

Principle approval of particulate filters

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Requirement specification

- The particulate filter must replace the existing silencer and must provide at least the same noise reduction.

This requirement is considered to be satisfied if a test of noise in motion from the engine with the maximum permissible power for the particulate filter results in a noise value not exceeding the limit in the Danish Vehicle Regulations for the engine size in question. The test must be performed on the largest filtersize covered by the principle approval.

- The engine backpressure with the particulate trap mounted must not exceed 20 kPa at engine max power.

This requirement is considered to be satisfied upon presentation of documentation of the engine backpressure on an engine with the maximum permissible power for the particulate filter.

- The particulate filter must be designed and mounted in a way that ensures that no danger of setting fire to the surroundings arises during use or during regeneration.

The Danish Technological Institute assesses the filter design and the installation guide.

- The filter must reduce by at least 80% the particle emission measured in a dilution tunnel in accordance with Directive EØF 88/77/EEC (stationary 13-mode test) on a Euro 1 engine (Directive 88/77/EEC as amended by 91/542/EEC, level A). Reference fuel with a maximum sulphur content of 50 ppm is used. The measured emissions must be representative of the emissions in practical use.

An 80% reduction corresponds to the tightening of emission limit values from Euro 3 to Euro 4. The tests must be performed on an Euro1 engine to ensure that the particulate filter will function at high particulate emission levels. It can be accepted that the measurements are performed using another engine type, provided that The Danish Technological Institute assesses that similar results can be expected.

Emission test results for CO, HC, NO_x and NO₂ must also be presented.

- The filter manufacturer lays down the maximum permissible exhaust gas opacity measured during free acceleration, at which the filter will be functional. On the engine side of the particulate filter it must be possible to insert an exhaust gas opacity tester to enable monitoring of the engine maintenance status.

The manufacturer can declare several different exhaust gas opacity values if the exhaust gas opacity varies with e.g. filter or engine size.

- In operation, the exhaust gas opacity measured after the particulate filter during free acceleration as described in Directive 96/96/EEC on periodic inspection of vehicles, must not exceed a K-value of $0,2 \text{ m}^{-1}$.

The filter manufacturer sends in a declaration.

- The filter status must be continuously monitored. A warning lamp visible to the driver must be activated if the backpressure exceeds the limit value.

The filter manufacturer sends in relevant documentation.

- If the functioning principle of the particulate filter results in increased emissions during operation or regeneration, this must be clearly stated.

The filter manufacturer sends in relevant documentation.

- The filter must be designed with a view to ensuring that it will be operational in the full lifetime of the vehicle, provided that the engine as well as the filter is maintained in accordance with the manufacturer's normal service guidelines.

The filter manufacturer sends in a declaration.

- Detailed service guidelines must be available. The service guidelines must contain a description of the work environment that complies with the recommendations from the Danish Work Inspection Agency. Guidelines regarding disposal must also be available.

The work environment related to maintenance of particulate filters is very important. Therefore, the manufacturer is required to provide detailed guidelines in accordance with the recommendations from the Danish Work Inspection Agency.

- It must be possible to use fuel with a maximum sulphur content of 50 ppm. If a particulate filter requires that special additives are used, then these must be added during the normal operation of the vehicle. Exempt from this

requirement are vehicles belonging to vehicle fleets that are fuelled only from their own company's fuel pumps.

If additives are used, the Danish Technological Institute performs an assessment of the additive dosage system to ensure that the correct amount of additive is dosed.