INTERNATIONAL STANDARD

ISO 13948-1

Second edition
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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

Reference number
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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 34, *Propulsion, powertrain, and powertrain fluids*.

This second edition cancels and replaces the first edition (ISO 13948-1:2000), which has been technically revised. The following changes have been made: the tables and figures have been revised.

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*

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. ISO 13948 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.

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

Part 1: Threaded connections

1 Scope

This part of ISO 13948 specifies dimensions and 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

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 4288, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture*

ISO 6149-1, *Connections for hydraulic fluid power and general use — Ports and stud ends with ISO 261 metric threads and O-ring sealing — Part 1: Ports with truncated housing for O-ring seal*

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 7876-5, *Fuel injection equipment — Vocabulary — Part 5: Common rail fuel injection system*

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 ISO 7876-5 apply.

3.2 Symbols

D_T Thread size

D_1 Clearance diameter for mating connection

D_2 Major diameter for washer sealing face

D_3 Minor diameter for washer sealing face / cone diameter

D_4 Pipe/seal bore diameter

D_5 Connecting hole diameter

T_1 Minimum depth of full thread form

T_2 Tapping drill depth

T_3 Pipe seat depth

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 that 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.

The specified configuration on the housing site may be used for the adaption of a straight connector also.

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 utilizes an O-ring seal on a cone 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 cone 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 axially 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 size 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 / 6g (medium).

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;

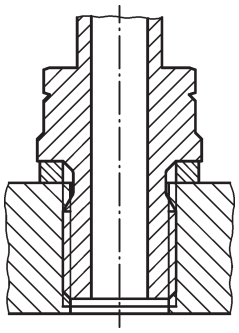
b) the type of connection, in accordance with Figures 1 to 5 and Tables 1 to 5;

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

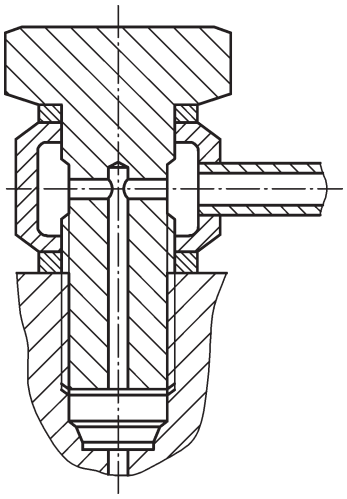
EXAMPLE A low-pressure fuel connection of type A with an M10 × 1,25 thread is designated as follows:

ISO 13948-1 – A – M10 × 1,25

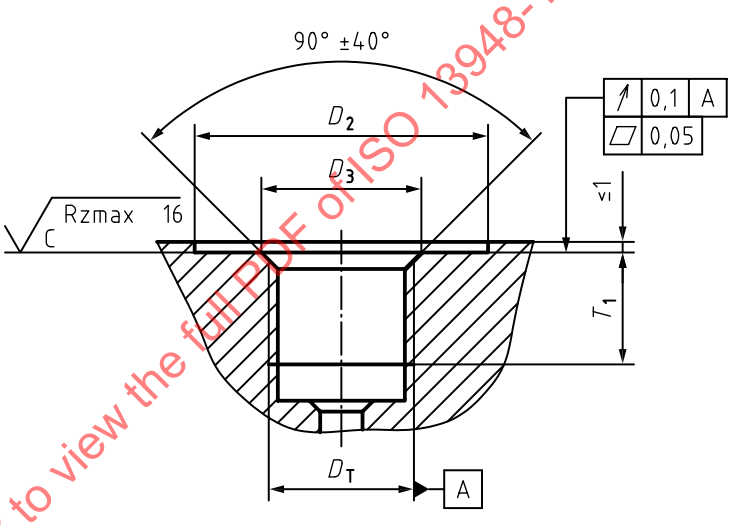
Dimensions in millimetres
Surface roughness in micrometres, measured according to ISO 4288



