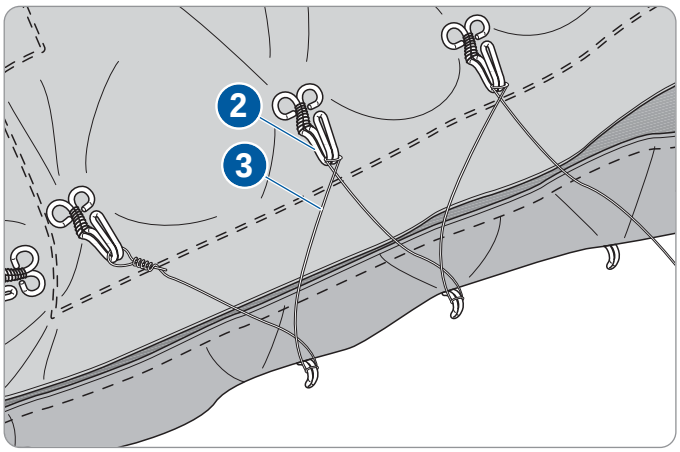
> The insulating jacket is secured by means of a fastening system (2) that is held together with tensioning wire (3).

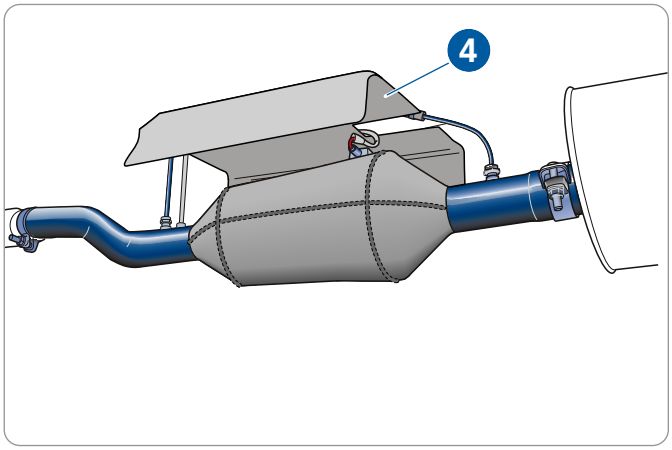
> In all other installation situations, a heat shield or contact shield must be used, unless, for example, occupational safety or other regulations, or special circumstances such as combustible materials in the vicinity, necessitate other measures. In such cases, the installer must decide for himself whether additional insulation of the system is necessary or not.

> The 'Kerafließ' (4) supplied with the kit can be used as the heat shield.

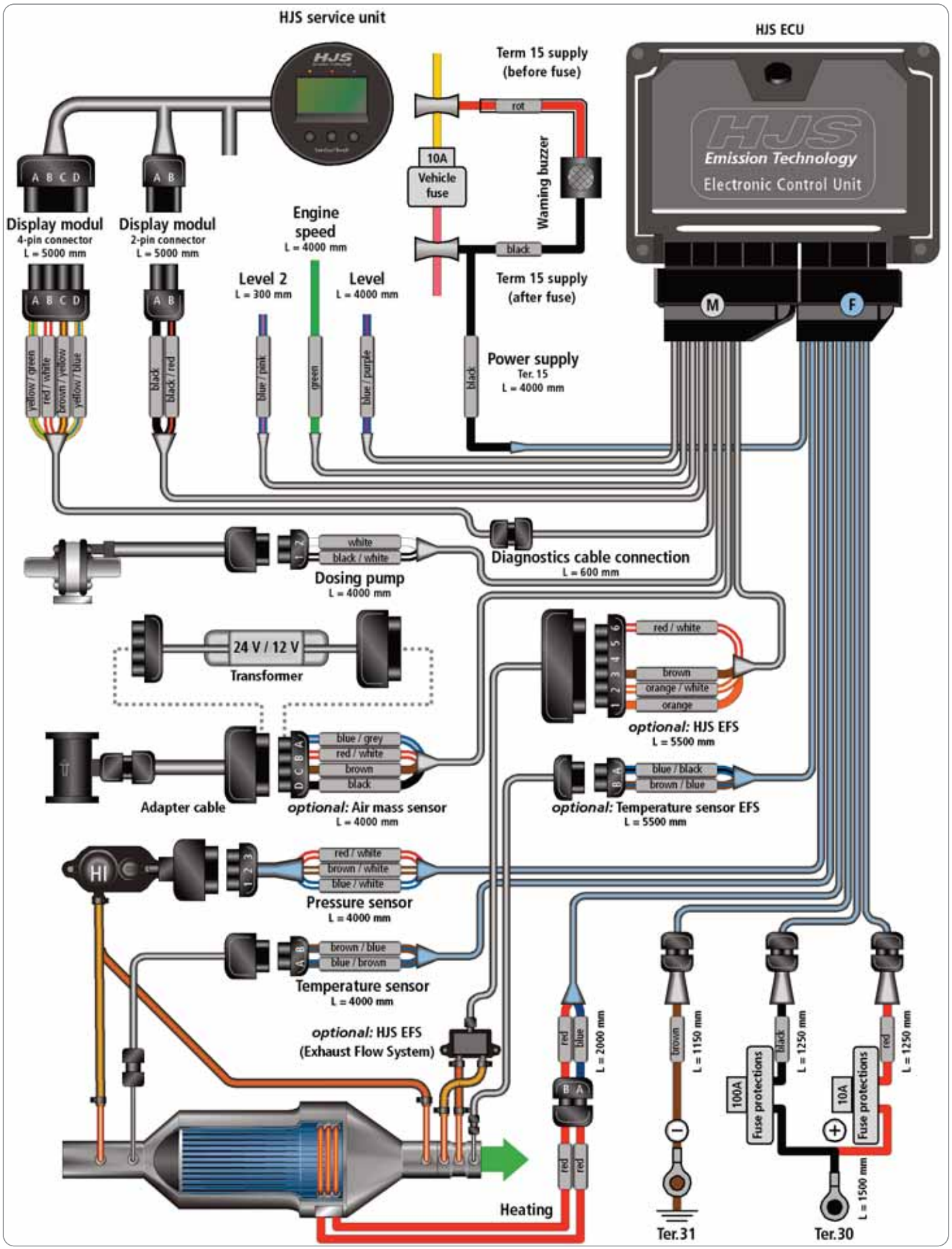
> Low-melting, combustible or medium-carrying components, such as brake, fuel or hydraulic lines located in the immediate vicinity of the filter, must likewise be jacketed with a heat shield. What's more, bearings and sleeves that are close to the filter must also be protected against the heat emitted by the filter.







Cable Harness Diagram



Cable Harness Diagram

> Pressure sensor connection (3-pin connector)

Pin assignment	Colour of cable on cable harness	Function	PIN ECU (F connector)
1	blue/white	Pressure sensor signal	45 F
2	brown/white	GND, pressure sensor	17 F
3	red/white	+5V power supply	26 F

> Temperature sensor connection (2-pin connector)

Pin assignment	Colour of cable on cable harness	Function	PIN ECU (F connector)
A	blue/brown	Temperature	47 F
B	brown/blue	GND, temperature	15 F

> Other connectors (cable harness connected to connector F)

General	Colour of cable on cable harness	Function	PIN ECU (F connector)
Audible warning indicator and 10 A fuse protection	black	Term. 15 (HJS ECU supplied by term. 15)	53 F
	brown	Term. 31 (ECU GND)	2 F
10 A fuse protection	red	Term. 30 (HJS ECU supplied by battery)	42 F
100 A fuse protection	black	Heater power supply from battery	1 F / 3 F / 5 F / 8 F
Heater connector (A)	blue	Heater circuit 2	6 F / 9 F
Heater connector (B)	red	Heater circuit 1	4 F / 7 F

> Optional HJS EFS temperature sensor connection (2-pin connector)

Pin assignment	Colour of cable on cable harness	Function	PIN ECU (F connector)
A	blue / black	Temperature	48 F
B	brown / blue	GND, temperature	16 F

> Optional HJS EFS connection (6-pin connector)

Pin assignment	Colour of cable on cable harness	Function	PIN ECU (M connector)
1	orange	CAN High	1 M
2	orange / white	CAN Low	2 M
3	brown	GND	13 M
6	red / white	+5V power supply	32 M

> Dosing pump connection (2-pin connector)

Pin assignment	Colour of cable on cable harness	Function	PIN ECU (M connector)
1	black/white	Power supply (Ter.15)	45 M
2	white	Switched GND signal via ECU	48 M

> Optional air mass flow meter connection (4-pin connector)

Cable	Pin assignment	Colour of cable on cable harness	Function	PIN ECU (M connector)
5	A	blue / grey	Load signal of air mass flow	51 M
4	B	red / white	+5V power supply	36 M
3	C	brown	GND	19 M
2	D	black	Term. 15 via ECU, 12 V supply	40 M

> Display HJS ServiceCheck display module (4-pin connector)

Cable	Pin assignment	Colour of cable on cable harness	Function	PIN ECU (M connector)
1	A	yellow/green	Diagnostics TX	76 M
2	B	red/white	+5V power supply, diagnostics	31 M
3	C	brown/yellow	GND, diagnostics	22 M
4	D	yellow/blue	Diagnostics RX	77 M

> Display HJS ServiceCheck display module (2-pin connector)

Cable	Pin assignment	Colour of cable on cable harness	Function	PIN ECU (M connector)
5	A	black	Term. 15 via ECU, red MIL supply	41 M
6	B	black/red	Switched GND signal, red MIL	74 M

> Optional HJS ServiceCheck display module signal outputs (supported as of software V1.0.6)

Cable	Max. current	Description
7	50 mA	Ter.15
8	10 mA	Red fault lamp signal (Switched GND via ECU)
9	10 mA	Yellow fault lamp signal (Switched GND via ECU)
10*	10 mA	Signal Buzzer (Open Collector) *Cable unlabelled

> Other connectors (cable harness connected to connector M)

General	Colour of cable on cable harness	Function	PIN ECU (M connector)
	blue/purple	Tank sensor	60 M
Square-wave signal	green	Terminal W	62 M
	blue/pink	Fuel level sensor 2 (retrofitted)	75 M

Installation/Connection Instructions Cable Harness

Connect the cable harness as shown in the cable harness diagram (see section entitled "Cable Harness Diagram").

Before you start work, disconnect the negative pole of the battery!

Do not mix up the connectors for terminals 30 and 31! If they are connected incorrectly, the ECU will be destroyed!

• Connecting the electric heater

> Run the power cable to the filter heater and connect it to the plug connection.

Make sure you install the cables without any kinks: The heater cable and HJS heater extension lead must not be installed in loops.

Only an HJS-approved extension cable may be used to lengthen the power cable to the electric heater!

• Connecting the earthing strap

> Connect the earthing strap supplied with the kit between the filter housing and the vehicle chassis or ground point.

• Connecting the PT-200 temperature sensor

> Run the signal cable to the temperature sensor at the filter inlet and connect it.

> If necessary, you can shorten the signal cable and use a crimp/shrink connector supplied with the kit to connect the two open ends.

> The cable is not allowed to be lengthened.

• Connecting the differential pressure sensor signal cable

> Run the connecting cable to the differential pressure sensor and connect it.

> If necessary, you can shorten the signal cable and use a crimp/shrink connector supplied with the kit to connect the two open ends.

> The signal cable is not allowed to be lengthened.

• Connecting the air mass flow meter signal cable

> The appropriate adapter cable has to be used to connect the air mass flow meter.

> If necessary, you can shorten the signal cable and use a crimp/shrink connector supplied with the kit to connect the two open ends.

> The signal cable is not allowed to be lengthened.

• Connecting the engine speed signal cable

> Run the signal cable from the ECU to the vehicle's alternator and connect it to terminal W (engine speed) using plug connectors.

> If necessary, you can shorten the signal cable.

• Connecting the warning buzzer

> Connect the warning buzzer in accordance with the cable harness diagram.

• Connecting the level sensor 1 signal cable

> Run the signal cable to the fuel tank sensor and connect it to the tank signal cable using crimp/shrink connectors.

> The tank sensor signal is used for pulsed and non-pulsed OE tank sensors.

> If necessary, you can shorten the signal cable.

• Connecting the level sensor 2 signal cable

> This signal cable is only required if a tank sensor has been retrofitted.

• Connecting the dosing pump

> Run the connecting cable to the additive dosing pump and connect it.

> If necessary, you can shorten the control cable and use a crimp/shrink connector supplied with the kit to connect the two open ends.

> The cable is not allowed to be lengthened.

• Connecting the display module signal cable

> Run the cable from the ECU to the ServiceCheck display module.

Comment:

Connect both the 4-pin and the 2-pin connector to the display module. The 4-pin connector also serves as the diagnostics port. If necessary, disconnect the 4-pin connector and use the diagnostics cable to make a connection to the PC.

> If necessary, you can shorten the signal cable and use a crimp/shrink connector supplied with the kit to connect the two open ends.

The signal cable may only be lengthened using an HJS extension cable!

• Connecting the voltage supply to permanent positive (term. 30 / 10 A)

> Run the cable harness from the ECU to the vehicle's battery and connect it to the positive pole. When connecting the HJS system to the power supply, make sure that the HJS ECU continues to be supplied with power for a further 2 minutes after the engine has been switched off. Take account of battery disconnectors if fitted.

• Connecting the voltage supply to ground (term. 31)

> Connect to the negative pole or ground point.

• Connecting the voltage supply to ignition current (term. 15)

> Connect to the vehicle's power supply system term. 15 downstream of the fuse.

Installing the ECU diagnostics software

Prerequisites for using the ECU diagnostics software

PC

Compatibility with all versions of Windows as of Windows XP (incl. Windows Vista and Windows 7)
Minimum screen resolution: 1024x768

HJS ECU for exhaust-gas aftertreatment systems

For all systems based on the HJS ECU as of software release 0.10.157
SMF®-AR, CRT®, FBC, SCRT®

Hardware

Diagnostics cable: all versions

Software:

Microsoft .Net Framework 3.5

Components and accessories

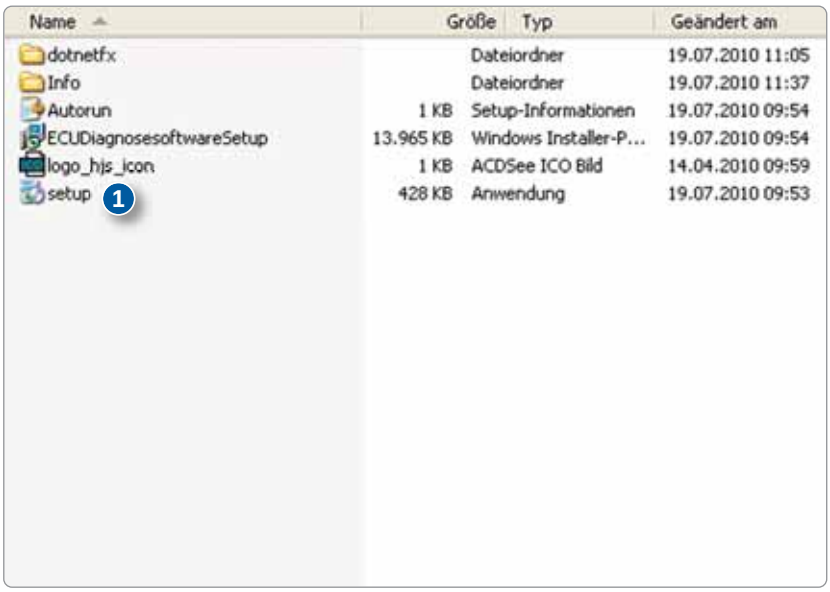
ECU diagnostics kit, incl. diagnostics cable (1)
ECU password
Commercially available PC

Installation instructions can be found on the CD under "Documentation".

