INTERNATIONAL STANDARD

ISO 4010

Second edition
1998-10-15

Diesel engines — Calibrating nozzle, delay pintle type

Moteurs diesels — Injecteur d'essai du type à téton et à étranglement

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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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.

International Standard ISO 4010 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 7, *Injection equipment and filters for use on road vehicles*.

This second edition cancels and replaces the first edition (ISO 4010:1977), which has been technically revised to include method 2.

Annex A of this International Standard is for information only.

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Diesel engines — Calibrating nozzle, delay pintle type

1 Scope

This International Standard specifies a nozzle intended for the testing and setting of injection pumps on injection pump test benches. It specifies the dimensions and test methods for determining the clearance at the "pintle" of the needle (method 1) and the clearance at the needle guide (method 2).

The exact limit of the application of the calibrating nozzle depends upon the test values specified for the injection pump. The applicability is to be verified in each case by the pump manufacturer and stated on the pump test specification for each pump type. The typical range is up to 150 mm^3/stroke.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2697:—[1], *Road vehicles — Fuel nozzles — Size "S".*

3 Designation and marking

The nozzle designation shall be marked on that part of the shank which protrudes beyond its cap nut. This designation is the number of this International Standard; i.e. ISO 4010.

4 Dimensions and tolerances

Dimensions and tolerances are given in figure 1.

All other dimensions of the nozzle, except the clearance at the needle guide, shall be as specified in ISO 2697 for type B. However, the two dowel holes are dropped.

The clearance of the needle in its guide shall be determined by the method given in 5.3.

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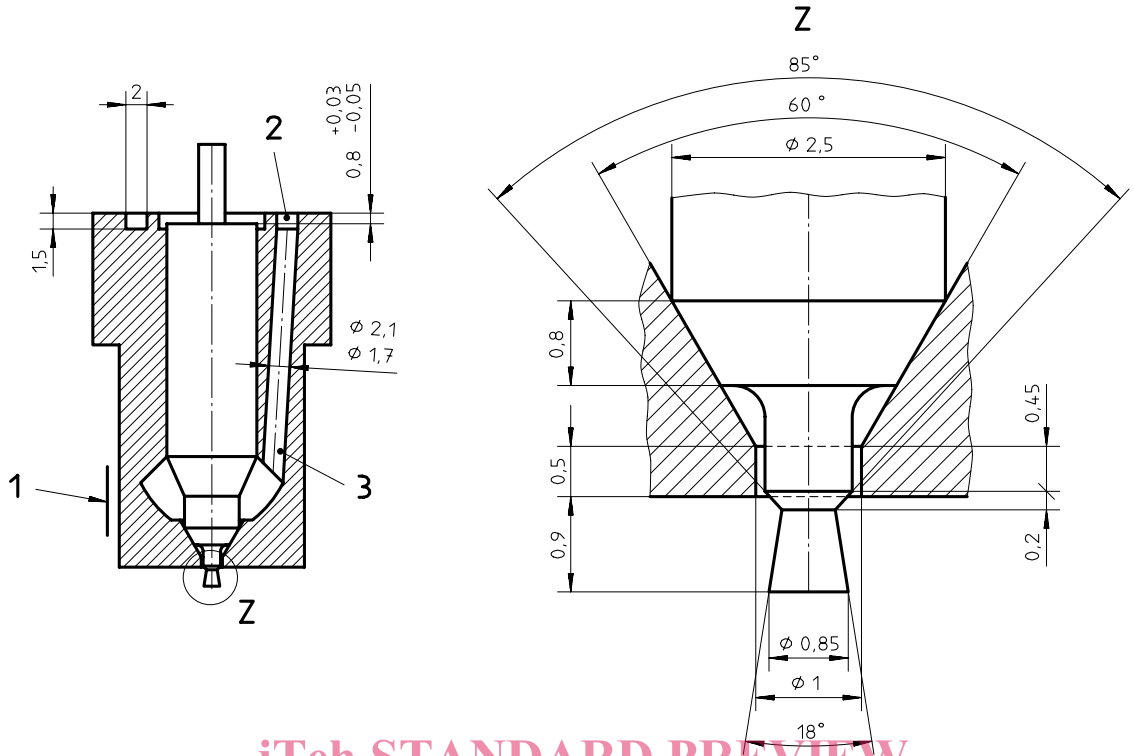
[1] To be published. (Revision of ISO 2697:1974)

Dimensions in millimetres



Key

1 Nozzle designation
2 Annular groove
3 Three holes

Figure 1 — Nozzle cross-section

5 Test methods

5.1 General

All measurements of the following two test methods shall be performed on clean, dry nozzles.

For the flow measurements, calibrated measuring devices with a measuring precision of ± 0,5 % of the value indicated shall be used.

5.2 Test method 1: Clearance at the “pintle”

Table 1 — Control values

Needle lift	Flow	
mm	cm^3/min	l/h
0,1	120 to 220	
0,35	< 400	
0,5	> 600	
Lift at maximum flow		228 to 238
End of lift		210 to 220

The values indicated in table 1 are based on

— an ambient pressure p_a of 0,98 bar[2];

— an ambient air temperature t_a of + 20 °C.

