INTERNATIONAL STANDARD

ISO 2974

Seventh edition
2013-03-01

Diesel engines — 60 degree female cones for high-pressure fuel injection components

Moteurs diesels — Raccords finaux à cône femelle de 60 degrés pour lignes d'injection de combustible haute pression

Reference number
ISO 2974:2013(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 2974 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 7, *Injection equipment and filters for use on road vehicles*.

This seventh edition cancels and replaces the sixth edition (ISO 2974:2005), of which it constitutes a minor revision.

Diesel engines — 60 degree female cones for high-pressure fuel injection components

1 Scope

This International Standard specifies the dimensional requirements of end-connections for high-pressure fuel injection equipment components, used on diesel (compression-ignition) engines.

It is applicable to externally threaded 60° female cones (see Figures 1, 2, 5, and 6) and intended for use with high-pressure fuel injection pipe assemblies with tube outside diameters of

— up to and including 12 mm for integral female cones (see Table 1), and

— up to and including 9 mm for fabricated female cones (see Table 2).

Details of the pipe connection ends referenced in this document are shown in ISO 13296.

2 Normative references

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

ISO 261, *ISO general purpose metric screw threads — General plan*

ISO 3508, *Thread run-outs for fasteners with thread in accordance with ISO 261 and ISO 262*

ISO 13296, *Diesel engines — High-pressure fuel injection pipe assemblies — General requirements and dimensions*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
integral female cone
female cone where the sealing cone and the thread are connected in the same part

Note 1 to entry: See Figures 1 and 2.

3.2
fabricated female cone
female cone where the sealing cone and the thread are separate parts prior to joining, e.g. by welding

Note 1 to entry: See Figures 5 and 6.

3.3
reference diameter
S
baseline for dimensioning of the female cone and the pipe end form

Note 1 to entry: *S* may or may not be coincident with the intended nominal sealing interface between the female cone and the pipe end form.

4 Requirements

4.1 Dimensions and tolerances

The following figures indicate the requirements for the 60° female cones at fuel injectors, CR-injectors, fuel injection pumps, high-pressure supply pumps, and rails to allow interchangeability for high-pressure fuel injection pipe assemblies according to ISO 13296:

— Figures 1, 2, 3, and 4 for integral female cones;

— Figures 5, 6, and 7 for fabricated female cones.

The 60° female cone and its relationship to the external thread shall meet the requirements of Figure 1 (integral female cones) or Figure 5 (fabricated female cones). However, for integral female cones, variations at the smaller end of the female cone as shown in Figure 3 are acceptable.

Dimensions and tolerances are given in Table 1 (integral female cones) and Table 2 (fabricated female cones). Unspecified details are left to the manufacturer's choice.

With reference dimension *T* in Figures 1, 2, 5, and 6, the external thread may be either with or without undercut. However, it shall be possible to screw the GO-gauge for the thread up to the plane specified by dimension *T*.

Figure 4 and Figure 7 show the assemblies with pipe end connections for the integral and fabricated female cone types, respectively.

4.2 Materials

The specification of material and heat treatment shall be made according to the intended use. To ensure tightness of the joint between the connection end of the high-pressure pipe and the female cone of the mating part of pump, injector, or rail for the initial assembly as well as for repeated assemblies, the necessary plastic deformation shall take place at the sealing face of the high-pressure pipe.

For this purpose, the minimum hardness of the female cone should be a minimum of 50HV harder than the maximum hardness of the pipe connection end. However, it shall be proven that the pipe sealing cone with its plastic deformation caused by assembly, in combination with the minimum preload, ensures the tightness of the joint for the initial and repeated assembly processes over the product's useful life.

5 Designation

A 60° female cone conforming to this International Standard shall be designated by the following elements, in the order given:

a) the term of the 60° female cone, in accordance with 3.1 or 3.2;

b) a reference to this International Standard (i.e. ISO 2974);

c) the shape, in accordance with Figure 3 (for integral female cones only);

d) the tube outside diameter, in millimetres;

e) the thread designation, in accordance with ISO 261.