The driver/operator must be instructed to monitor the display of the ServiceCheck display module regularly. Excess temperature levels can cause serious damage to the system and/or vehicle.

Installing the ECU diagnostics software 2010

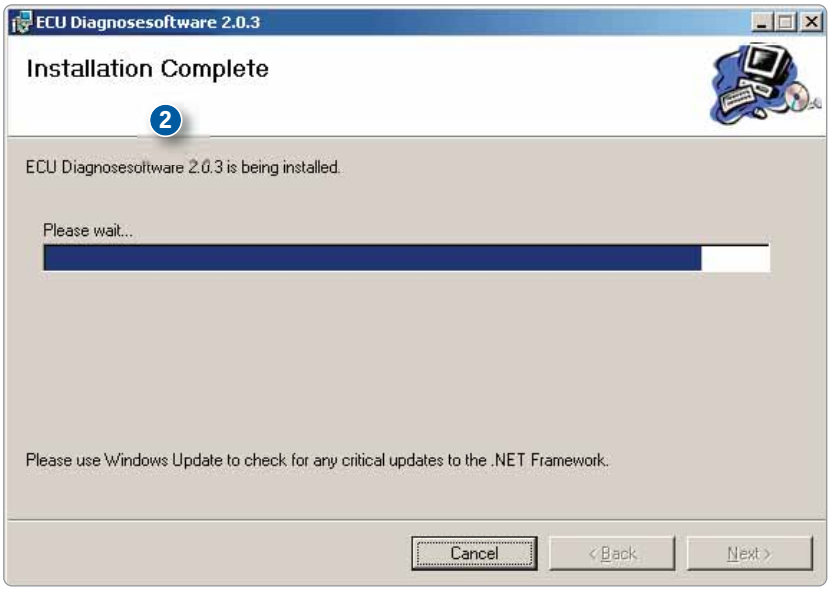
The ECU diagnostics software requires Microsoft's .NET Framework as its runtime environment. This software package from Microsoft will in most cases already be installed on your PC. If not, you can download the latest version from the Microsoft website free of charge.



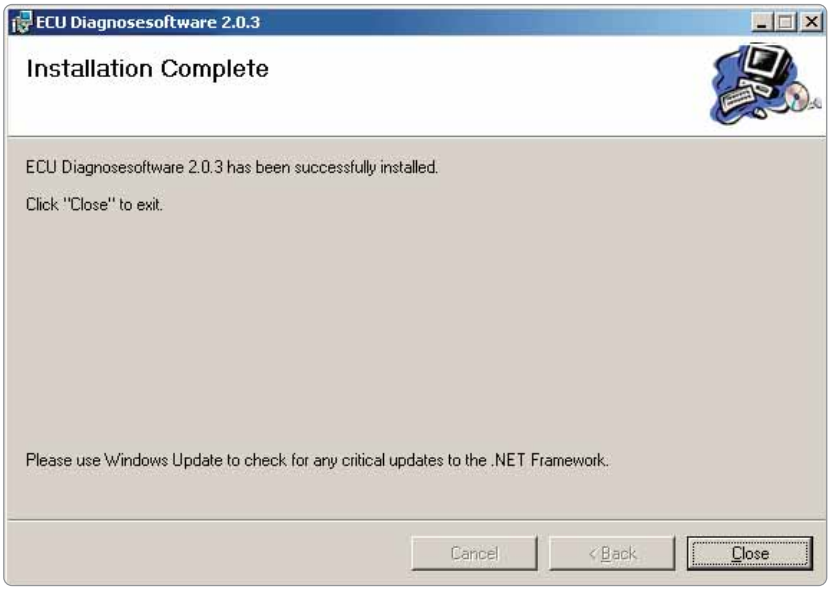
The steps necessary to do this are described in the relevant documentation from Microsoft.

> You are now ready to install the ECU diagnostics software, which you do by double-clicking the "setup.exe" file (1) on the Installation CD.

> An installation wizard (2) then navigates you through the steps to be followed.



> Once installed, you can start the ECU diagnostics software either from the icon on the desktop or from Programs after clicking the Start button.



Installing the ECU diagnostics software 2010

First steps

> When you start the ECU diagnostics software, the start screen of the user interface appears on the monitor (1). This start screen lets you reach all the software modules required.

> By clicking the **[Home]** button (2) in the top toolbar, you can return to this start screen whenever you want. Clicking the **[Back]** button (3) will display the last screen you used.

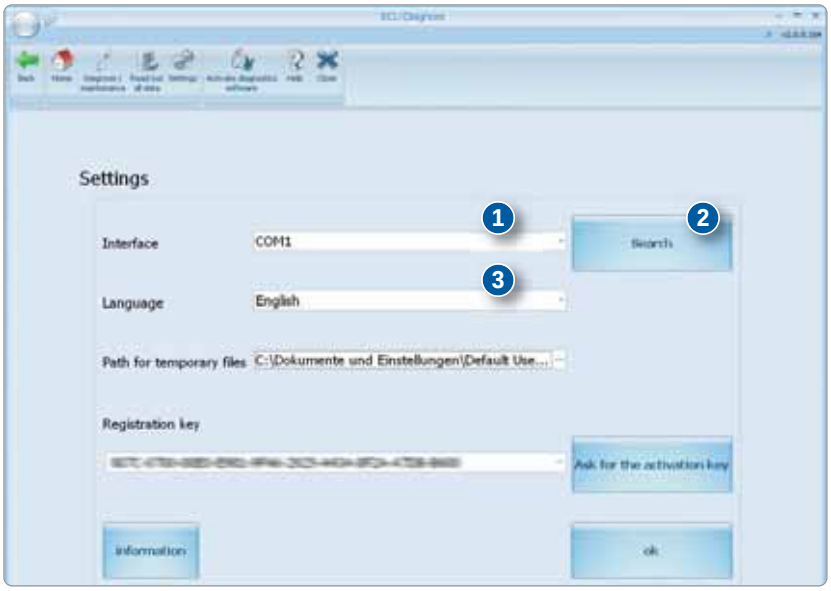
> Before you use the ECU diagnostics software for the first time, you have to make a number of basic settings via the **[Settings]** button (4).

Port

> The first setting to make is to select the COM port (1) to be used. If the computer is already connected to the ECU by the HJS diagnostics cable and the vehicle's ignition is on, you can also use the automatic search function (2). If not, you have to select the COM port or virtual COM port of the USB-RS232 adapter.

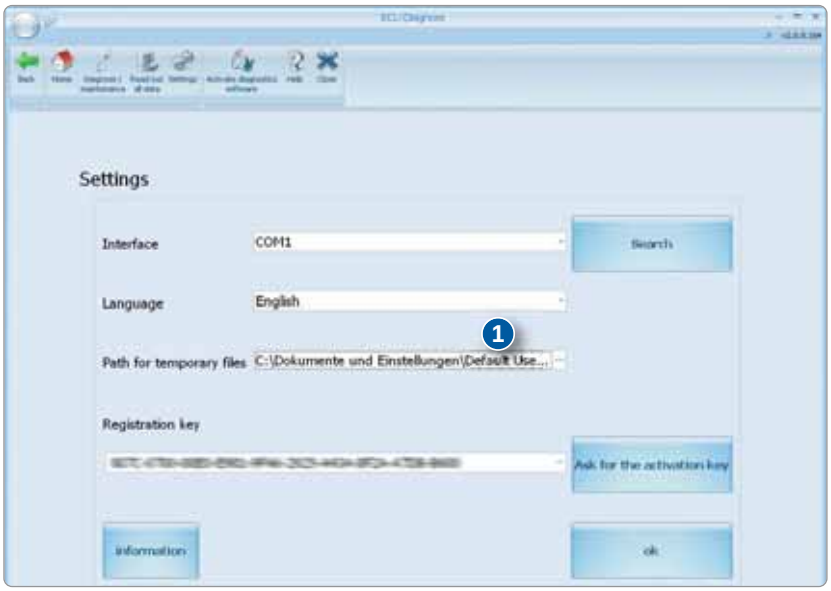
Language

> The language used by the ECU diagnostics software is chosen automatically based on the system language set in your computer. Optionally, you can select a different language here (3).



Path for temporary files

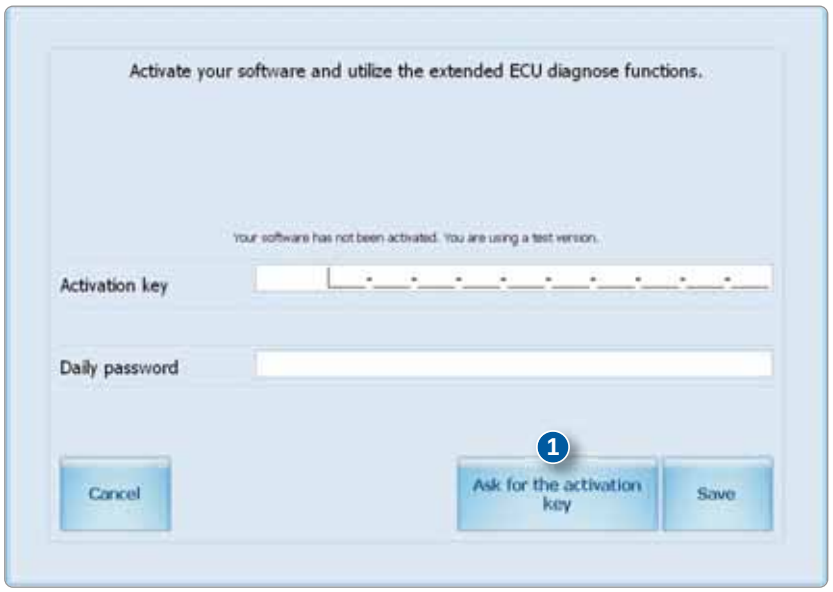
> All temporary files generated by the ECU diagnostics software are saved to this path (1). This path can be changed if necessary.



Installing the ECU diagnostics software 2010

Activation key, step 1:

> For safety reasons, you can only access basic functions in the ECU diagnostics software unless you have registered it. Functions such as measured data evaluation and maintenance mechanisms are not supported until the software has been registered and activated. You register the software by clicking the **[Ask for the Activation key]** button (1).



Activation key, step 2:

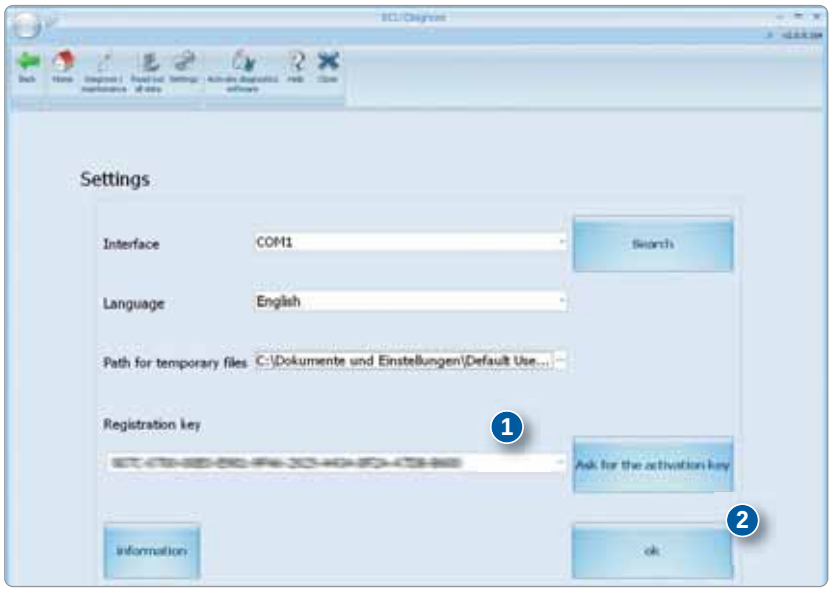
> All registration fields have to be filled in correctly for registration to be successful.

> After filling in the necessary details for registration, you then have to contact the sales partner responsible by e-mail, phone or fax in order to request an activation key.

Activation key, step 3:

> Once you have entered the activation key (1), all the necessary functions the software offers are available for you to use.

> Click the **[OK]** button (2) to complete registration.



Installing the ECU diagnostics software 2010

Connecting the diagnostics software to the ECU

> The cable harness includes the diagnostics connector (1) for the ECU.

The 4-pin connector on the display module (2) also serves as the diagnostics connector. The plug connection has to be disconnected first in order to connect the HJS diagnostics cable.

> Make the connection between the PC and the diagnostics port using the diagnostics cable (3).

> Make the connection between the ECU diagnostics software and the ECU.

> Switch on the ignition of the vehicle and start the diagnostics program.

Configuring the SMF®-AR System

> The SMF®-AR system should now already be fully installed and connected up. If you look in the Installation Guidelines, you will find a checklist you can use to check that you can have carried out the installation procedure completely and properly.
> Please connect your computer to the ECU by means of the diagnostics cable and switch on the vehicle's ignition in order to supply the ECU with power.
> Click the **[Application]** button (1). During configuration of the ECU, it is possible to save several files. You can find an exact explanation of what to do in the following sections.
> The connection to the HJS ECU is set up.

