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Diesel engines — High-pressure fuel injection pipe assemblies — General requirements and dimensions

Moteurs diesels — Lignes assemblées d'injection de carburant à haute pression — Exigences générales et dimensions

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

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 13296 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 7, *Injection equipment and filters for use on road vehicles*.

This third edition cancels and replaces the second edition (ISO 13296:2005), which has been technically revised.

Diesel engines — High-pressure fuel injection pipe assemblies — General requirements and dimensions

1 Scope

This International Standard specifies dimensions and requirements for high-pressure fuel injection pipe assemblies and assembled pipe sets for both integral and fabricated 60° female cones used on diesel (compression-ignition) engines.

NOTE Dimensions of integral and fabricated 60° female cone connectors are specified in ISO 2974.

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 2974, *Diesel engines — 60° female cones for high-pressure fuel injection components*

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

ISO 8535-1:2011, *Diesel engines — Steel tubes for high-pressure fuel injection pipes — Part 1: Requirements for seamless cold-drawn single-wall tubes*

ISO 8535-2:2003, *Compression-ignition engines — Steel tubes for high-pressure fuel injection pipes — Part 2: Requirements for composite tubes*

ISO 12345, *Diesel engines — Cleanliness assessment of fuel injection equipment*

3 Terms and definitions

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

4 Dimensions and tolerances

The requirement and configuration drawing for a pipe assembly shall include at least the following:

a) an indication of compliance with this International Standard, i.e. ISO 13296;

b) the outside diameter and inside diameter of the pipe and an indication of compliance with ISO 8535-1 or ISO 8535-2;

c) the thread and the hexagon size of the connector nuts according to Table 2 or Table 4;

d) the type of connection ends as specified in 7.2;

e) a graphic representation of the centre-line of the pipe with the connection ends and each bend intersection labelled as a point, with each point listed in a table with Cartesian coordinates x, y and z with the orthogonal distance from the axis and the bend radius (the beginning and end points are given as the "S" dimension for the defined configuration);

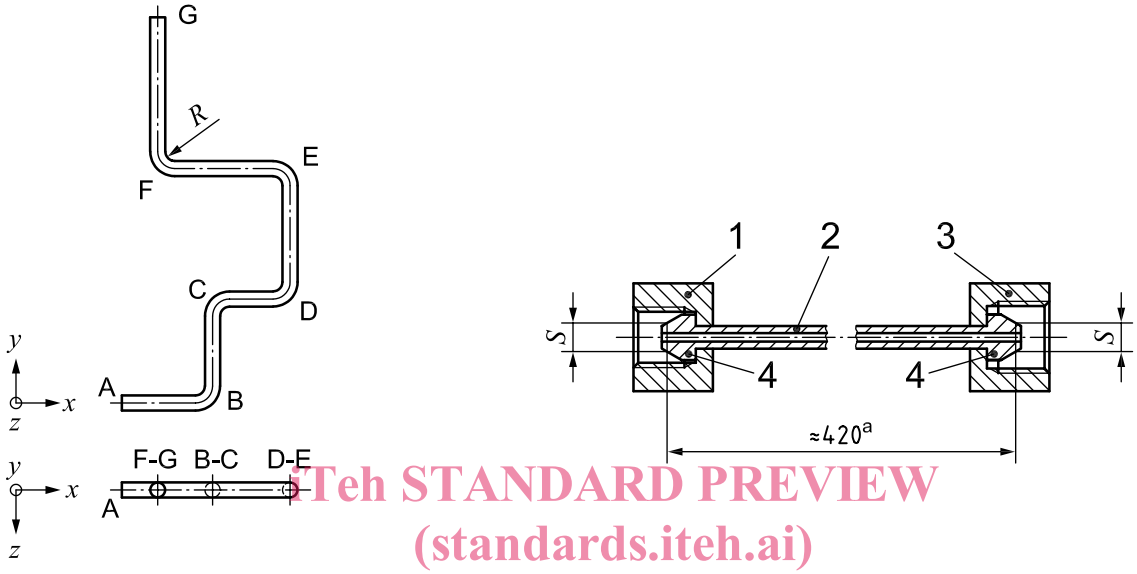
NOTE The coordinates are used to specify the theoretical exact centre-line of the pipe. See the example given in Figure 1.

f) the developed length of the pipe as an approximated value;

g) the material and surface finish requirements of the pipe and connector nuts according to ISO 8535-1 or ISO 8535-2.

The dimensional tolerance of a pipe assembly shall be stated in terms of the actual outside contour of the tube in relation to the specified maximum outside contour and the variance of the actual pipe connection end from the specified position, as agreed between supplier and customer.

Dimensions in millimetres



Point	x	y	z	Radius
A	0	0	0	0
B	65	0	0	15
C	65	100	0	15
D	140	100	0	15
E	140	150	0	15
F	40	150	0	15
G	40	185	0	0

Key

1 connector nut: thread M12; hexagon across flats 17
2 pipe: tube outside diameter 6 mm
3 connector nut: thread M14; hexagon across flats 19
4 pipe connection ends: both of Type C

a Developed length.