a) Straight connector



b) Banjo connector



c) Detail of port

Figure 1 — Type A connection

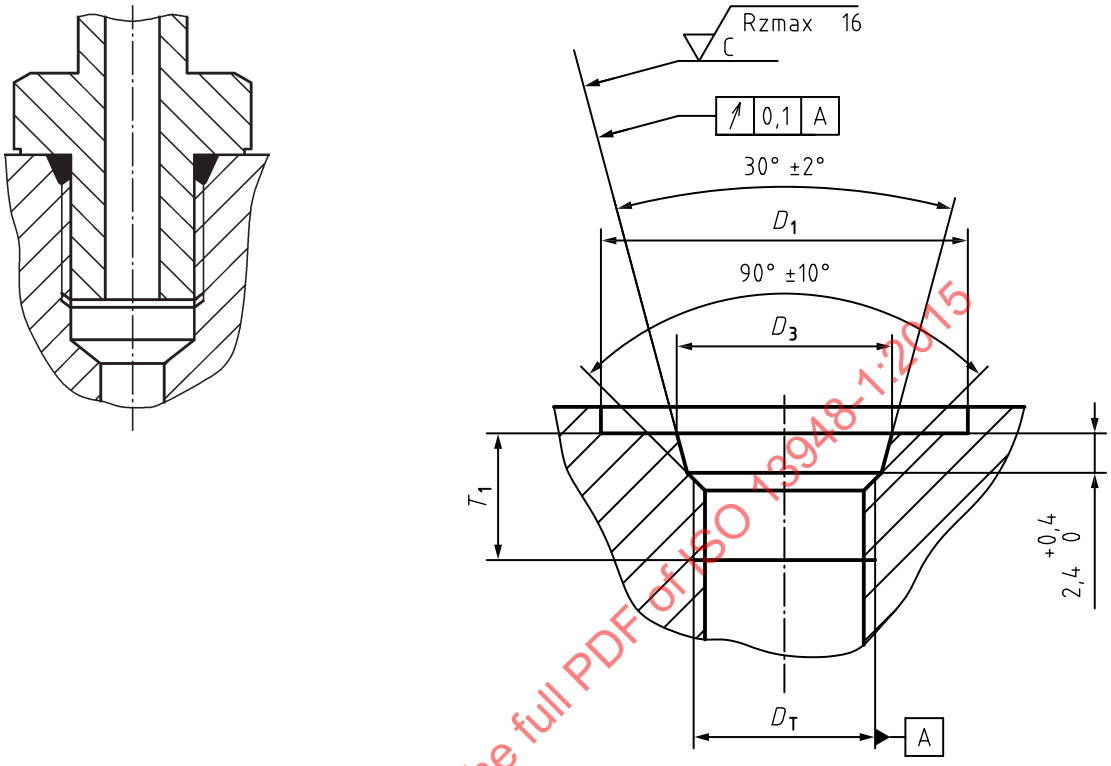
Table 1 — Dimensions for type A

Dimensions in millimetres

Fuel	Oil	Air	Thread D_T	D_2 min.	D_3	T_1 min.
×		×	M6 × 1	13	6,5 ± 0,3	7
×		×	M8 × 1	13	8,5 ± 0,3	8
×		×	M8 × 1,25	13	8,5 ± 0,3	8
×	×	×	M10 × 1	14	10,5 ± 0,3	9
×		×	M10 × 1,25	16	10,5 ± 0,3	8,3
×	×	×	M12 × 1,5	17	12,5 ± 0,3	10
×	×		M14 × 1	18	14,5 ± 0,3	10
×	×		M14 × 1,5	19	14,5 ± 0,3	10
×	×		M16 × 1,5	22	16,5 ± 0,3	12
×	×		M18 × 1,5	24	18,5 ± 0,3	14