Note about file extensions:

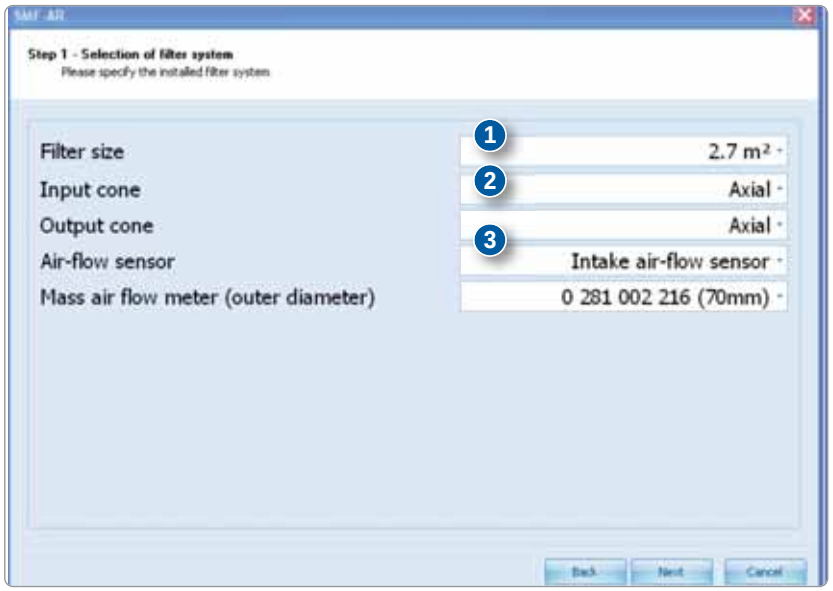
***.hjstkw :**	Tank curve
***.hjssmw :**	Vehicle data + tank curve
***.hjssmw.kbf :**	Configuration file (incl. vehicle data + tank curve)
***.pdf :**	Installation report containing all information entered to facilitate subsequent tracing

A tank curve is required only for discontinuous dosing. If this function is not fitted, go to the section entitled "Drawing up the tank curve of the SMF®-AR system" first!

> To program the HJS ECU, select **[Modular SMF®-AR – Discontinuous Dosing]** (2) or **[Modular SMF®-AR – Intelligent Continuous Dosing]** (3). (See separate section entitled "Intelligent Continuous Dosing (IKD)").

> Enter the vehicle data, e.g.:
• Year of construction
• Vehicle Identification Number

Note the following variants of mass flow sensor under Step 1: air mass flow meter or HJS Exhaust Flow Sensor (HJS EFS)



Step 1 – Selecting the filter system (Variant with **air mass flow meter**)

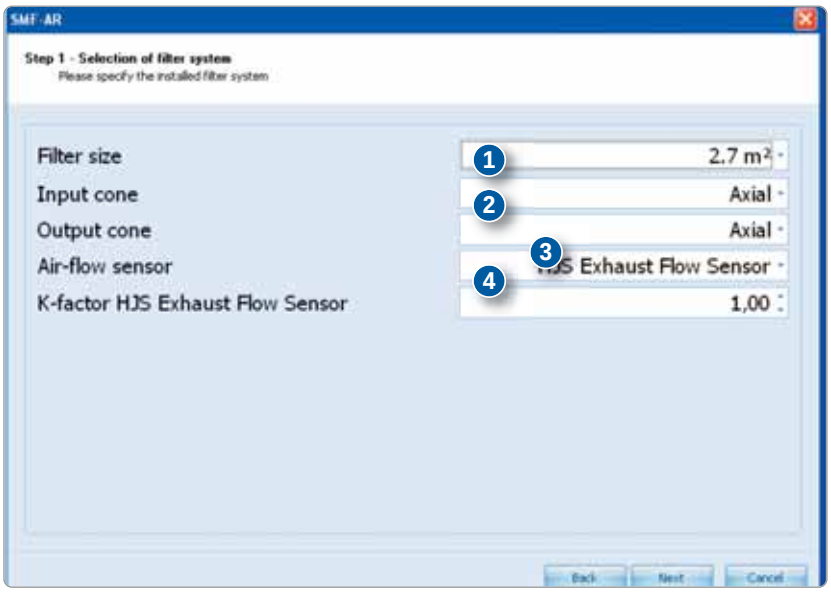
> Enter the "Filter size" (1) used, the type of inlet and outlet tapers (2) installed and "Air mass flow meter" (3).

Configuring the SMF®-AR System

Step 1 – Selecting the filter system
(Variant with **HJS Exhaust Flow Sensor**)

The HJS Exhaust Flow Sensor (3) is only supported by control units with software version 1.11.9 or higher!

> Enter the "Filter size" (1) used, the type of inlet and outlet tapers (2) installed and "HJS Exhaust Flow Sensor" (3).
> If the HJS Exhaust Flow Sensor is being used, an additional k-factor must be entered (4) that is embossed on the primary element.

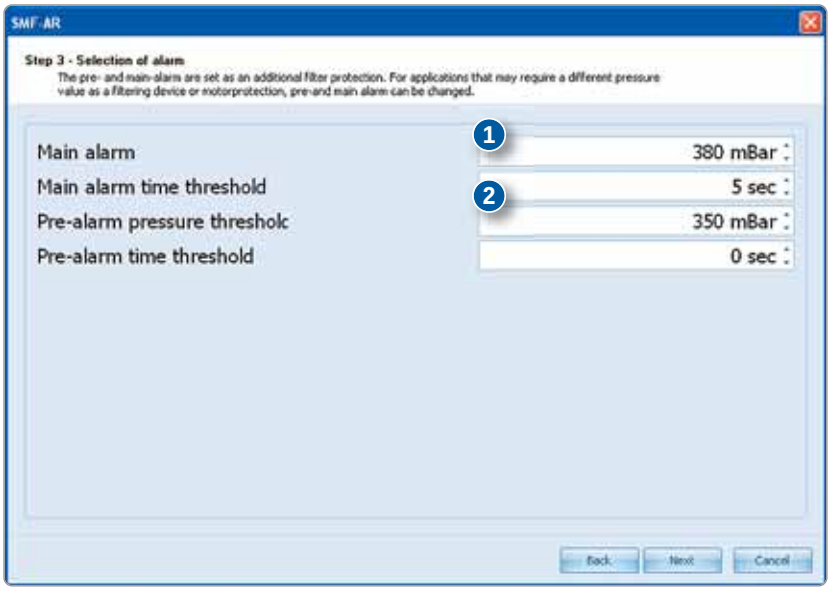


Step 2 – Entering the engine data (no screenshot)
> Enter the engine data

Step 3 – Selecting the alarm
> When dimensioning the SMF®-AR system, your supplier specified the maximum permissible exhaust backpressure as the main alarm threshold based on the engine manufacturer's specifications and the size of the filter. This value must be entered in the box next to "Main alarm" (1). The time threshold for "Main alarm" and "Pre-alarm" must be set to at least 5 seconds.

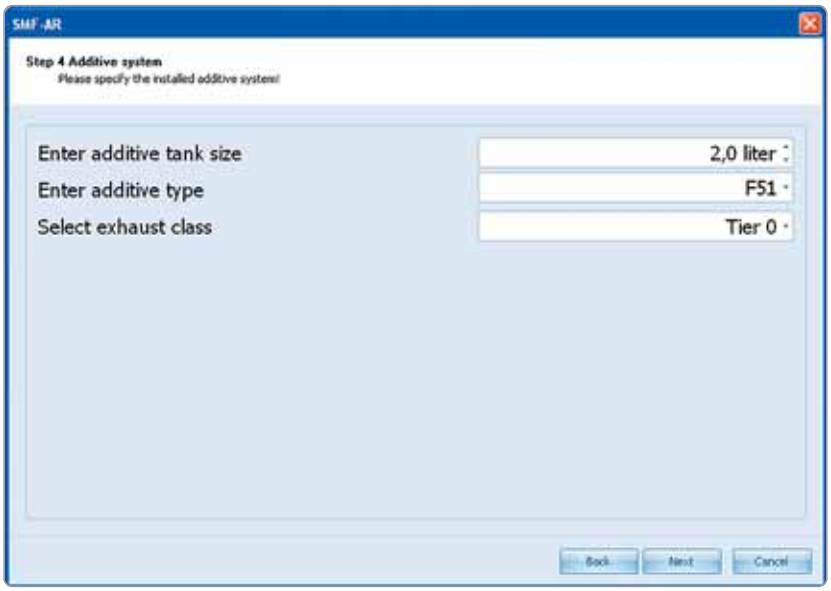
The "Main alarm" value must always be coordinated with the engine manufacturer's specification with respect to the filter size!

Pre-alarm (2): approx. 90% of the main alarm value



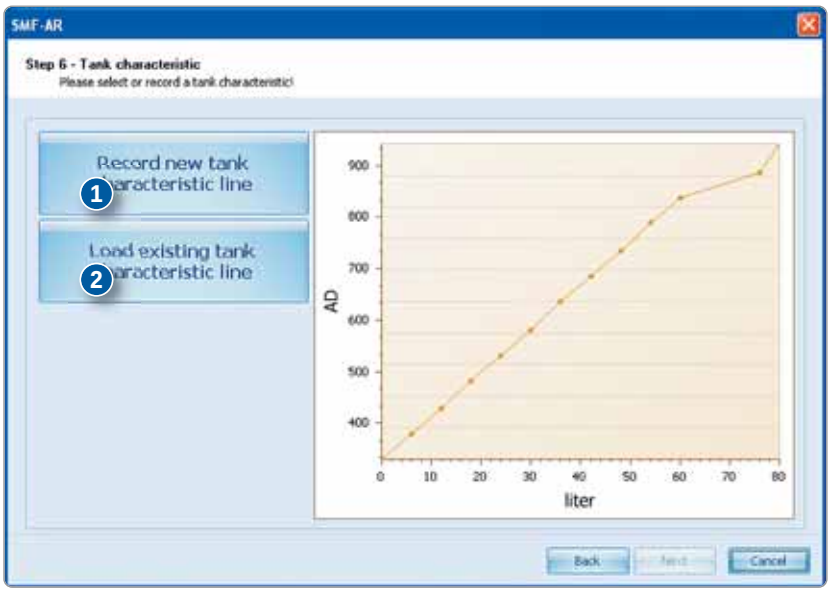
Step 4 – Additive system
> Enter the additive tank size and additive type.
> The emission class only needs to be selected if Intelligent Continuous Dosing is used.

HJS approval required!



Configuring the SMF®-AR System

Step 5 – Tank curve

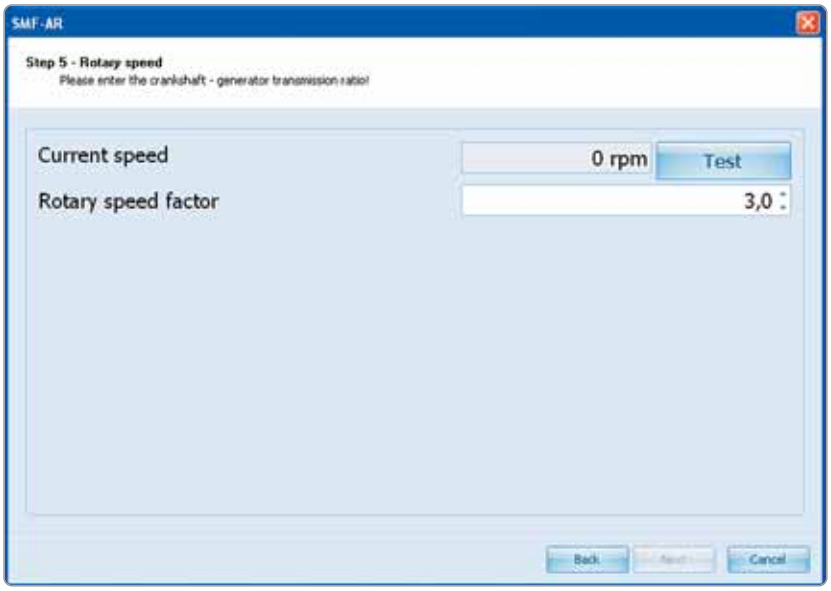


> Click the **[Record new tank characteristic line]** button (1) to generate a new tank curve file with the file extension ".hjstkw".

Please read the section entitled "Drawing up the tank curve of the SMF®-AR system" for description of how this is done!

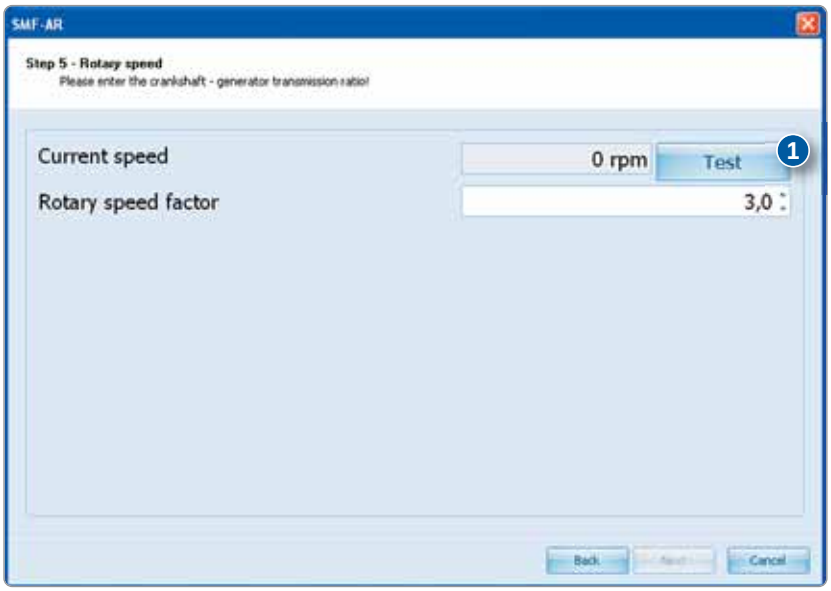
> Click the **[Load existing tank characteristic line]** button (2) to load the existing file with the extension ".hjstkw". The various reference points of the tank curve are displayed in the graph.

Step 6 – Engine speed
(Up to control unit version 1.7.8)



> Because the HJS cable harness is connected to the winding of the alternator (terminal W), the engine speed variable has to be adjusted to match the respective diameter of the alternator pulley. This is based on the ratio of the alternator pulley to the crankshaft pulley:

$$\frac{\text{Ø alternator}}{\text{Ø crankshaft}} = \text{„speed factor“}$$



> After entering the speed factor, start the engine. Click the [**Test**] button (1) to update the engine speed value. If the value displayed here is the same as the actual engine speed, you can switch the engine off. The ignition must be left switched on for the next steps. Click **[Next]** to continue.

An engine speed of at least 650 rpm must be set for the engine running detection function of the HJS ECU.