Figure 1 — Example of a requirement and configuration drawing

5 Cleanliness

The bore of a high-pressure fuel injection pipe assembly shall be clean, and this shall be assessed in accordance with ISO 12345. Unless otherwise agreed between supplier and customer, cleanliness of pipe assemblies shall be designated using the Fuel Injection Equipment Cleanliness Code (FIECC), as defined in ISO 12345.

6 Minimum bend radii

The radius of any bend made in fabricating high-pressure pipe assemblies shall be not less than two and a half times (2,5×) the outside diameter of the pipe as measured from the pipe centre-line. Bends shall be a sufficient distance from the end connections so as to allow easy fitting of the pipe assembly for its intended use. Bends shall be a sufficient distance from one another so as not to impair fabrication. Bend radii shall be of uniform size in each pipe assembly whenever possible.

7 Pipe end connections

7.1 General

The relationships of connection ends to the connector nut and with the dimensions G and S are shown in Table 1 for the integral 60° female cone and in Table 3 for the fabricated 60° female cone.

The design of the shoulders of the connection end and of the related connector nut shall be agreed between supplier and customer.

NOTE The dimensional characteristics of integral 60° female cones and of fabricated 60° female cones for high-pressure fuel injection components are specified in ISO 2974.

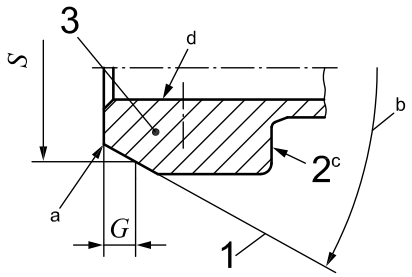
7.2 Types of connection ends

Figures 2 and 3 show two fundamentally different designs of connection ends for high-pressure fuel injection pipe assemblies:

— Type C, with conical sealing face;

— Type S, with spherical sealing face.

Details of a Type C connection end are shown in Figure 2, those of a Type S connection end are shown in Figure 3.



Key

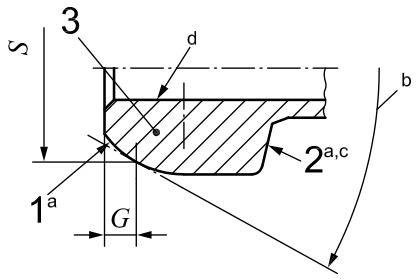
1 connection-end sealing face (conical)
2 shoulder of connection end[c]
3 connection end of pipe

NOTE For dimensions G and S, see Table 1.

a Rounding of the leading edge of the sealing face is necessary for the straight connection-end sealing face.
b 58° ± 1° included angle for Type C connection-end sealing face.
c Design of the shoulder is not specified (see 7.1).
d The connection-end bore entrance configuration is shown in Figure 6.

Figure 2 — Connection end Type C (conical)

Details of a Type S connection end are shown in Figure 3.



Key

1 connection-end sealing face (spherical)

2 shoulder of connection end[c]

3 connection end of pipe

NOTE For dimensions G and S, see Table 1.

[a] Spherical shape of the connection-end sealing face and of the shoulder in order to allow an inclined position of the pipe connection end to the matching female cone.

[b] Spherical connection end to fit into the 60° female cone specified in ISO 2974.

[c] Spherical shoulder in order to achieve a constant transmission of the axial force to the circumference of the shoulder and the connection-end sealing surface. Details of the shoulder design are not specified (see 7.1).

[d] The connection-end bore entrance configuration is shown in Figure 6.

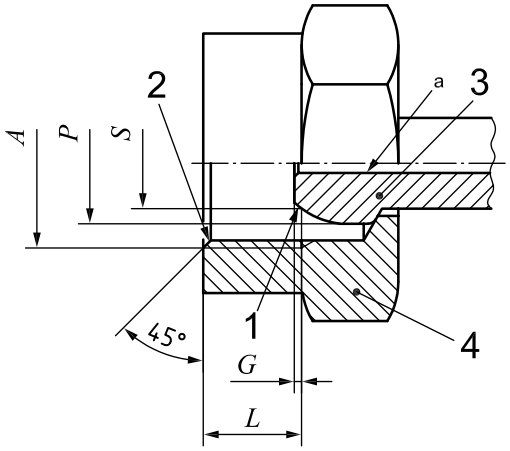
Figure 3 — Connection end Type S (spherical)

7.3 Pipe end assembly for integral 60° female cones

Figure 4 shows the basic requirements and relationships of a connection end assembled to the related connector nut (valid for both Type C and Type S connection ends).

For dimensions, see Table 1.

NOTE The dimensions of Table 1 correspond to the values specified in ISO 2974:2005, Table 1.



Key

1 connection-end sealing face (conical or spherical)

2 chamfer to root of thread

3 connection end of pipe (according to Figures 2 or 3)

4 connector nut (according to Table 2)

a The connection-end bore entrance configuration shall be so chosen that, after final assembly, the pipe inside diameter is not reduced (see 7.5).

Figure 4 — Pipe end assembly for integral 60° female cones (schematically)