A characteristic course of the air flow versus the needle lift is shown in figure 2.

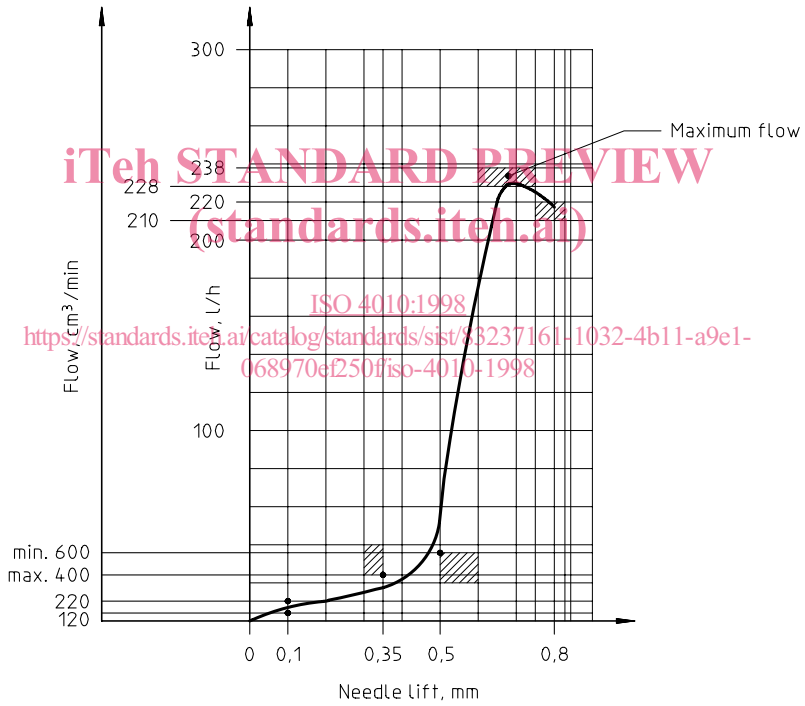


Figure 2 — Flow diagram

5.2.2 Measuring conditions

The flow indicated by the measuring device is proportional to the effective cross-section of the nozzle, if sound velocity is reached in the effective cross-section and at the outlet of the nozzle.

In order to ensure that this always happens in practice, a pressure (p_e) of at least 0,6 bar[2] ($_a$), shall always be available at the nozzle outlet when measuring.

At the needle lifts of 0,1 mm and 0,35 mm the pressure at the nozzle outlet shall be at least 0,8 bar[2] below the ambient pressure.

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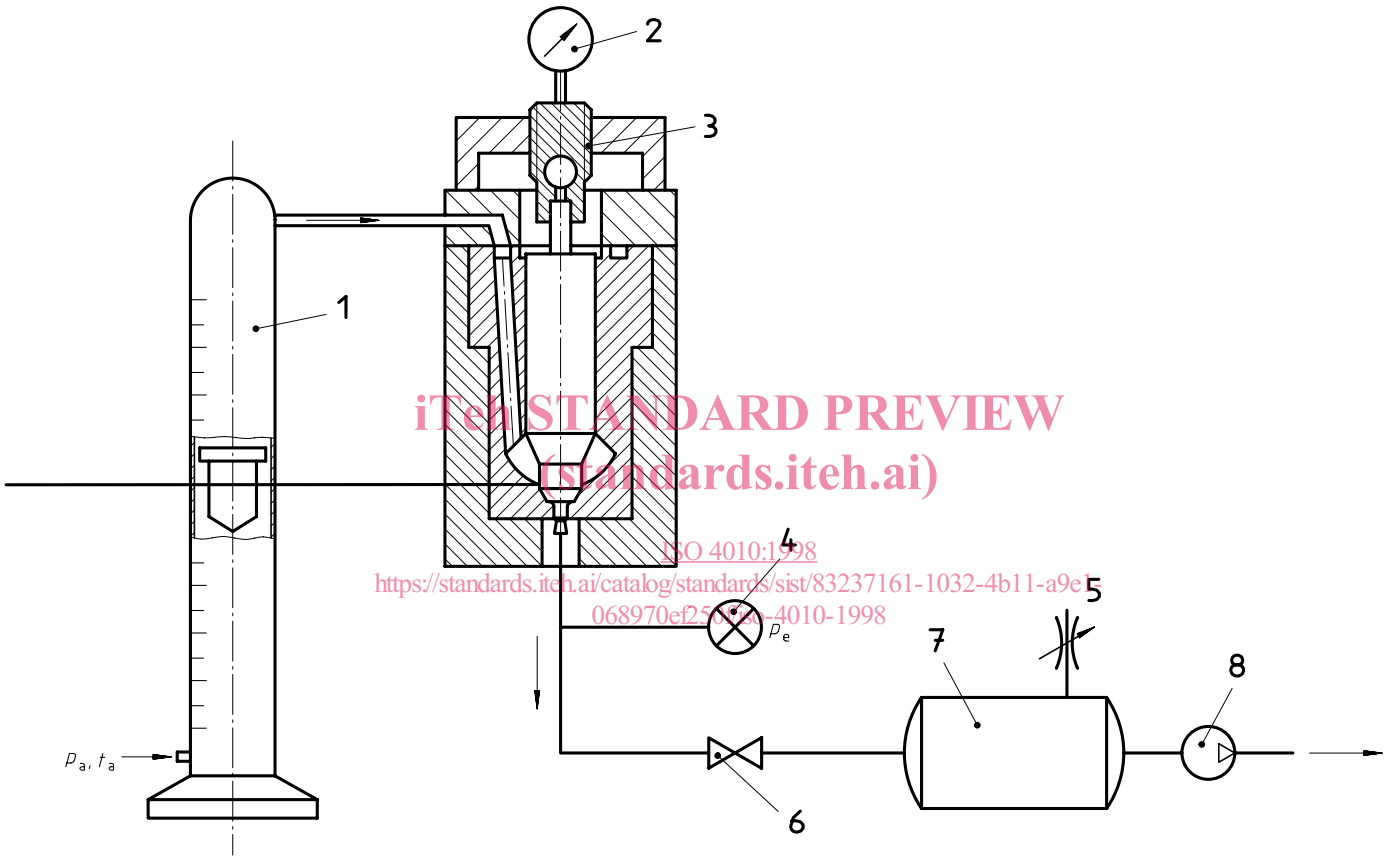
[2] 1 bar = 10^5 N/m^2