Configuring the SMF®-AR System

Remark about Step 6

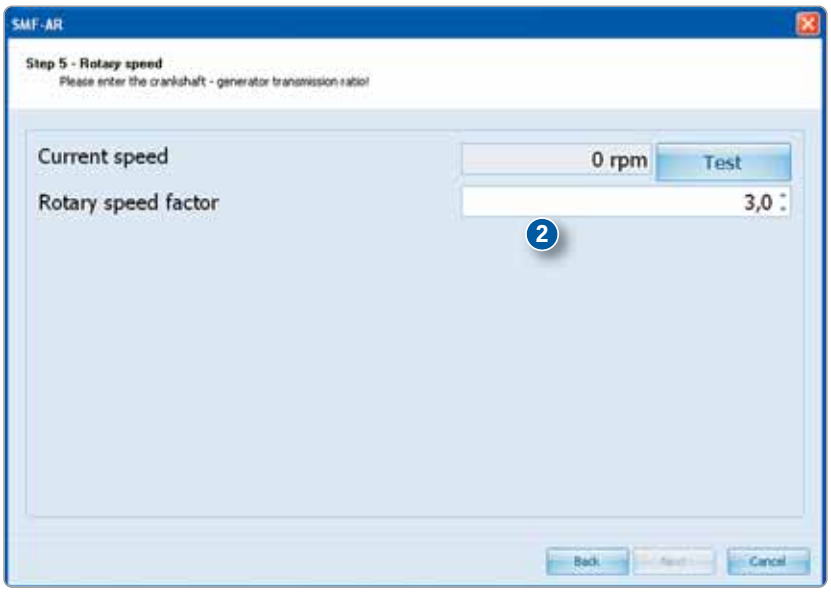
> The system can be calibrated with the actual engine speed by changing the speed factor (2).

Later adjustment of the engine speed

Applies only for configurations already set!
Applies only for control units **up to version 1.7.8**!

> The speed factor can still be changed even after the ECU has been configured. To do this, the configuration program can be run through up to Step 6 without having to enter any of the data (Steps 1 to 4) again. You can then change the speed factor (2). Click **[Cancel]** to adopt the speed factor.

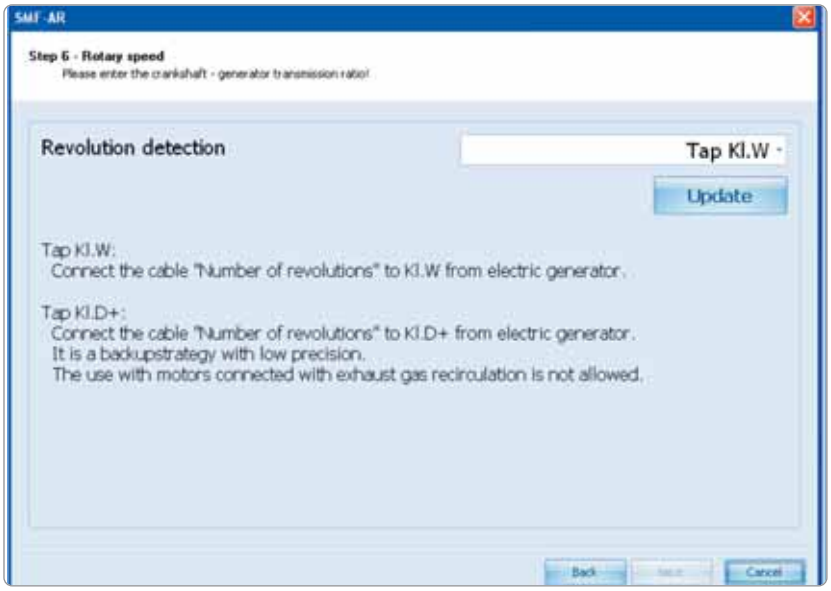
Do not upload a new data record!



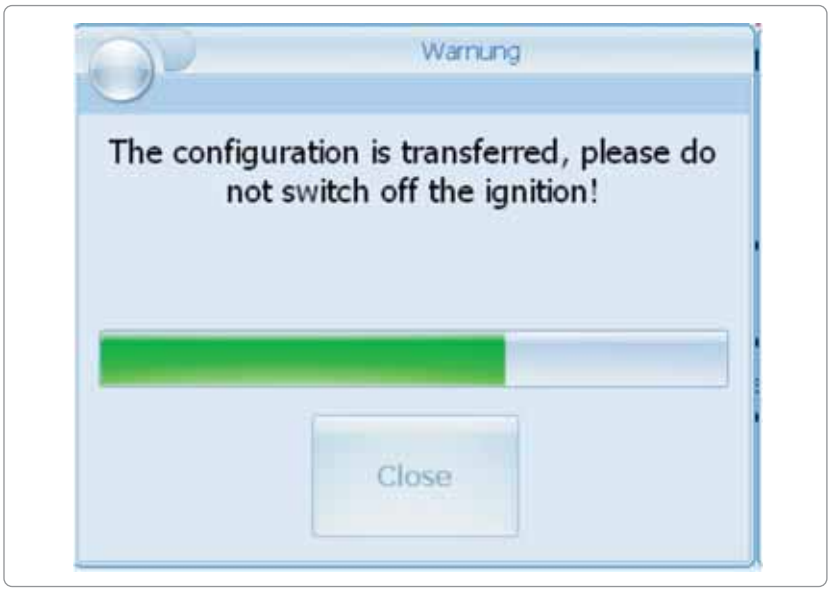
Step 6 – Engine speed
(Control unit version 1.11.9 or higher)

If the control unit connected has software version 1.x.9, you can choose between two different methods for measuring the engine speed:

Tapping at term. W
> The engine speed is tapped from terminal W of the alternator.
Tapping at term. D+ (alternative strategy)
> The HJS "Speed" cable is connected to terminal D+ of the alternator. In this case, the engine speed is calculated by the mass flow meter (MAF/EFS).
> After selecting the method for tapping the engine speed, click the **[Update]** button.



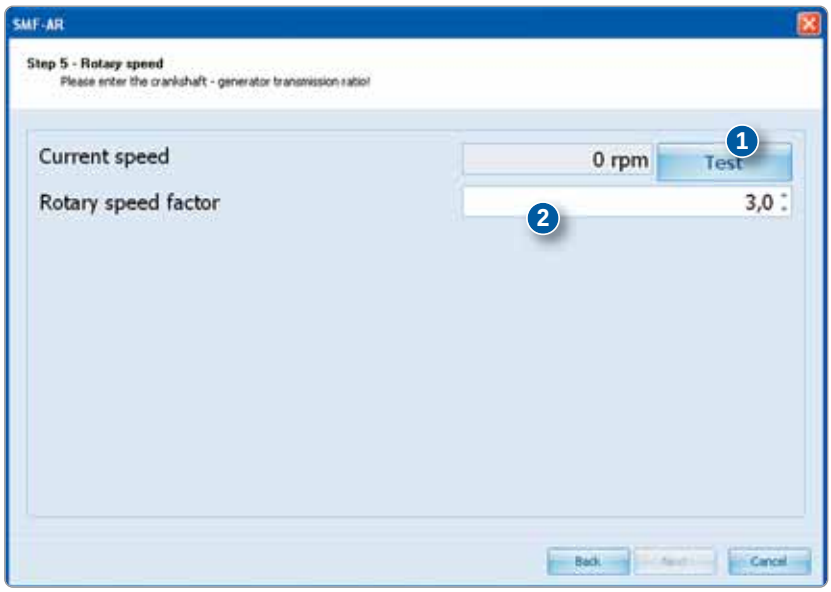
> A configuration that is required for continued application of the system is then uploaded. The next step is to enter the engine speed factor.



Configuring the SMF®-AR System

> After entering the speed factor, start the engine. Click the [**Test**] button (1) to update the engine speed value. If the value displayed here is the same as the actual engine speed, you can switch the engine off. The ignition must be left switched on for the next steps. Click **[Next]** to continue.

> The system can be calibrated with the actual engine speed by changing the speed factor (2).

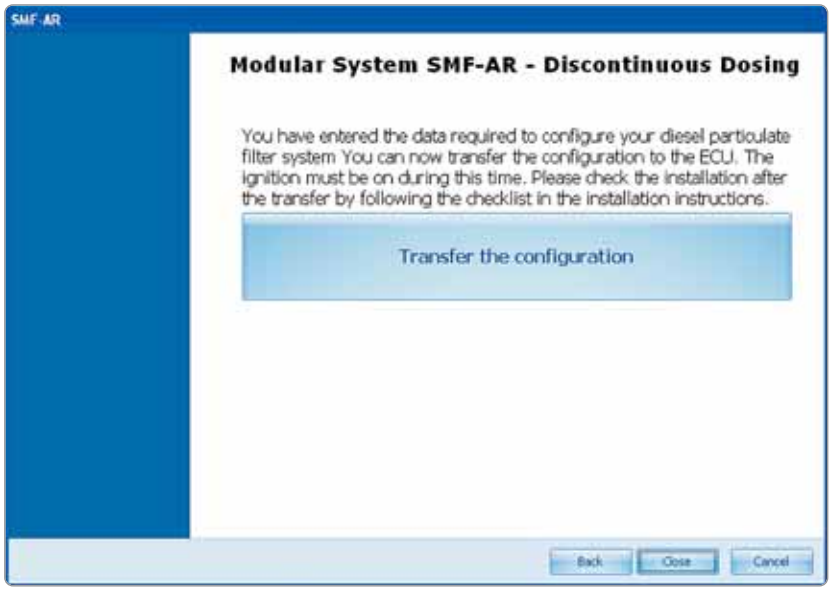


Uploading the data record

> In the next step, the data configured are uploaded to the ECU. The configuration file can also be saved for later use.

> The pdf file created serves as confirmation of the system having been installation and it is to be kept with the workshop documents. This report must be sent to HJS together with the installation certificate.

> Quit system configuration by clicking **[Close]**.



Drawing up the tank curve of the SMF®-AR system

To make sure that the concentration of the additive in the tank is correct and that the required amount of additive can be dosed when filling the vehicle with fuel, a tank curve must be drawn up, i.e. recorded by taking individual part measurements (max. 15 reference points). During configuration of the ECU, it is possible to save several files.

Note about file extensions:

***.hjstkw :**	Tank curve
***.hjssmw :**	Vehicle data + tank curve
***.hjssmw.kbf :**	Configuration file (incl. vehicle data + tank curve)
***.pdf :**	Installation report containing all information entered to facilitate subsequent tracing

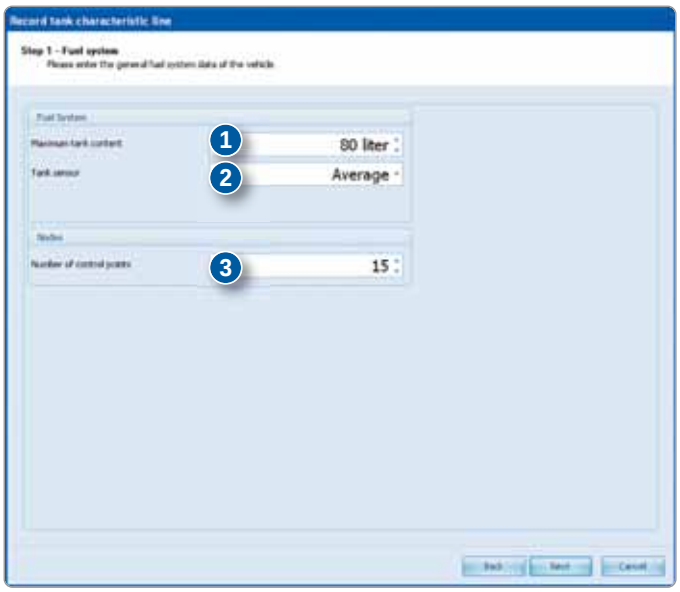
Drawing up the tank curve

The fuel tank must be empty in order to be able to draw up the tank curve!

> Switch on the vehicle's ignition.
> Click the **[Application]** button (1).
> The connection to the HJS ECU is set up.
> Select **[New Tank characteristic line]** (2).

Step 1 – Entering the fuel system parameters

> Enter the maximum tank capacity (1) (see User's Manual, filling station bill or estimate)
> Enter whether the original tank sensor (2) is to be used or an extra tank sensor is to be retrofitted.



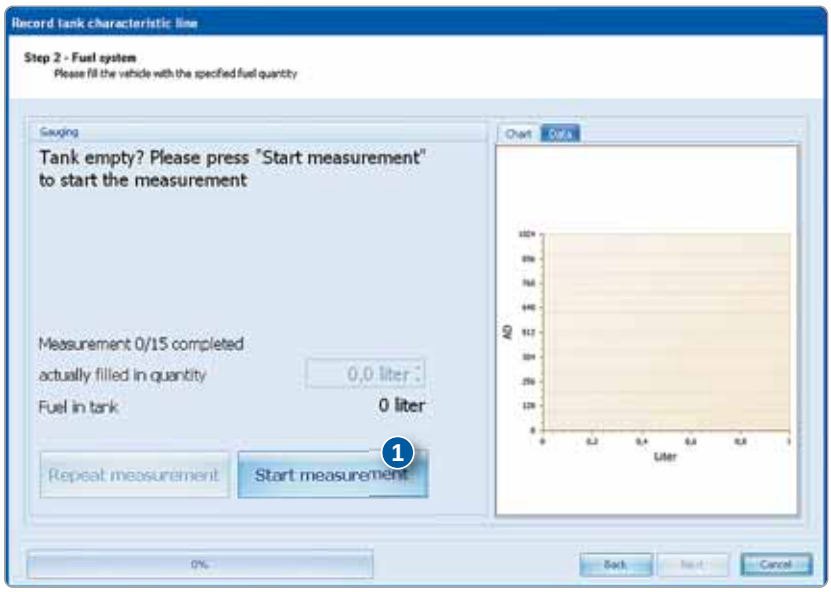
If a retrofitted tank sensor is to be used, the short cable of the cable harness must be used (see system circuit diagram).

> The more reference points are used to record the tank curve, the more precise the system will be able to detect how much fuel is added to the tank and how much additive must be dosed. The default reference points "Tank empty" and "Tank full" must be added to the number of part measurements, i.e. in the example in the screenshot opposite:
13 part measurements of 10 litres each + 2 default reference points = 15 reference points

Drawing up the tank curve of the SMF®-AR system

Step 2 – Litering out

> Select **[Start Measurement]** (1).



Step 2 – Litering out

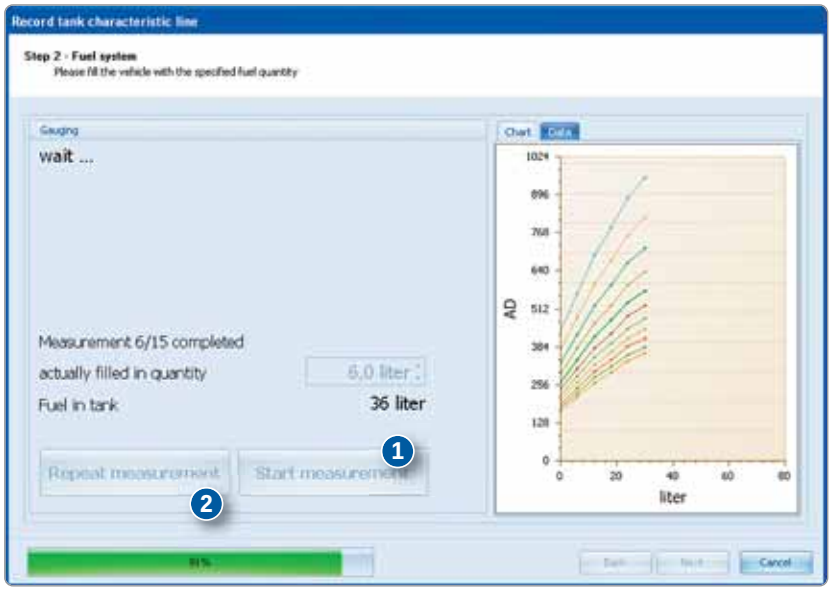
> The volumes of fuel to be poured in are calculated on the basis of the reference points and maximum tank capacity entered.

