
**Diesel engines — Procedure for checking
the dynamic timing of diesel fuel injection
equipment —**

**Part 1:
Preconditioning**

*Moteurs diesels — Procédure pour contrôler le calage dynamique de
l'équipement d'injection de combustible diesel —*

Partie 1: Préconditionnement

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Published in Switzerland

Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13555-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 7, *Injection equipment and filters for use on road vehicles*.

ISO 13555 consists of the following parts, under the general title *Diesel engines — Procedure for checking the dynamic timing of diesel fuel injection equipment*:

- *Part 1: Preconditioning*
- *Part 2: Test method*
- *Part 3: Validation of timing measurement devices*

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Diesel engines — Procedure for checking the dynamic timing of diesel fuel injection equipment —

Part 1: Preconditioning

1 Scope

This part of ISO 13555 establishes the preconditioning phase of the procedure for checking the dynamic setting of fuel injection equipment fitted to diesel engines. Such preconditioning is carried out prior to the dynamic timing measurement of the fuel injection pump setting according to ISO 13555-2, in which timing measurement devices are used, based on the principle of sensing a pressure rise in the high-pressure pipe by either clamp-on (clip-on) pressure transducers that measure high-pressure pipe dilation or by inline pressure transducers.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7876-1, *Fuel injection equipment — Vocabulary — Part 1: Fuel injection pumps*

ISO 7876-2, *Fuel injection equipment — Vocabulary — Part 2: Fuel injectors*

ISO 7876-3, *Fuel injection equipment — Vocabulary — Part 3: Unit injectors*

ISO 7876-4, *Fuel injection equipment — Vocabulary — Part 4: High-pressure pipes and end-connections*

ISO 13555-2, *Diesel engines — Procedure for checking the dynamic timing of diesel fuel injection equipment — Part 2: Test method*

ISO 13555-3, *Diesel engines — Procedure for checking the dynamic timing of diesel fuel injection equipment — Part 3: Validation of timing measurement devices*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7876-1, ISO 7876-2, ISO 7876-3 and ISO 7876-4 apply.

4 Requirements

4.1 General conditions

Prior to commencement of preconditioning, it is essential to check that the equipment fitted to the vehicle or engine under test or both, conforms to that recommended and specified by the vehicle/engine manufacturer and that the fuel and engine oils used conform to those recommended by the manufacturer for normal use.

Vehicle/engine manufacturer recommended practices for preconditioning that are additional to those specified in this part of ISO 13555 should be adhered to at all times.

4.2 Vehicle/engine preconditioning requirements

4.2.1 Gearbox

For vehicles equipped with a manually operated or semi-automatic transmission, the gear change lever shall be in the neutral position and the clutch engaged.

For vehicles equipped with an automatic gearbox, the gear selector shall be in neutral or the parking position. See manufacturer's recommendations.

4.2.2 Coolant fan

For vehicles fitted with intermittent action coolant fans, dynamic timing readings shall only be taken when the coolant fan is non-energized.

4.2.3 Vehicle/engine accessories

Any auxiliary engine devices that could affect the engine load or engine test speed (e.g. air conditioning equipment) or both shall be non-operative, wherever possible. Refer specifically to the manufacturer's recommendations or regulations where existent.

4.2.4 Fuel injection system

It is essential for good dynamic timing measurement that no leakage in the fuel system occur and that the system be correctly maintained.

The fuel injection system shall be checked for any visible leakage from the low-pressure system and the high-pressure fuel injection pipes, to ensure that all connections are in good condition.

High-pressure pipe clamps shall be correctly fitted, as specified by the manufacturer.

The fuel filter or filters fitted between the fuel tank and the injection pump shall have been replaced within the period recommended by the vehicle or engine manufacturer. If there is no record of this maintenance, it is recommended that the filter or filters be renewed prior to testing.

4.2.5 Engine thermal conditions

A minimum lubricant temperature of 80 °C in the sump or lubrication reservoir shall be obtained.

The normal water jacket operating temperature shall also be achieved (see manufacturer's data) in order that any devices affecting the fuel injection pump timing are in the "normal running condition".

For some fuel injection systems it is important that fuel temperatures be closely controlled in order that timing variations may be reduced. Refer to the manufacturer's data for any specific fuel temperature requirements.

It is good practice in any case, and should be ensured, that the fuel tank is maintained at more than 40 % of its capacity and that the vehicle, engine or both are allowed time to soak for a sufficient period at an ambient temperature of between 10 °C and 40 °C as part of preconditioning.

4.2.6 Engine operating conditions

From the vehicle or engine or test equipment manufacturer's data, determine the appropriate engine test speed and conditions. Run the engine at these conditions while ensuring that there is no obvious engine speed instability caused by, for example, engine misfire or poor engine mounts.

Maximum engine speed variation to proceed with dynamic timing measurement should be less than ± 20 r/min, as indicated by the timing measurement device (see ISO 13555-2 and ISO 13555-3). If this is not achieved, the source of the instability needs to be determined and rectified.

4.3 Test equipment requirements

IMPORTANT — The timing measurement device is to be regularly checked and calibrated in-line with the manufacturer's recommendations.

4.3.1 Engine lubricating oil temperature measurement

A device is required for measuring the lubricant temperature in the sump or lubricant reservoir. The accuracy of the measurement shall be equal to or better than ± 2 °C between 70 °C and 100 °C. Readings outside this range should be possible.

4.3.2 Ambient temperature measurement

The accuracy of the measurement of ambient temperature shall be equal to or better than ± 2 °C between 5 °C and 45 °C.

4.3.3 Timing measurement device

See ISO 13555-3 for specification, validation, calibration and preparation requirements when using the timing measurement device with high-pressure pipe "clamp on" or "in-line" transducer.

Identify the method used for sensing engine crank angle position and ensure that the constituent parts are in good condition. See ISO 13555-2 for further detail.

5 Procedure

The preconditioning shall be carried out according to the following, in the sequence given.

- a) Prepare the engine or vehicle or both in accordance with 4.2.1 to 4.2.4.
- b) Prepare the test equipment in accordance with 4.3.
- c) Warm up the engine to achieve the condition given in 4.2.5.
- d) Check for engine speed stability in accordance with 4.2.6.

(Then proceed to perform the dynamic timing test method in accordance with ISO 13555-2.)

ICS 43.060.40

Price based on 3 pages