The value indicated by the flowmeter depends upon the ambient conditions at the measuring site during the measurement (pressure, air temperature).

To obtain comparable results, the reading of the flowmeter shall be corrected to the calibrating conditions of the flowmeter manufacturer. This corrected value shall, in addition, be corrected to the conditions of this International Standard upon which the diagram in figure 2 is based (pressure: 0,98 bar[2)]; temperature: + 20 °C) according to the laws of thermodynamics.

5.2.3 Measuring installation

See figure 3.



Key

1 Floating body flowmeter (example)
2 Lift gauge
3 Adjustable lifting device
4 Vacuum gauge
5 Bypass
6 Stop-cock
7 Vacuum reservoir
8 Vacuum pump

Figure 3 — Measuring installation (schematic) with a floating body flowmeter

5.3 Test method 2: Clearance at the needle guide

Method 2 determines the clearance of the needle within the nozzle body by the N_2 gas-flow method.

The schematic diagram of the measuring installation and the measuring conditions are shown in figure 4.

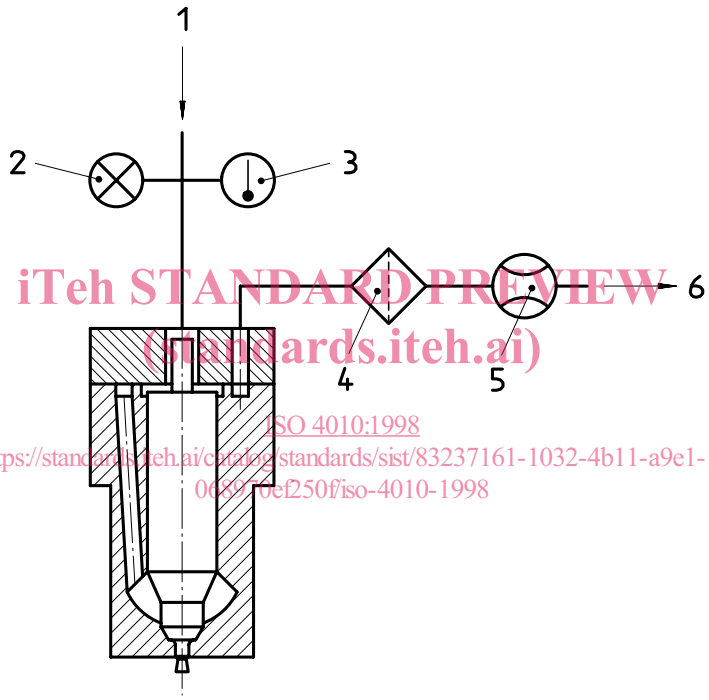
The conditions for N_2 gas flow are the following:

— pressure p: 20 bar ± 0,1 bar[2)];

— temperature t: + 20 °C at nozzle entrance.

The gas flow of new nozzles, as well as of used ones, shall be between 50 ml/min and 100 ml/min.

NOTE It is recommended to repeat the measuring procedure for the clearance twice after, in each case, turning the needle within the nozzle body at about 120°. All readings should be within the stated tolerance.



Key

1 N_2 gas
2 Pressure gauge
3 Thermometer
4 Filter
5 Flowmeter
6 Atmospheric pressure

Figure 4 — Measuring installation for N_2 gas-flow method (schematic)

Annex A
(informative)

Bibliography

[1] ISO 7440-1:1991, *Road vehicles — Fuel injection equipment testing — Part 1: Calibrating nozzle and holder assemblies*.