Sequence after the first reference point:

1. Pour in fuel.
2. Change the "actually filled in quantity" as necessary.
3. Click **[Start Measurement]** (1) – the tank level reading is updated.
4. Repeat the above steps until the tank is full.

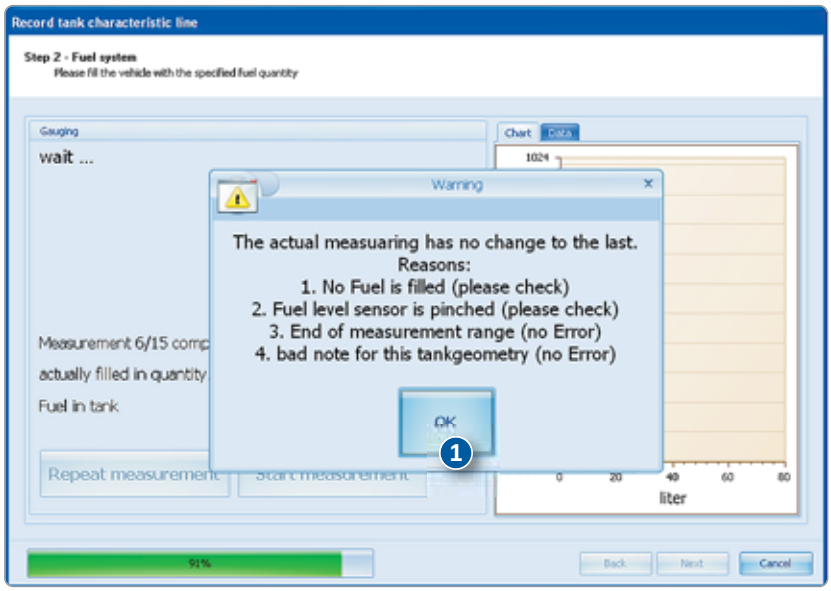
> In the event of a measuring error, the tank level measurement in progress can be repeated by clicking **[Repeat Measurement]** (2).

> The different curves displayed describe the amplification factor calculated by the software and used to process the signal.



Remark about Step 2

> If point 3. or 4. in the warning message displayed opposite is true, you can continue the measurement procedure by clicking **[OK]** (1).

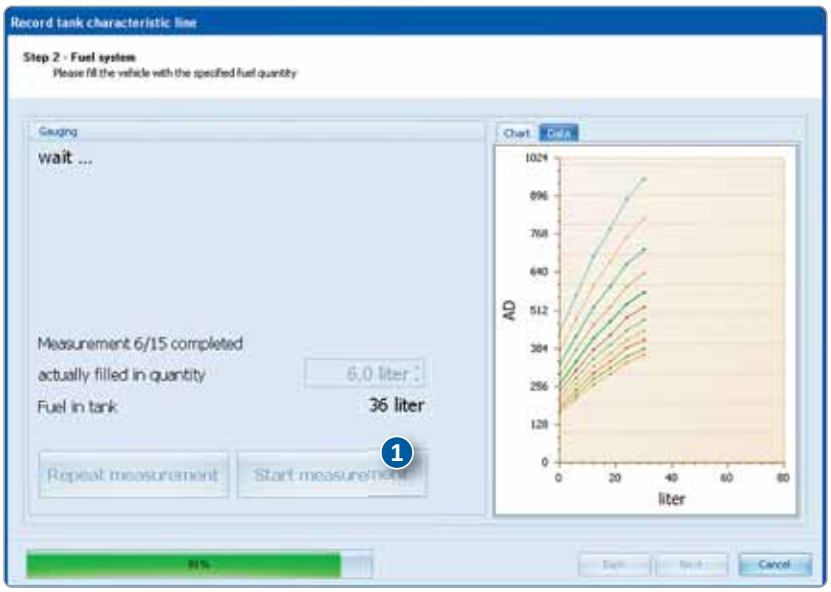


Drawing up the tank curve of the SMF®-AR system

Step 2 – Litering out

> If the tank is already completely full before the maximum number of litres entered is reached, you can end the measurement sequence by clicking **[Next]**.

> If the tank is not completely full when the maximum number of litres entered is reached, you can continue the measurement sequence by clicking **[Start Measurement]** and extend it by any number of reference points (up to a maximum of 15). When the measurement sequence is completed, click **[Next]** to finish recording the tank curve.

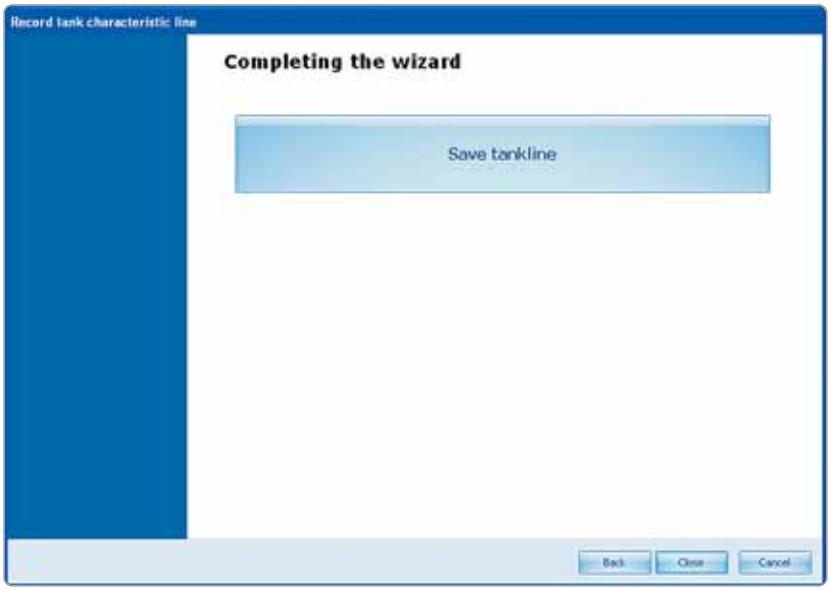


Saving the tank curve

> The tank curve recorded must be saved. We recommend you use e.g. the vehicle model name or the tank serial number for the file name. This file can also be used for other applications as long as the tank size, tank geometry and tank sensor are identical with those of the application configured.

> Save by clicking **[Save tankline]**.

> Click **[Close]** to continue.



Using Saved System Configuration Files

> Once you have drawn up a tank curve and entered the vehicle data, the files can be used for other applications.

Vehicle configuration 1

Valid for vehicles with identical engine and tank size:

> Select **[Update HJS ECU]**.
> Click "Select File".
> Upload the *.hjssmw.kbf file.
> Check the plausibility of the actual values (see section entitled "Checking and Putting the System Configuration Into Service").

Vehicle configuration 2

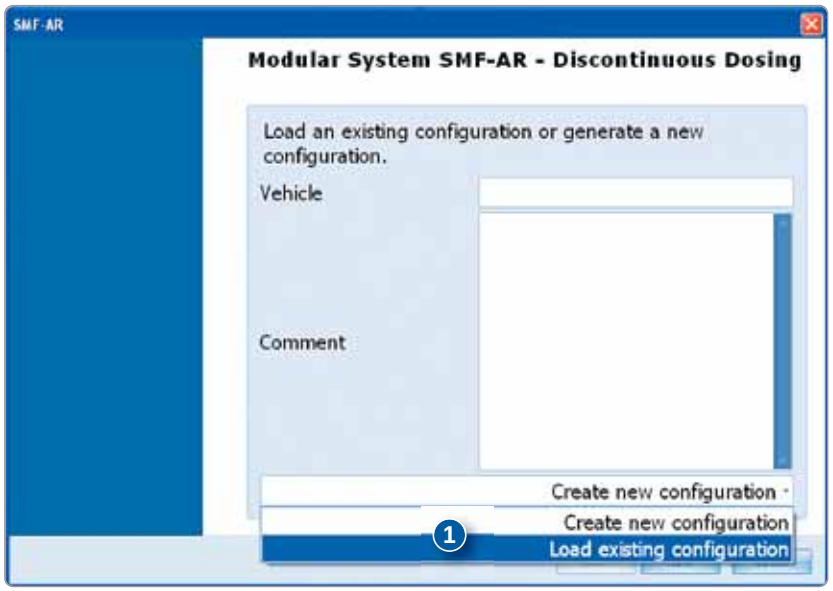
Valid for vehicles with identical engine but different tank size:

> Select **[Modular System SMF-AR – Discontinuous Dosing]** (1).

Vehicle configuration 2

Valid for vehicles with identical engine but different tank size:

> Click **[Load existing configuration]**.
> Upload the *.hjssmw file (all data are uploaded).

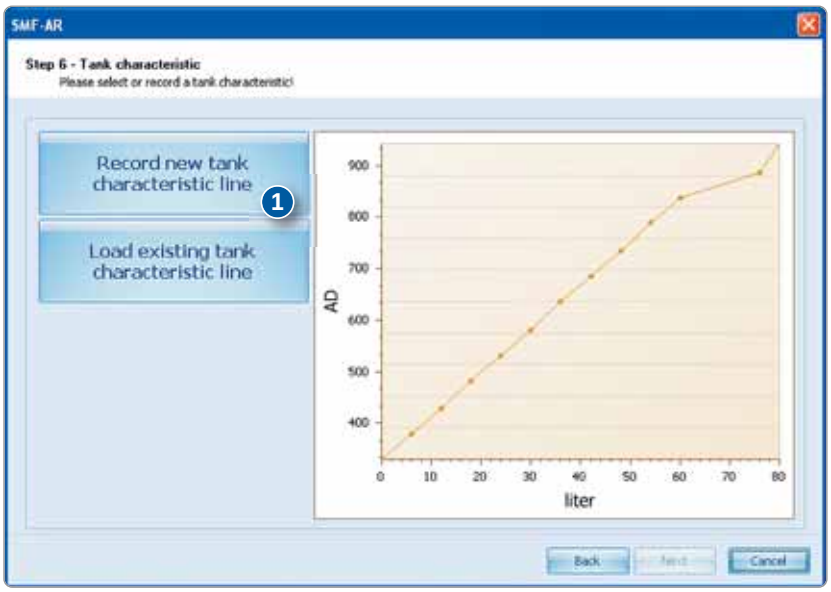


Using Saved System Configuration Files

Vehicle configuration 2

Valid for vehicles with identical engine but different tank size:

> In Step 6, the previous tank curve is displayed. You now have to draw up (record) a new tank curve (1).



Vehicle configuration 3

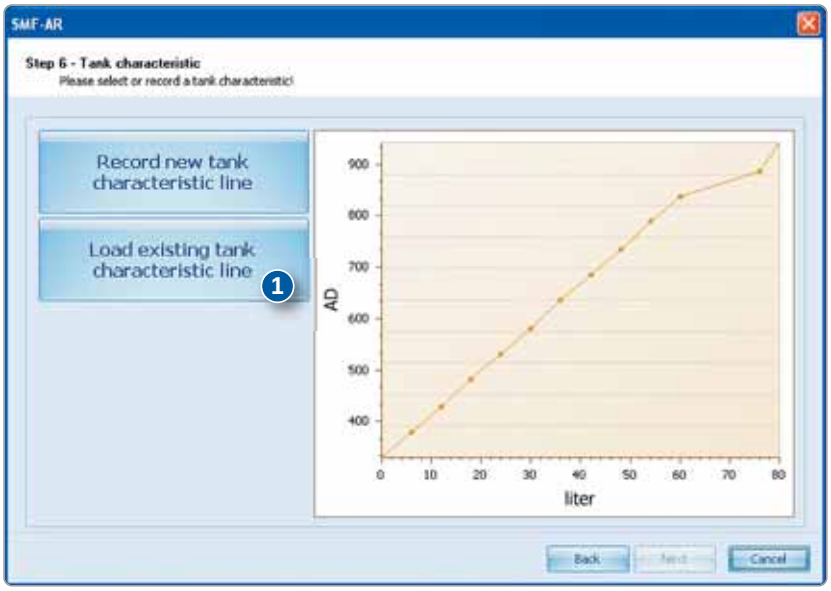
Valid for vehicles with identical tank size but different engine:

> Select **[Modular System SMF-AR – Discontinuous Dosing]**.

> First of all, you have to enter all the new data for the different engine.

> When you reach Step 5, click the **[Load existing tank characteristic line]** button (1) and upload the *.hjstkw file.

> **[Next]** to continue.



Intelligent Continuous Dosing (IKD)

General information

In the case of Intelligent Continuous Dosing, or IKD (from the German) for short, the additive required to enable the SMF®-AR system to operate is dosed (injected) continuously into the diesel return line of the engine. From here, it then flows into the fuel tank and mixes with the diesel. The additive, together with the diesel, is then injected into the engine's combustion chambers where it is combusted along with the diesel and lowers the temperature at which particulate matter ignites to a level necessary for the filter system to function. Unlike the system with discontinuous dosing, the concentration of the additive in the diesel fluctuates for reasons inherent to the system. For this reason, a discontinuous dosing system (see section entitled "Drawing up the tank curve of the SMF®-AR system") should be preferred over a continuous dosing (IKD) system. In some cases, the noise made by the dosing pump while it is operating may be audible.

In order to ensure that the system is always operated with an optimum concentration of additive, the operating behaviour of the vehicle and filter is evaluated by the ECU and the additive concentration adjusted to the respective conditions. The parameters required for correct operation of the filter can be parameterised in the ECU with the aid of the diagnostics software. A wizard helps you set the necessary values. Please be exceedingly conscientious and careful when setting these parameters. If you enter incorrect values, this can cause damage to the filter system and the vehicle. If you are ever uncertain about what values to enter, please contact your local sales partner so that they can put you in contact with our Technical Support people, who will ensure that you don't make any errors when setting up the system.

Information about continuous dosing

> If an application is not equipped with a tank sensor, the tank sensor installed cannot be used or it is not possible to install an additional tank sensor, use of the Intelligent Continuous Dosing (IKD) system is subject to limitations. In this case, the ECU doses the additive in proportion to the fuel consumption level set (in l/h). The ECU can decrease or increase the dosing rate depending on the filter load (exhaust backpressure) and success of regeneration.