EXAMPLE 1

A 60° female cone in accordance with 3.1 (integral female cone) of shape A, of pipe outside diameter 10 mm, and with an external thread M22 × 1,5 is designated:

Integral female cone ISO 2974 **A 10 - M22** × **1,5**

EXAMPLE 2

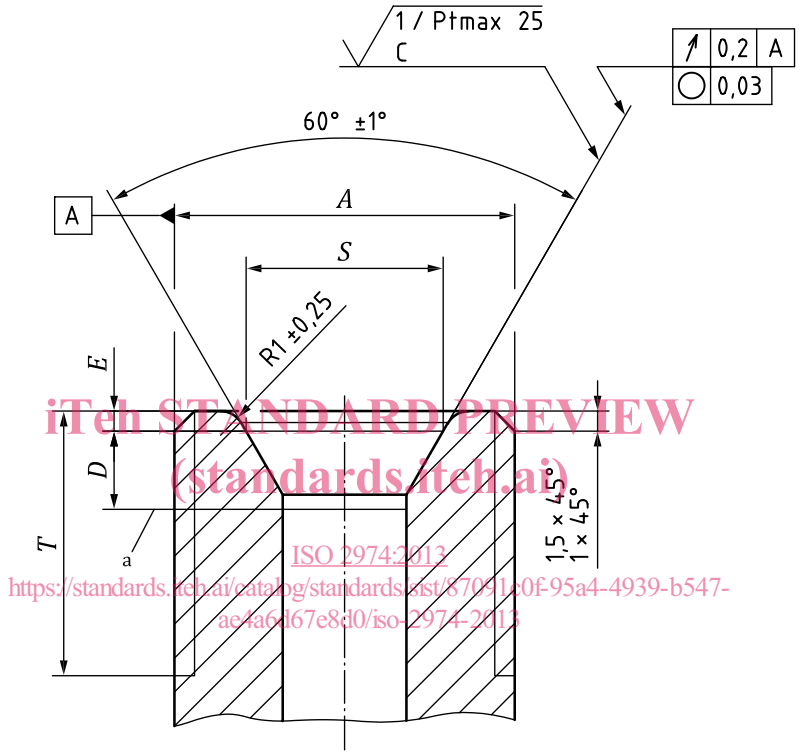
A 60° female cone in accordance with 3,2 (fabricated female cone), of pipe outside diameter 6,35 mm, and with an external thread M14 × 1,5 is designated:

Fabricated female cone ISO 2974 **6,35 - M14 × 1,5**

6 Figures and tables

6.1 Integral 60° female cone

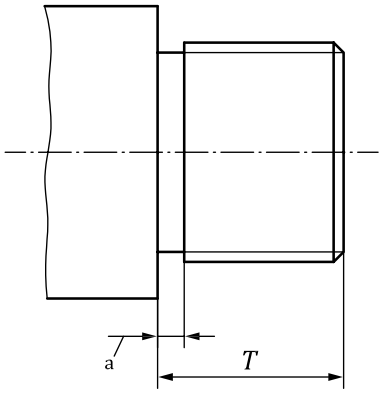
Dimensions in millimetres, surface roughness values in micrometres



a Highest point of any inserted device. Care shall be taken to ensure that the pipe end does not touch any inserted device after final assembly.

NOTE See Table 1 for dimensions *A*, *E*, *D*, *S*, and *T*.

