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**Diesel engines — Fuel injection pumps and  
fuel injector low-pressure connections —**

**Part 1:  
Threaded connections**

*Moteurs diesels — Raccords basse pression pour pompes d'injection de  
combustible et porte-injecteurs de combustible complets —*  
*(Partie 1: Raccords filetés)*

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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 3.

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 part of ISO 13948 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 13948-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 7, *Engine equipment and filters for use on road vehicles*.

ISO 13948 consists of the following parts, under the general title *Diesel engines — Fuel injection pumps and fuel injector low-pressure connections*:

— *Part 1: Threaded connections*

— *Part 2: Non-threaded (push-on) connections*

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## Introduction

It is recognized that a large variety of low-pressure connections for fuel injection pumps and injectors exist, using different sealing principles as well as designs. This International Standard attempts to provide the user with a common set of preferred types.

ISO 13948 is divided into two parts, covering threaded connections (ISO 13948-1) and non-threaded (push-on) connections (ISO 13948-2) for use with low-pressure fuel supply and return, boost air pressure and lubricating oil supply and return.

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# Diesel engines — Fuel injection pumps and fuel injector low-pressure connections —

## Part 1: Threaded connections

### 1 Scope

This part of ISO 13948 specifies requirements for mechanical, threaded connections used on diesel fuel injection pumps and fuel injectors for the connection of low-pressure fuel, lubrication oil or air supply.

Five types of threaded connections (types A to E) are described in this part of ISO 13948. Type A is commonly used for both pumps and injectors, while types B to E are for diesel fuel injection pumps only.

NOTE Low-pressure connections to fuel filters are covered in other International Standards; see the bibliography. High-pressure end-connections for pumps and injectors are covered in ISO 2974.

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### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 13948. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 13948 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 261:1998, *ISO general-purpose metric screw threads — General plan.*

ISO 6149-1:—<sup>1)</sup>, *Connections for fluid power and general use — Ports and stud ends with ISO 261 threads and O-ring sealing — Part 1: Ports with O-ring seal in truncated housing.*

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.*

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1) To be published. (Revision of ISO 6149-1:1993)

### 3 Terms, definitions and symbols

#### 3.1 Terms and definitions

For the purposes of this part of ISO 13948, the terms and definitions given in ISO 7876-1 to -4 apply.

#### 3.2 Symbols

- $D_1$  Clearance diameter for mating connection
- $D_2$  Maximum diameter for washer sealing face
- $D_3$  Minimum diameter for washer sealing face
- $T_1$  Minimum depth of full thread form

### 4 Connection designs and applications

#### 4.1 General

Tables 1 to 5 indicate the preferred designs, sizes and key dimensions for three different low-pressure connection applications for fuel injection pumps and injectors:

- fuel: inlet, back-leakage and any other fuel connection on pumps;
- lubrication oil: for use mainly with inline pumps which have a separate lubrication supply to the fuel feeding system;
- air: for the connection of an engine inlet pressure signal.

Five different design principles are shown in Figures 1 to 5 (combined with typical mating pipe end-connections) as types A to E. Types C and D have features in common with type A and therefore can be used as type A connections.

#### 4.2 Types of connection

##### 4.2.1 Type A: banjo connection (see Figure 1)

This design uses external sealing washers each side of a “banjo” end-connection on the mating low-pressure pipe, the flow from which is usually directed at right angles to the plane of flow of the connection. The pipe end-connection is secured to the pump connection by means of a “banjo” bolt.

##### 4.2.2 Type B: O-ring seal connection (see Figure 2)

This design is based on a similar design contained in SAE J2244/1 (ISO 6149-1) and utilises an O-ring seal on a chamfer provided on the pump connection, outboard of the connection thread.

##### 4.2.3 Type C: compression seal connection (see Figure 3)

The principle used in this design is compression sealing on a chamfer provided on the pump connection inboard of the connection thread.

#### 4.2.4 Type D: internal rubber ring seal “flexible” connection (see Figure 4)

This type of connection provides an internal sealing diameter, inboard of the connection thread, which is used in conjunction with a rubber sealing ring that is compressed by applying a torque to the pipe end-connection and is sealed by radial compression.

#### 4.2.5 Type E: external rubber ring seal “flexible” connection (see Figure 5)

This type of connection provides a sealing face (radius and internal bore) external to the main body of the connection. This sealing face is used in conjunction with a rubber sealing ring (fitted around the mating pipe) that is compressed a fixed amount by the connecting nut.

Type E is preferred to type B for flexible pipe fittings.

## 5 Dimensions and tolerances

For dimensions and tolerances for each of the five types of low-pressure connection, see Tables 1 to 5.

The preferred sizes for each type of application is indicated by a cross (×).