Dimensions in millimetres

Surface roughness in micrometres, measured according to ISO 4288



a) Schematic connection **b) Detail of port**

Figure 2 — Type B connection

Table 2 — Dimensions for type B

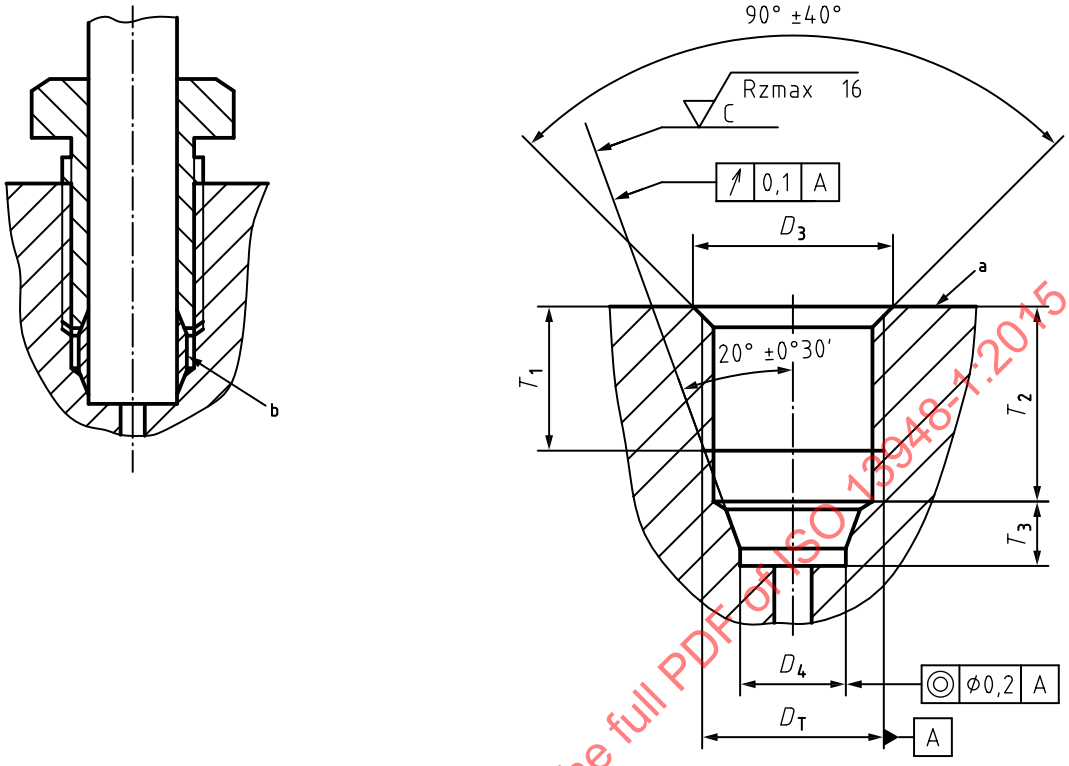
Dimensions in millimetres

Fuel	**Oil**	**Air**	**Thread** D_T	D_1[a] min.	D_3 +0,1 0	T_1 min.
×			M12 × 1,5	19	13,8	11,5
×			M14 × 1,5	21	15,8	11,5

[a] Spotface dimension, if required.

Dimensions in millimetres

Surface roughness in micrometres, measured according to ISO 4288



a) Schematic connection **b) Detail of port**

Key

a Type A Top Face sealing alternative permissible. See Figure 1 and Table 1 for face details.

b Sealing element.

Figure 3 — Type C connection

Table 3 — Dimension for type C

Dimensions in millimetres

Fuel	Oil	Air	Thread D_T	D_3 ±0,3	T_1 min.	T_3 ±0,1	T_2 ±0,2	D_4 ±0,1
×	×	×	M10 × 1	10,5	9	3,4	10,75	5,1
×	×	×	M12 × 1,5	12,5	10	3,2	11,1	8,13
×	×		M14 × 1,5	14,5	10	3,4	13,7	8,25