Comment:
Continuous dosing should only be used in consultation with HJS, because this strategy is complex and demands experience and empirical values.

Advantages of IKD
> No need for a tank sensor signal or to install a tank sensor.

Disadvantages of IKD
> The exact level of fuel consumption (in l/h) is required to be able to set the dosing rate. This value frequently varies and is very difficult to acquire.
> Not suitable for machines with changing fuel consumption levels.
> Overdosing shortens the intervals between servicing (due to additive ash).

Preconditions and specifications for the use of HJS Intelligent Continuous Dosing (IKD)

The HJS ECU must have software release 1.7.8 or higher installed.

See the sticker affixed to the HJS ECU.

> To guarantee optimum dosing of additive, the values that influence the amount of additive added to the fuel must be entered precisely in l/h. If you enter too high a level of fuel consumption, the intervals at which the additive must be topped up and the filter serviced will be significantly shortened. If you enter too low a level of fuel consumption, there is a risk of the resulting inadequate additive dosing rate preventing the system from regenerating at all.
> Changes in the level of fuel consumption (due to changing drivers, different driving behaviour or changing the application of the vehicle) can influence the concentration of additive in the fuel tank and should therefore be avoided. The customer must be informed of the fact that differing operating and application profiles of the vehicle can lead to problems in respect of the amount of additive added to the fuel.
> To ensure a consistent and optimum additive-fuel ratio, the amount of diesel fuel added each time the fuel tank is topped up should always be small (i.e. fill up often). The vehicle operator should be instructed to ensure this strategy is followed.

If you have any doubt regarding compliance with the above-mentioned preconditions and specifications when installing a SMF®-AR/FBC system, HJS advises against configuring an application to operate with Intelligent Continuous Dosing.

Intelligent Continuous Dosing (IKD)

Setting up IKD

> The SMF®-AR system should now already be fully installed and connected up. If you look in the Installation Guidelines, you will find a checklist you can use to check that you can have carried out the installation procedure completely and properly.
> Please connect your computer to the ECU by means of the diagnostics cable and switch on the vehicle's ignition in order to supply the ECU with power.
> Click the **[Application]** button (1).
> The connection to the HJS ECU is set up.

Setting up IKD

> To program the HJS ECU, select **[Modular SMF®-AR – Intelligent Continuous Dosing]** (2).
> Enter the vehicle data, e.g.:
• Year of construction
• Vehicle Identification Number

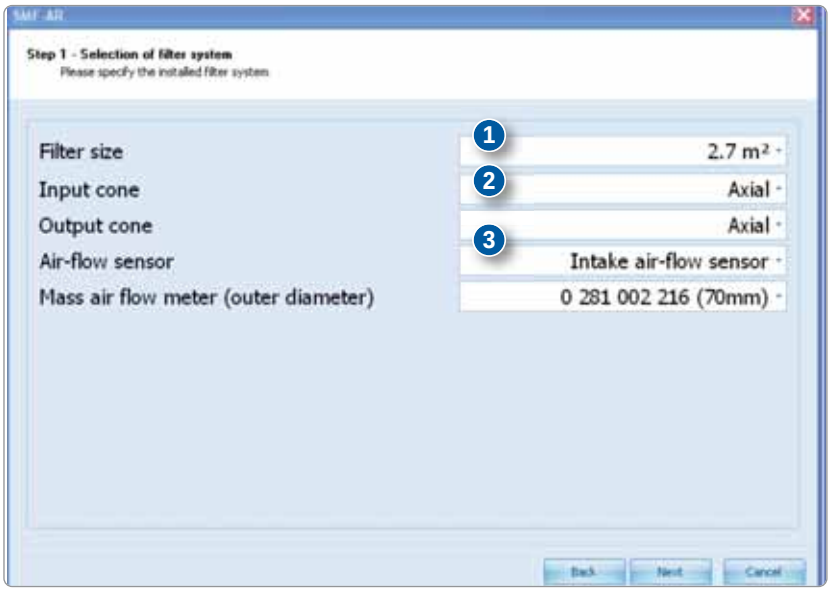
Note the following variants of mass flow sensor under Step 1: air mass flow meter **or** HJS Exhaust Flow Sensor (HJS EFS)

Step 1 – Selecting the filter system (Variant with **air mass flow meter)**

> Enter the "Filter size" (1) used, the type of inlet and outlet tapers (2) installed and "Air mass flow meter" (3).

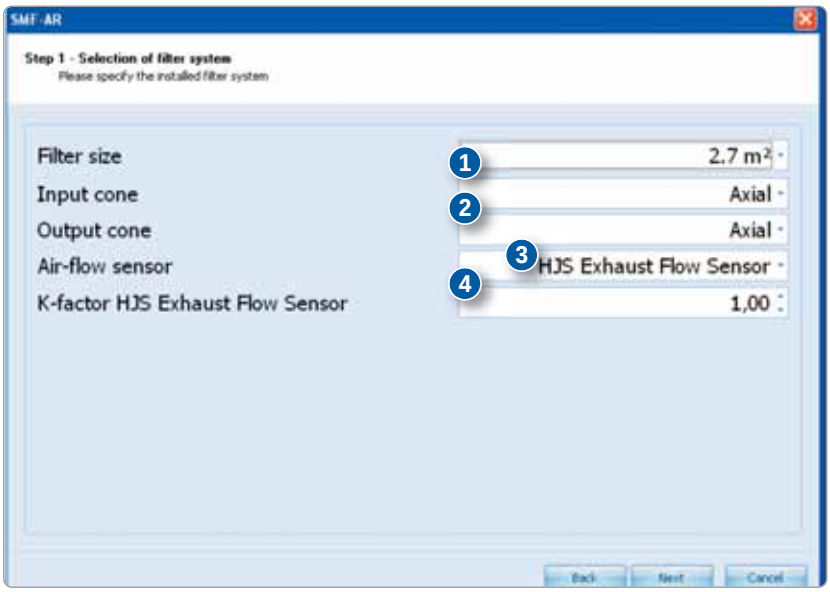
Step 2 – Entering the engine data (no screenshot)

> Enter the engine data.



Intelligent Continuous Dosing (IKD)

Step 1 – Selecting the filter system
(Variant with **HJS Exhaust Flow Sensor**)



The HJS Exhaust Flow Sensor (3) is only supported by control units with software version 1.11.9 or higher!

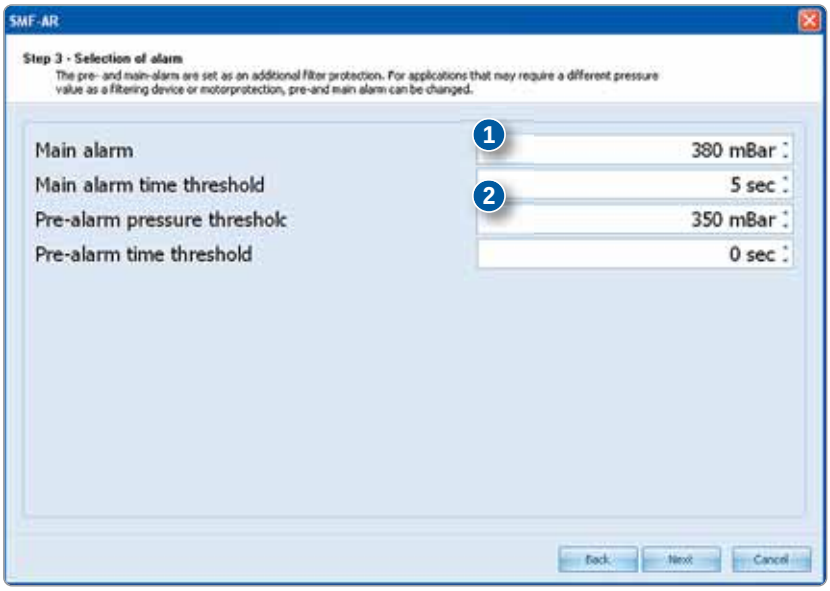
> Enter the "Filter size" (1) used, the type of inlet and outlet tapers (2) installed and "HJS Exhaust Flow Sensor" (3).

> If the HJS Exhaust Flow Sensor is being used, an additional k-factor must be entered (4) that is embossed on the primary element.

Step 2 – Entering the engine data (no screenshot)

> Enter the engine data.

Step 3 – Selecting the alarm



> When dimensioning the SMF®-AR system, your supplier specified the maximum permissible exhaust backpressure as the main alarm threshold based on the engine manufacturer's specifications and the size of the filter. This value must be entered in the box next to "Main alarm" (1). The time threshold for "Main alarm" and "Pre-alarm" must be set to at least 5 seconds.

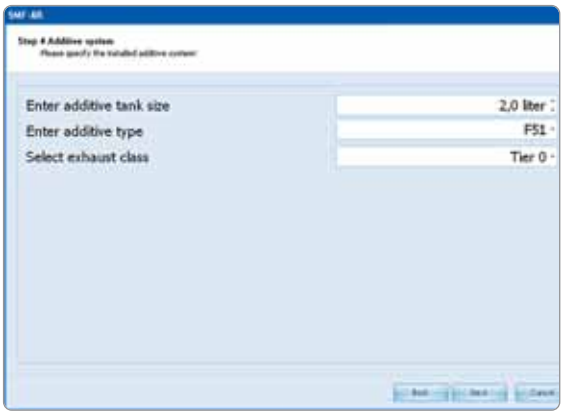
The "Main alarm" value must always be coordinated with the engine manufacturer's specification with respect to the filter size!

Pre-alarm (2): approx. 90% of the main alarm value

Step 4 – Additive system

> Enter the additive tank size and additive type.

> Select the emission class.



Emission class

If you are not able to ascertain the vehicle's emission class in line with EU Non-road Directive 97/68/EC, you can select "unknown" from the options list for this parameter. The vehicle will then be operated with the maximum additive concentration approved by the manufacturer of the additive. If possible, then, please do your very best to ascertain the emission class of the vehicle in which you are installing the system. As a rule, it is stated in the vehicle's registration documents. Please also make sure that the vehicle in question actually complies with the emission class specified for it. Vehicles whose mode of operation is highly dynamic are prone to exceeding the permissible emissions limits applicable to them. Furthermore, the emission class in a number of stages in emissions legislation relates to the condition of the vehicle or machinery when new. Only as of Stage IIIA does compliance with the specified limits have to be assured over a certain period of time. This can lead to too little additive being added to the fuel, which in turn can cause damage to the filter system and vehicle.

Intelligent Continuous Dosing (IKD)

Step 5 – Fuel system

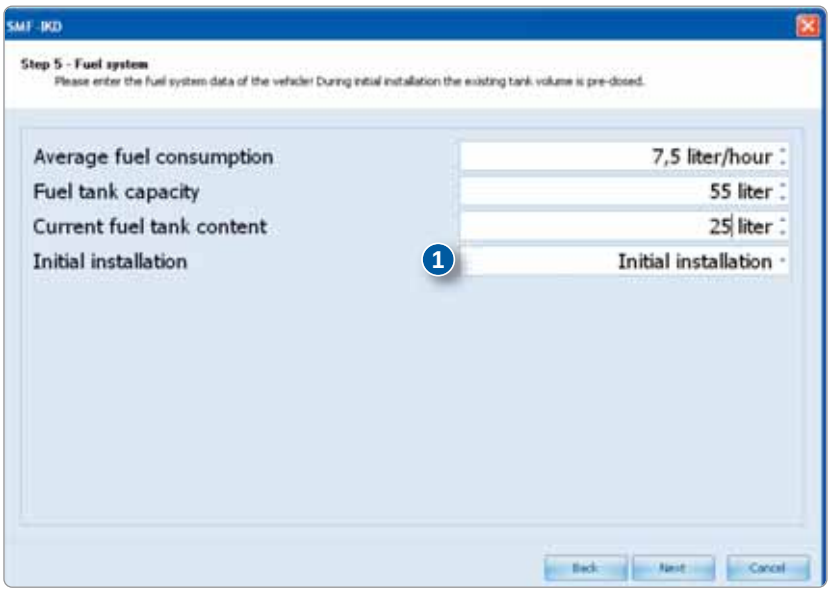
The average fuel consumption is one of the key parameters for IKD. Please enter as accurate a figure as possible. Speak with the vehicle operator at length in order to ensure you have accurate data.

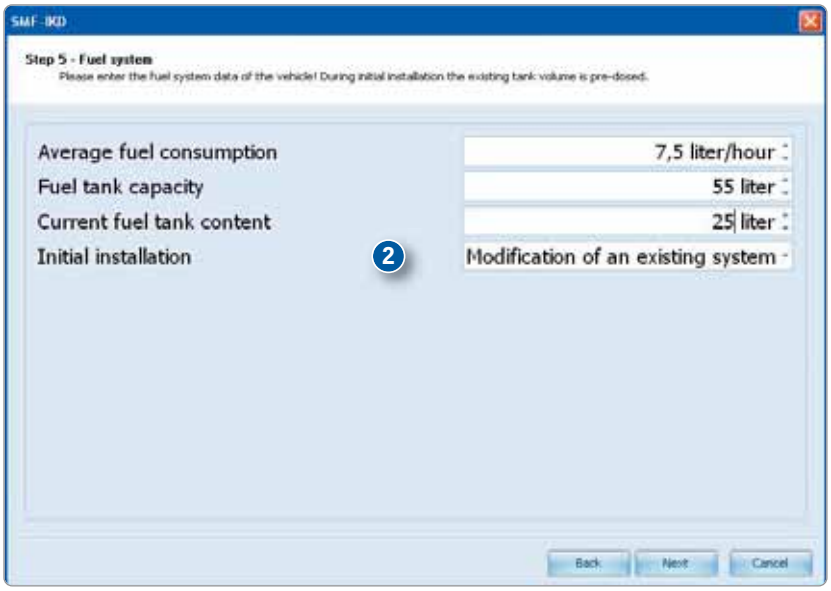
If the level of consumption fluctuates massively during the operating period, we advise against using IKD.

> We recommend that you fill up the diesel tank as full as possible prior to beginning installation. Select whether the installation work being carried out is a "First-time installation" (1) or a modification of an existing system. In the case of a first-time installation, an appropriately calculated quantity of additive is pre-added to the fuel in the tank.

If you do not add an initial quantity of additive before installing a new system, you could end up causing damage to the filter system and the vehicle!