Connection sizes shall be determined by the fuel injection system designer taking account of system flow rate requirements, standardization, cost and other factors.

All threads are recommended to be of tolerance grade 6H (medium).

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## 6 Designation

Connections in accordance with this part of ISO 13948 shall be designated by the following elements:

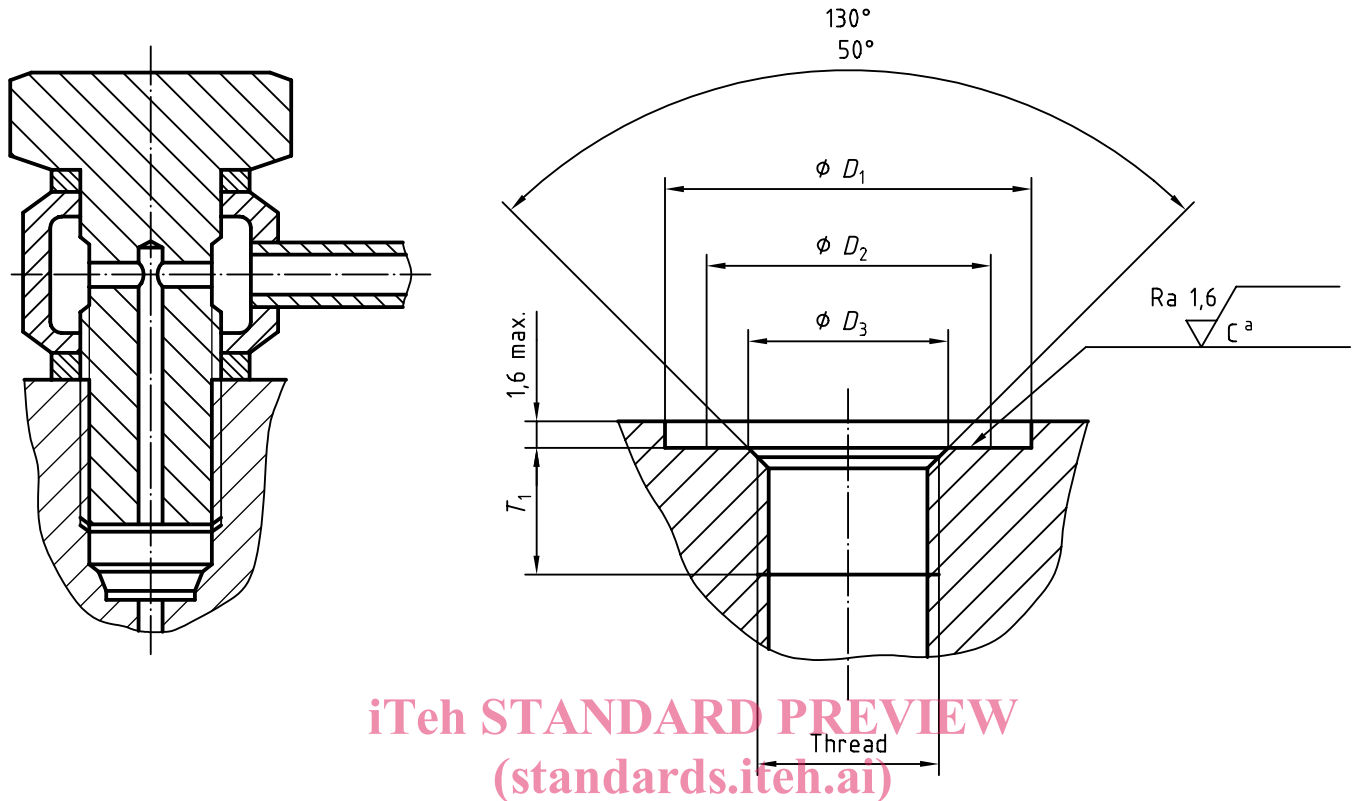
- a) reference to this part of ISO 13948;
- b) the type of connection, in accordance with Figures 1 to 5 and Tables 1 to 5;
- c) the thread designation, in accordance with ISO 261.

### EXAMPLE

A low-pressure fuel connection of type A with an M10 × 1,25 thread is designated as follows:

ISO 13948-1 – A – M10 × 1,25

Dimensions in millimetres  
Surface roughness in micrometres



Detail of port

ISO 13948-1:2000

a Surface finish applicable to the zone between  $D_2$  and  $D_3$ . <https://standards.sist/855d7f5c-7c35-4745-a199-bed9b869cb3a/iso-13948-1-2000>