Figure 1 — Integral 60° female cone without undercut



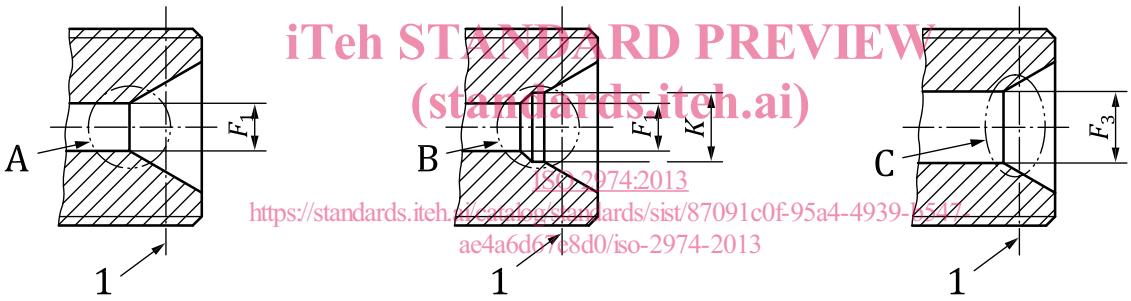
a Undercut in accordance with ISO 3508.

NOTE 1 All dimensions and specifications other than the undercut a are the same as for the female cone of Figure 1.

NOTE 2 See Table 1 for dimension *T*.

Figure 2 — Integral 60° female cone with undercut

Dimensions in millimetres



a) Shape A **b) Shape B** **c) Shape C**

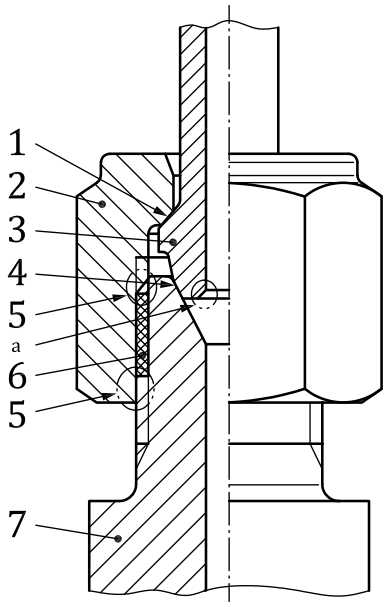
Key

1 reference diameter plane (see dimension *S* in Table 1)

K (counterbore), size to be agreed between supplier and customer

NOTE See Table 1 for dimensions F_1 and F_3. Shape C is used for any inserted device (i.e. throttle or edge filter).

Figure 3 — Shapes on integral 60° female cones according to Figures 1 and 2



Key

1 contact area of connector nut (2) and pipe connection end (3)

2 connector nut

3 connection end of pipe (end form); see NOTE

4 contact area (sealing area) of pipe connection end (3) and female cone connector (7)

5 chamfer to root of thread [connector nut (2) and connector (7)]

6 engaged thread (recommended design should allow 3x pitch minimum)

7 female cone (connector)

a Pipe connection end [pipe connection end bore entrance configuration shall be chosen such that after final assembly, the pipe inside diameter is not reduced (see ISO 13296)].

NOTE For details of pipe connection ends, see ISO 13296.

Figure 4 — Pipe end assembly for integral 60° female cone (basic relationships)

Table 1 — Integral 60° female cones

Dimensions in millimetres (see Figure 1, 2, or 3)

Tube outside diameter	Thread [a, c] A	Reference diameter S	F_1 [b] ± 0,1	F_3 [b] max.	E +0,3 −0,1	T min.	D [d] min.
4,5	M10 × 1,25 M12 × 1,5	5	1,12 to 2,24	-	0,8	10	1,8
6	M12 × 1,5 M14 × 1,5	6,5	1,5 to 3	5,4	0,9	11	1,8

a Tolerance classes of threads: 6g for external threaded end-connection; 6H for connector nuts.

b Dimension F_1 shall be adapted to the inside diameter of the pipe for the sake of optimum flow conditions. If required, for instance for edge filters, application of dimension F_3 is allowed.

c There is no relation between thread size and reference diameter (see ISO 13296 for further detail on thread size recommendations).

d Minimum dimension between the gauge diameter plane and the top surface of any inserted device (i.e. throttle or edge filter). This is a recommended value. It is preferable that the dimension D is determined by also taking into account the maximum angular misalignment of the installed pipe.