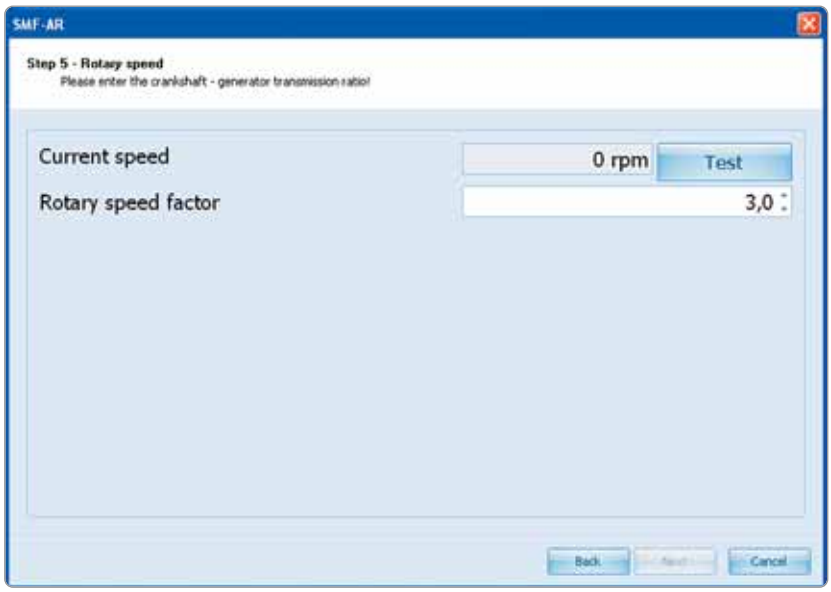
> If you are modifying a SMF®-AR system with discontinuous dosing to a system with intelligent continuous dosing (IKD) and the diesel in the fuel tank already has additive added to it, the type of installation you are performing is a modification to an existing system. If you want to change the data of an existing system, e.g. the average fuel consumption, you do not need to add any more additive as an initial dosing.
> Select "Modification of an existing system" (2).





Intelligent Continuous Dosing (IKD)

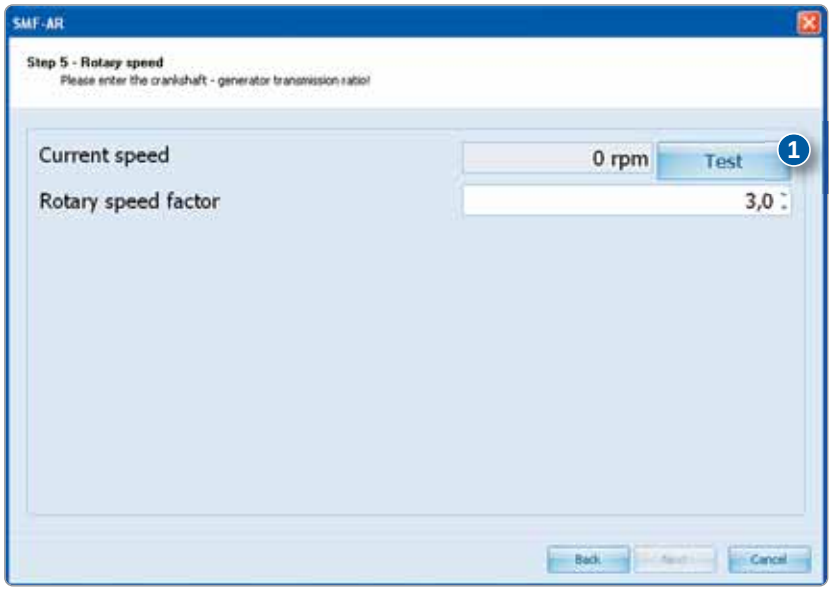
Step 6 – Engine speed (Up to control unit version 1.7.8)



> Because the HJS cable harness is connected to the winding of the alternator (terminal W), the engine speed variable has to be adjusted to match the respective diameter of the alternator pulley. This is based on the ratio of the alternator pulley to the crankshaft pulley:

$$\frac{\text{Ø alternator}}{\text{Ø crankshaft}} = \text{„speed factor“}$$

> After entering the speed factor, start the engine. Click the [**Test**] button (1) to update the engine speed value. If the value displayed here is the same as the actual engine speed, you can switch the engine off. The ignition must be left switched on for the next steps. Click **[Next]** to continue.

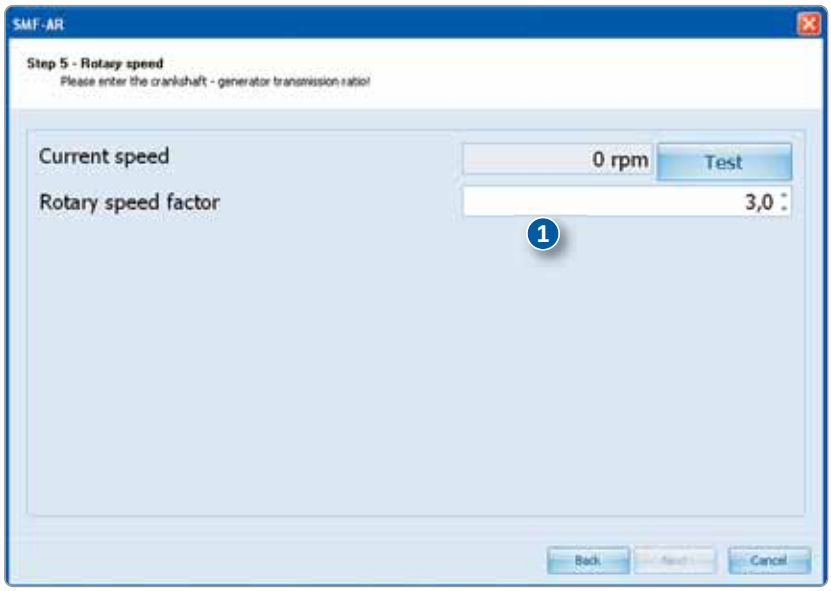


An engine speed of at least 650 rpm must be set for the engine running detection function of the HJS ECU.

Remark about Step 6

> The system can be calibrated with the actual engine speed by changing the speed factor (1).

Later adjustment of the engine speed



Applies only for configurations already set! Applies only for control units up to version 1.7.8!

> The speed factor can still be changed even after the ECU has been configured. To do this, the configuration program can be run through up to Step 6 without having to enter any of the data (Steps 1 to 4) again. You can then change the speed factor (1). Click **[Cancel]** to adopt the speed factor.

Do not upload a new data record!

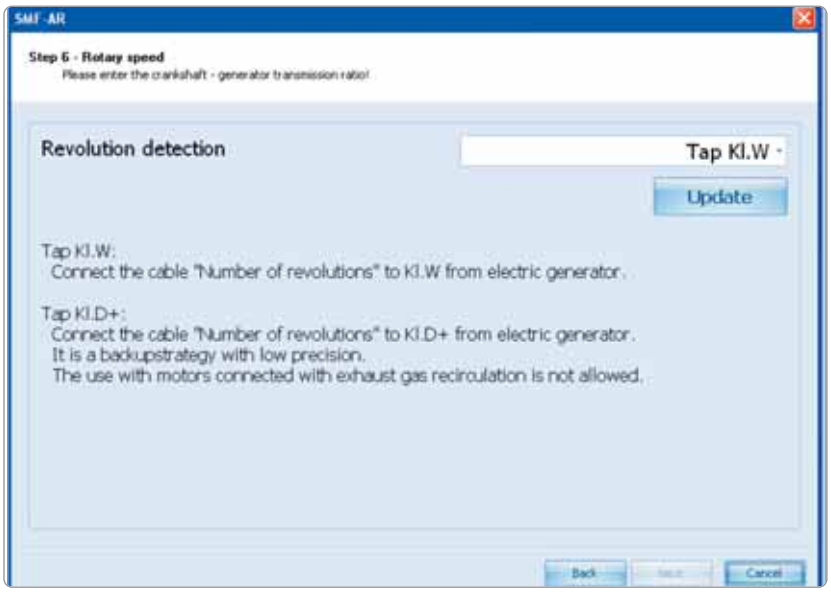
Intelligent Continuous Dosing (IKD)

Step 6 – Engine speed
(Control unit version 1.11.9 or higher)

If the control unit connected has software version 1.x.9, you can choose between two different methods for measuring the engine speed:

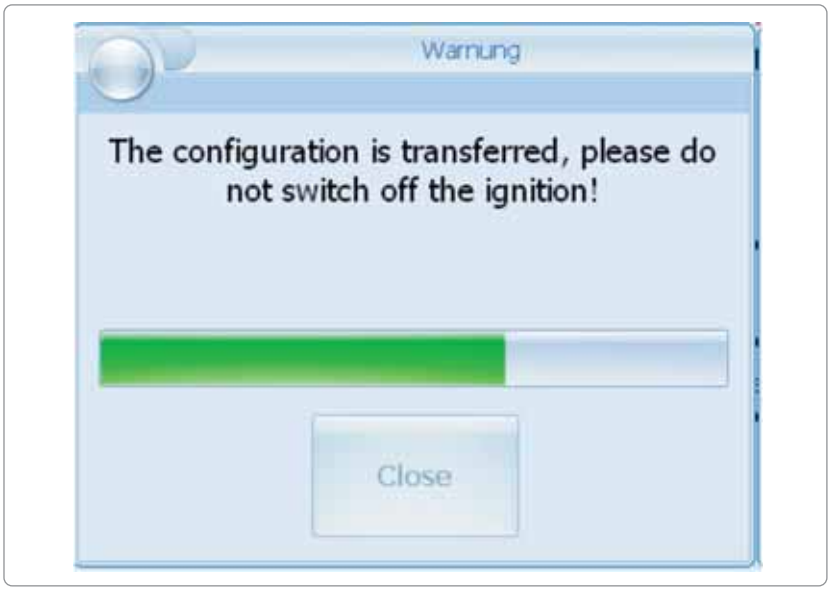
Tapping at term. W
> The engine speed is tapped from terminal W of the alternator.

Tapping at term. D+ (alternative strategy)
> The HJS "Speed" cable is connected to terminal D+ of the alternator. In this case, the engine speed is tapped from the mass flow meter (LMM/EFS).



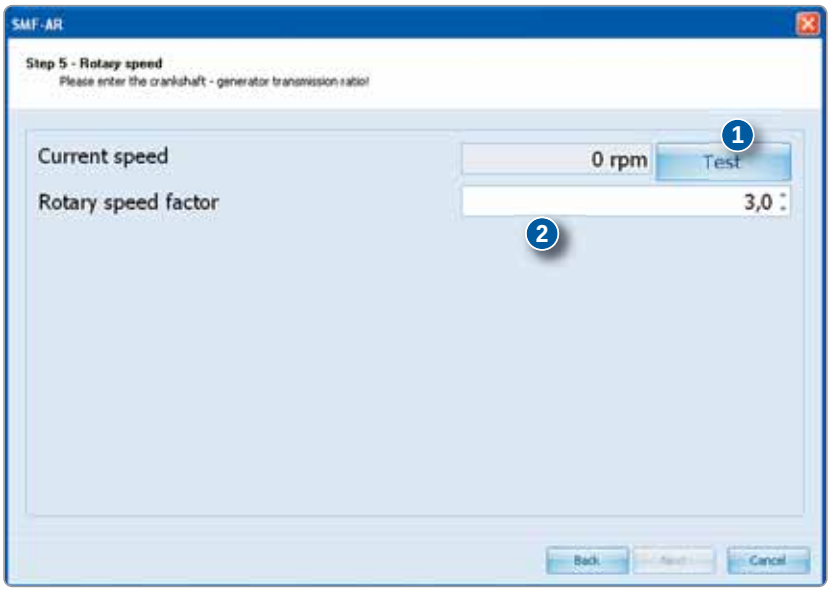
> After selecting the method for tapping the engine speed, click the **[Update]** button.

> A configuration that is required for continued application of the system is then uploaded. The next step is to enter the engine speed factor.



> After entering the speed factor, start the engine. Click the [**Test**] button (1) to update the engine speed value. If the value displayed here is the same as the actual engine speed, you can switch the engine off. The ignition must be left switched on for the next steps. Click **[Next]** to continue.

> The system can be calibrated with the actual engine speed by changing the speed factor (2).



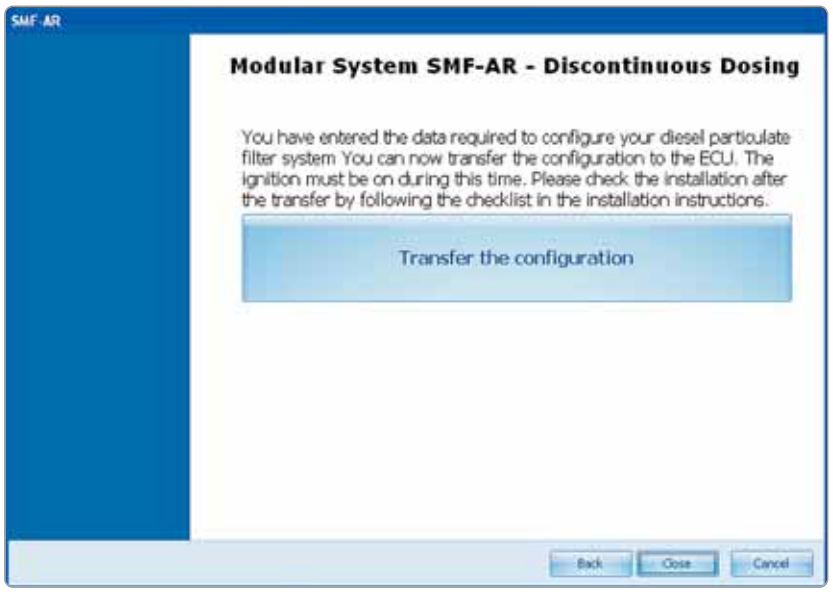
Intelligent Continuous Dosing (IKD)

Uploading the data record

> In the next step, the data configured are uploaded to the ECU. The configuration file can also be saved for later use.

> The pdf file created serves as confirmation of the system having been installation and it is to be kept with the workshop documents. This report must be sent to HJS together with the installation certificate.

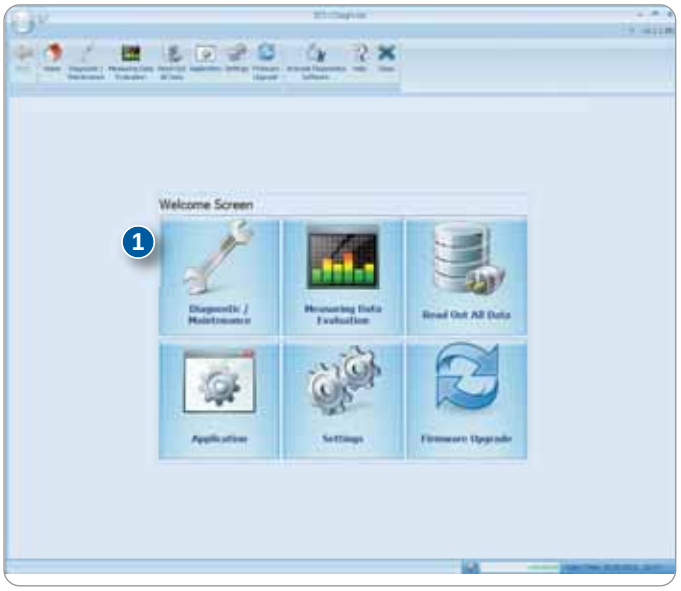
> Quit system configuration by clicking **[Close]**.