Figure 1 — Type A connection

Table 1 — Dimensions for type A

Dimensions in millimetres

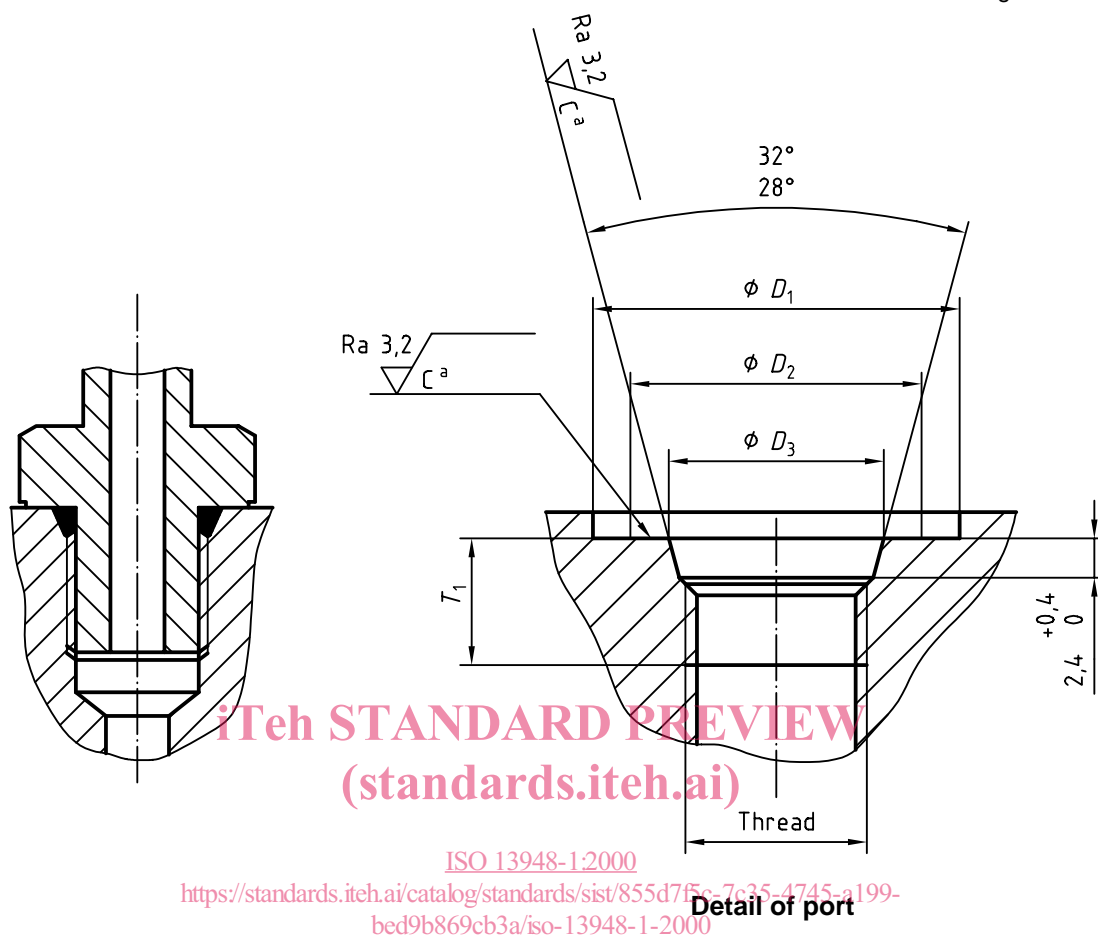
Fuel	Oil	Air	Thread	$D_1^b$	$D_2$ min.	$D_3$	$T_1$ min.
x		x	M6 x 1	—	13	6,5 max.	7
x		x	M8 x 1	—	13	8,5 max.	8
x	x	x	M10 x 1	—	14	10,5 ± 0,3	9
x		x	M10 x 1,25	—	16	10,5 ± 0,3	8,3
x	x	x	M12 x 1,5	21,8 min.	16	12,5 ± 0,3	10
x	x		M14 x 1,5	18,5 min.	18	14,5 ± 0,3	10
x	x		M16 x 1,5 <sup>a</sup>	—	22	16,5 ± 0,3	12

<sup>a</sup> Thread may be changed using an M14 x 1,5 insert.

<sup>b</sup> Spotface dimension, if required.



Dimensions in millimetres  
Surface roughness in micrometres



Ports in accordance with ISO 6149-1.

<sup>a</sup> Surface finish applicable to the zone between  $D_2$  and  $D_3$ .

**Figure 2 — Type B connection**

**Table 2 — Dimensions for type B**

Dimensions in millimetres

Fuel	Oil	Air	Thread	$D_1^a$ min.	$D_2$ min.	$D_3$ $+0,1$ $0$	$T_1$ min.
×			M12 × 1,5	19	17,5	13,8	11,5
×			M14 × 1,5	21	19,5	15,8	11,5

<sup>a</sup> Spotface dimension, if required.