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Road vehicles — Measurement of opacity of exhaust gas from compression-ignition (diesel) engines — Steady single-speed test

Véhicules routiers — Mesure de l'opacité des gaz d'échappement des moteurs à allumage par compression (diesel) — Essai à vitesse constante unique

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7645 was prepared by Technical Committee ISO/TC 22, *Road vehicles.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Road vehicles — Measurement of opacity of exhaust gas from compression-ignition (diesel) engines — Steady single-speed test

1 Scope

This International Standard specifies a test method for the measurement of exhaust gas opacity from compression-ignition (diesel-)engined vehicles. It describes the measurement of exhaust opacity under quasi-steady conditions at a single speed at full load, and is designed to ensure a correlation with measurement under steady-state conditions.

NOTE — This method is most suitable as an inspection station test but the test may also be carried out on the road. The lug-down test specified in ISO 7644 is only suited to an inspection station test.

2 Field of application

This International Standard applies to compression-ignition (diesel-)engined road vehicles. It is not intended to cover agricultural tractors and special vehicles for use in civil engineering.[1)]

3 References

ISO 1585, *Road vehicles — Engines test code — Net power.*

ISO 3173, *Apparatus for measurement of the opacity of exhaust gas from diesel engines operating under steady state conditions.*

ISO 7644, *Road vehicles — Measurement of opacity of exhaust gas from compression-ignition (diesel) engines — Lug-down test.*

4 Definitions

For the purposes of this International Standard, the definitions in ISO 7644 apply.

5 Principle

Positioning the vehicle on a free-running roller assembly and, with the transmission engaged, measuring the exhaust opacity while the vehicle is run at a selected steady speed with the engine at full load for a maximum of 8 s. The load is absorbed by the vehicle brakes on the drive axle(s).

6 Test equipment

6.1 Roller assembly

The roller assembly shall be capable of accepting single or tandem drive axles (laden up to 13 t per axle) with coupling of left and right rollers (if separate) on at least one pair of the rollers used for the drive axle(s).[2)]

Roller brakes or other suitable means shall be provided to facilitate removing the test vehicle from the roller assembly. The roll diameter shall not be less than 200 mm. The roller assembly need not be capable of absorbing power, i.e., it may consist of "free rollers".[3)]

6.2 Speed indicator

Means shall be provided for displaying the engine speed. The accuracy shall be within ± 60 r/min or 2 % of the engine speed, whichever is the greater. The response time shall be better than 0,5 s for 90 % of a step input and the linearity shall be better than 1 %.

6.3 Elapsed time indicator

Means shall be provided for indicating when the elapsed time is outside the limits specified in 8.6 and 8.8.

6.4 Opacimeter

6.4.1 The opacimeter shall conform to ISO 3173 and to the manufacturer's instructions.

6.4.2 Other measuring instruments are allowed. If an instrument other than those described in ISO 3173[4)] is used, it shall be shown to be equivalent.

1) This test has been developed for vehicles of more than 3,5 t G.V.M., since there is less experience with lighter vehicles. The test should be limited to conditions where the power torque at the drive axle is less than the available brake torque. (See ISO/TR 9130.)

2) It is preferable that the left- and right-hand rollers are coupled to all drive axles.

3) If an adequately-sized absorption-type roller dynamometer is available, this may be used for absorbing the engine load instead of the vehicle brakes.

4) An International Standard on filter-type smoke meters is under preparation.

7 Test preparation

7.1 Equipment calibration

The equipment shall be calibrated in accordance with the manufacturer's instructions.

7.2 Vehicle preparation

7.2.1 Tyres

Tyres used for the test shall be undamaged and shall be inflated to the normally recommended pressure.

7.2.2 Engine

The engine shall be at the normal operating temperature, e.g. after a road run or a dynamic test.

7.2.3 Exhaust system

The exhaust system shall not have any holes through which the gases emitted by the engine might be diluted.

7.2.4 Brakes — Load conditions

For vehicles with brake regulators actuated by load sensing, it may be necessary to disconnect the load-sensing device or test the vehicle in a partly laden condition.

8 Test method

8.1 Set the vehicle on the free-running rollers, taking the following precautions :

— the drive axle wheels shall be cradled securely in the roller assembly;

— lateral restraint shall be provided for front-wheel-drive vehicles;

— the drive axles which are not on the rollers shall be disengaged.

8.2 Connect the opacimeter to the vehicle exhaust in accordance with the opacimeter manufacturer's instructions.

8.3 Immediately before starting the test, carry out three accelerations with the gear lever in neutral to governor runout speed, to ensure that the exhaust system is clear.

8.4 The vehicle shall be tested in the highest possible gear, but for safety reasons, the gear selected shall ensure a roller speed corresponding to a road speed of not greater than 70 km/h for trucks, and 80 km/h for passenger cars and light-duty vehicles (i.e. vehicles of less than 3,5 t G.V.M.).

8.5 The measuring speed shall be within the range of 50 % to 90 % of the rated speed, and shall correspond to the speed at which the greatest gas opacity value was indicated when testing in accordance with ISO 1585[1]. If this speed lies in an unstable region, choose the nearest stable speed.

8.6 The exhaust gas opacity shall be measured at full load, i.e., with the accelerator fully depressed.

Increase the engine speed until it is slightly above the measuring speed, then apply the footbrake to reduce the engine speed to the measuring speed. A setting time of at least 3 s should elapse before opacity measurement can commence.

8.7 Measure the exhaust gas opacity in accordance with the manufacturer's instructions, and note only the results during the last 2 s of the test period.

8.8 After a maximum of 8 s, including the settling time, discontinue brake application and allow at least 2 min to elapse before the test may be repeated. Only one repetition is permissible for safety reasons; otherwise a waiting time of 15 min shall be respected before the next two tests.

If brake failure occurs, the test shall be discontinued.

9 Test results

The average exhaust gas emission measurement during the last 2 s shall be the value, in metres to the power minus one (m^{-1}), indicated in the test report.

NOTE — The ambient pressure and temperature (depending on weather conditions and altitude) not only influence the operation of the opacimeter (see manufacturer's instructions), they also determine the density of the intake air and therefore influence the engine operation, especially at full load.

Bibliography

ISO/TR 9310, *Road vehicles — Smoke measurement of compression-ignition (diesel) engines — Survey of short in-service tests.*

1) For other standards or regulations, other speed ranges may apply.

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