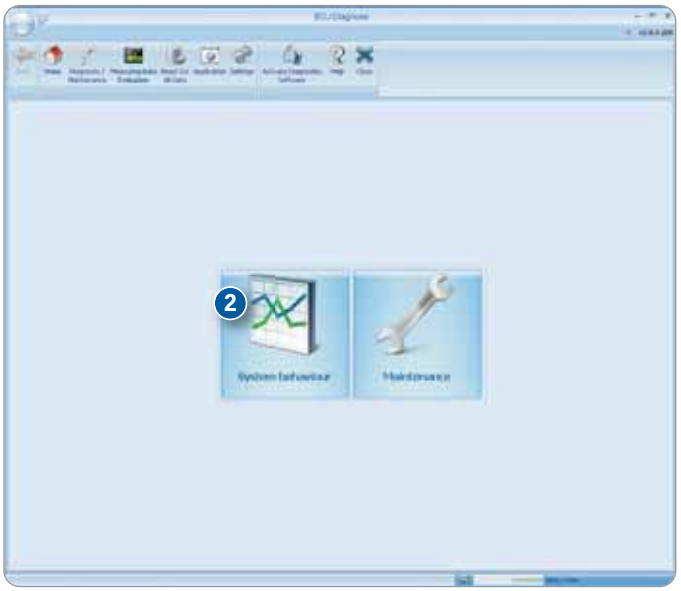
Checking and Putting the System Configuration Into Service

> Finally, you have to check the system configuration of the ECU to make sure it is plausible.

> Click the **[Diagnostics / Maintenance]** button (1).



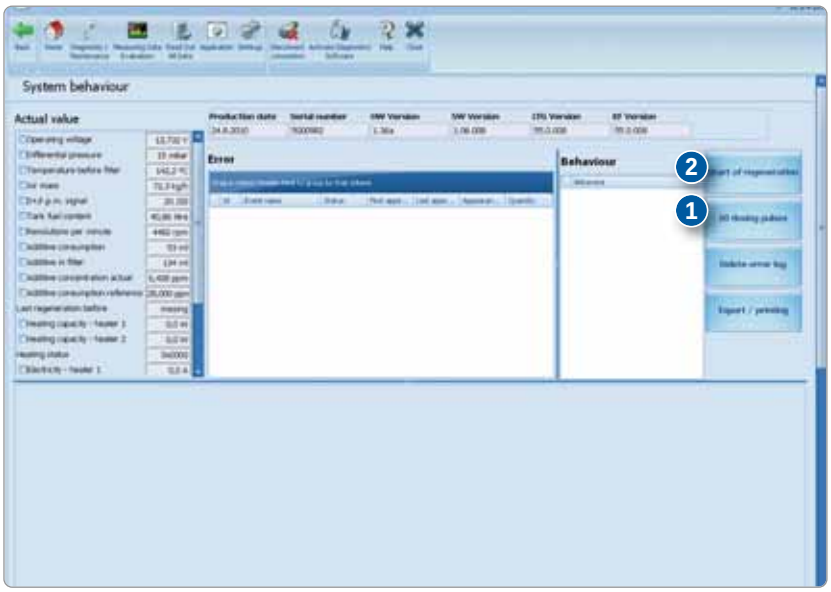
> Click the **[System behaviour]** button (2).



Checking and Putting the System Configuration Into Service

> You can view and examine all the values of the system in the "Actual Values" list.
Check the plausibility of the system as follows on the basis of the actual values:

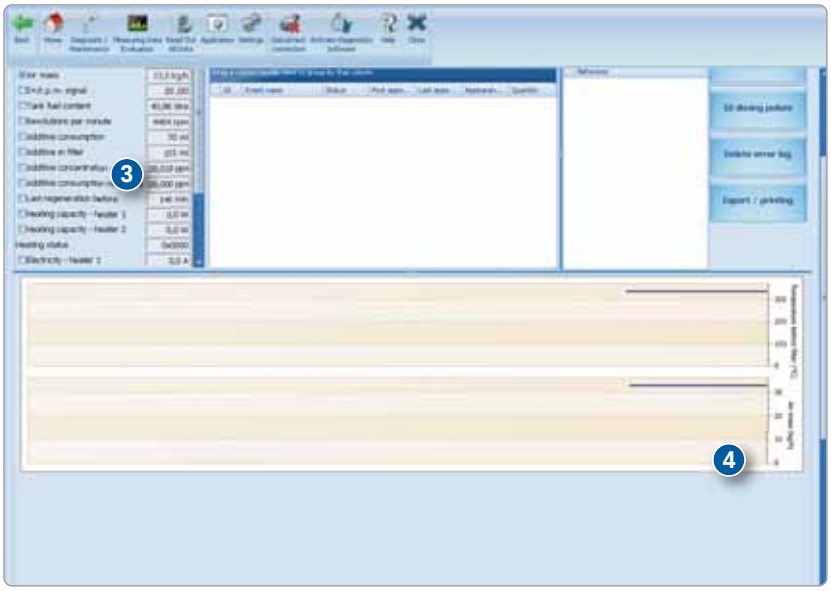
- Check the tank level. (Not for IKD)
- Check the additive consumption level (consumption of additive must rise after the engine is started).
- Check the main and pre-alarm thresholds.
- Check that the dosing pump is functioning properly by clicking the **[10 Dosing Pulses]** button (1).



Perform only when a new filter has been fitted:

> Click the **[Start of regeneration]** button (2) to activate the heater circuits of the system. While these circuits are active, check the "Heating output" and "Heating current" readings for the two heater circuits:
12-V system: values between 400 and 500 W
24-V system: values between 900 and 1100 W

> If readings are displayed that are implausible, you must repeat programming of the ECU.



Incorrect litre readings under "Tank level" are usually the result of incorrectly drawn-up tank curves. In a configuration with Intelligent Continuous Dosing (IKD), no tank level is specified.

> If you select a value under (3), the data you have selected are displayed as a value/time graph (4).

Checklist After Installing the SMF®-AR System

SMF®-AR filter unit

> Check the heater cable is properly connected to the cable harness.
> Check the temperature sensor is properly connected to the filter and cable harness.
> Check the differential pressure sensor is properly connected.
> Check the pressure measuring point is properly connected to the filter unit.
> Check the system is properly mounted and secured.
> Check the pipework is properly connected.
> Check the exhaust system is air-tight.
> Check the earthing strap is properly connected to the filter and vehicle.

Differential-pressure and exhaust-gas temperature sensors

> Check that there are no kinks in the pressure hoses to the differential pressure sensor.
> Check the pressure hoses are installed with a constant downward gradient from the pressure sensor to the measuring point.
> Check the differential pressure sensor is properly connected.
> Check the pressure measuring point upstream of the filter is connected to "HI" on the differential pressure sensor (8 mm hose).
> Check the pressure measuring point downstream of the filter is connected to "REF" on the differential pressure sensor (6 mm hose).

Additive dosing system

> Check the tank is fixed securely and properly installed in the vehicle.
> Check the entire additive hose line is free of kinks, fixed securely, is not rubbing against anything and is tight.
> The additive dosing system may be operated only with additive F-51 approved by HJS.
> Check whether the additive tank is full (read the hazard warnings concerning the additive).
> Check the additive line is properly connected to the fuel return line.

Cable harness

> Check all cables to ensure they are not rubbing against body or engine components.
> Check all plug connections of the cable harness are properly connected.
> Check the insulation on the cable harness (short-circuit-proof).
> Check the fuses.

ECU

> Check the ECU is fixed properly and securely installed in the vehicle.
> Check the connector on the ECU is properly connected.

General information

Check you have carried out installation correctly:
> Check all cables to ensure they are not rubbing against the bodywork of the vehicle, are adequately shielded from heat and short-circuit-proof.
> Make sure all pressure, fuel and additive hoses are free of kinks.
> Check all installed components and all vehicle components affected by installation of the system to ensure they are properly secured.
> Reconnect the battery and check the fuses.
> Carry out a trial run.
> Check for leaks and make sure the pipes have been run properly.
> Fill in the installation certificate.
> Instruct the customer on how to use the system.

Checklist After Installing the SMF®-AR System

Checklist for System Configuration

> Connect the diagnostics cable.

> Switch on the ignition; the indicator lamps must light up for approx. 10 seconds every time you switch on the ignition (check that they do). The time lag lasting approx. 2 minutes must expire before you can check again.

> The additive line is vented the first time the ignition is switched on after the system has been installed.

> Start the HJS diagnostics program.

> Select **[Diagnostics / Maintenance]**.

> Select **[System Behaviour]**.

> Execute the **[Delete Fault Memory]** command.

> If fault messages are displayed, follow the prompted troubleshooting instructions by double-clicking the respective fault message.

> Start the engine.

> Check the actual/specified levels of the additive.

> Execute the **[10 Dosing Pulses]** command, listen for audible confirmation of the pulses and observe the measured values to make sure the pulses are being sent.

> Execute the **[Start Regeneration]** command.

> Under "Actual Values", check the "Output heater 1" and "Output heater 2" values.

12-V system: values between 400 and 500 W

24-V system: values between 900 and 1100 W

> Check the "Engine speed" value (at idle speed = approx. 800 rpm)

> Check the "Differential pressure" value (at idle speed = 0 – 10 mbar).

> Rev the engine up to its governed (max. no-load) speed. Check the "Engine speed" value (should correspond to governed speed of engine).

> Check the "Differential pressure" value (must be higher at governed speed than at idle speed).

> Check the tank level.

> End the connection.

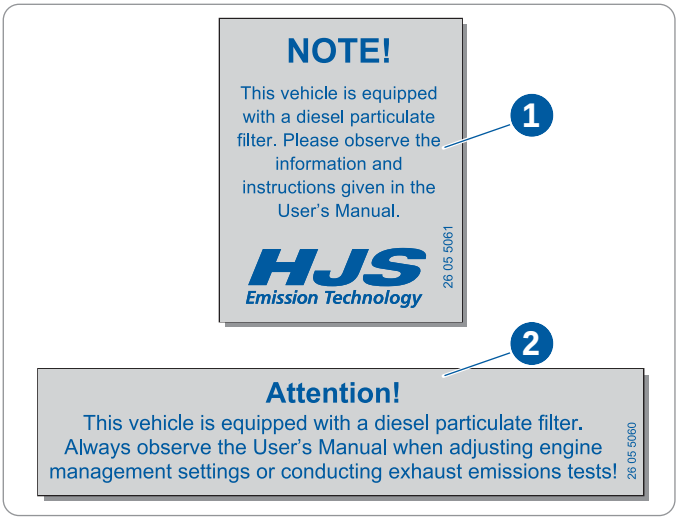
> Switch off the engine and ignition.

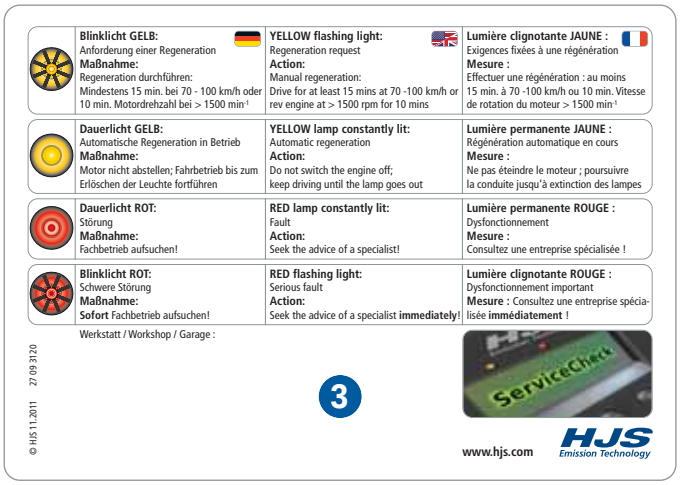
> Disconnect the diagnostics cable.

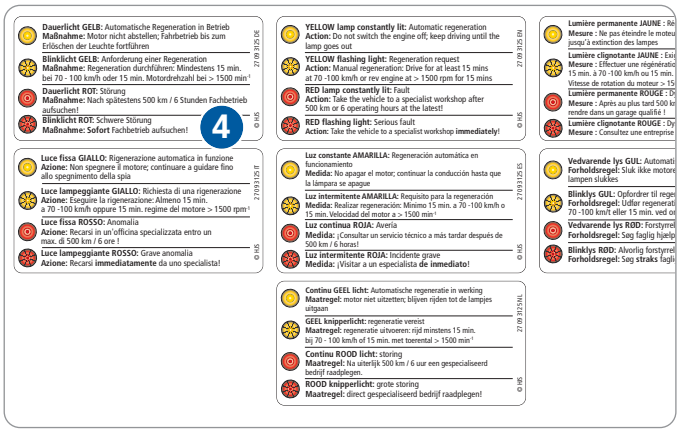
> Reconnect the HJS ServiceCheck to the diagnostics connector of the cable harness.

Information for the user

> Add the SMF®-AR User's Manual to the other vehicle documents and keep in a safe place.
> After carrying out servicing work, fill in the service history section of the Maintenance Manual.
> Affix the system stickers inside the cockpit (1) and the engine compartment (2).
> Stow the Quick Reference card (3) inside the vehicle, somewhere where the owner/driver can find it quickly.
> Peel off the Quick Reference sticker (4) and affix it near the Service-Check display module.







www.hjs.com

HJS Emission Technology GmbH & Co. KG is a medium-sized company based in Menden in central Germany and has 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, commercial vehicles as well as a wide range of non-road mobile machinery and stationary applications.

In addition to systems for spark-ignition engines, HJS today focuses on solutions for diesel engines – especially for reducing the emissions of soot particles (PM) and nitrogen oxides (NO_X). With extensive patents for DPF® (diesel particulate filter) and SCRT® (Selective Catalytic Reduction Technology) systems, HJS sets benchmarks.




HJS technology portfolio for OE and retrofitting

> Diesel Particulate Filters (DPF®)
Reduction of soot-particle emissions (PM)

> SCR-Systems
Reduction of nitrogen-oxide (NO_X) emissions

> SCRT®-Systems
Simultaneous reduction of soot-particle (PM) and nitrogen-oxide (NO_X) emissions

> Thermal Management
For DPF®-regeneration and SCR-functionality

> Electronic Control Units and Software
Monitoring and controlling of all system functions

A clean future with HJS!

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