INTERNATIONAL STANDARD

ISO 8535-1

Fifth edition
2011-12-01

Diesel engines — Steel tubes for high-pressure fuel injection pipes —

Part 1: Requirements for seamless cold-drawn single-wall tubes

Moteurs diesels — Tubes en acier pour lignes d'injection de combustible à haute pression —

Partie 1: Exigences pour les tubes monoparoi sans soudure étirés à froid

Reference number
ISO 8535-1:2011(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 8535-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 7, *Injection equipment and filters for use on road vehicles*.

This fifth edition cancels and replaces the fourth edition (ISO 8535-1:2006), which has been technically revised.

ISO 8535 consists of the following parts, under the general title *Diesel engines — Steel tubes for high-pressure fuel injection pipes*:

— *Part 1: Requirements for seamless cold-drawn single-wall tubes*

— *Part 2: Requirements for composite tubes*

NOTE The first part of the general title, "*Diesel engines*", is used for Part 1 only; for Part 2 "*Compression-ignition engines*" is still used but will be replaced at the next revision.

Diesel engines — Steel tubes for high-pressure fuel injection pipes —

Part 1: Requirements for seamless cold-drawn single-wall tubes

1 Scope

This part of ISO 8535 specifies dimensions and requirements for seamless cold-drawn single-wall steel tubes for high-pressure fuel injection pipes used on diesel (compression-ignition) engines (class 2) and for fuel injection pump testing (class 1).

It applies to diesel (compression-ignition) engines.

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 404, *Steel and steel products — General technical delivery requirements*

ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method*

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

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

3 Dimensions and tolerances

3.1 Diameters

Recommended inside and outside diameters are given in Table 1. Other sizes may be used by agreement between supplier and customer.

Tolerances on inside and outside diameters shall be as follows:

a) Inside diameter, d

$d \leq 4$ mm: $\pm$ 0,05 mm for class 2
$\pm$ 0,025 mm for class 1[1)]

$d > 4$ mm: $\pm$ 0,10 mm.

NOTE Classes 1 and 2 are explained in Clause 1.

1) These tolerances are in accordance with ISO 4093.

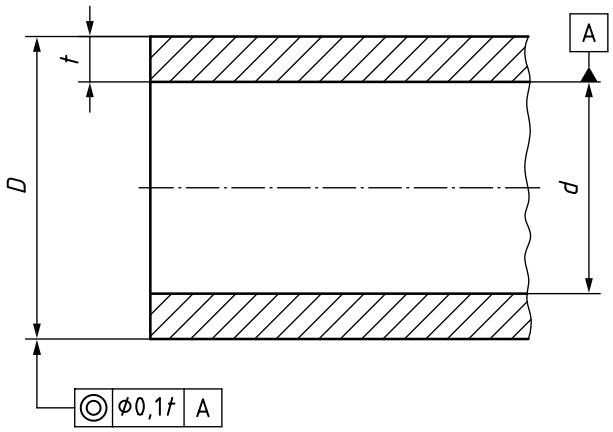
b) Outside diameter, D

$D < 8$ mm: $\pm$ 0,06 mm

$D \geq 8$ mm: $\pm$ 0,10 mm

for classes 1 and 2.

c) The maximum value of the concentricity of the tube outside diameter relative to the inside diameter shall be proportional to the wall thickness, as shown in Figure 1.



Concentricity of the tube outside diameter

3.2 Length

Length and tolerances on length shall be by agreement between supplier and customer.

4 Material processing

4.1 Steel manufacturing process

The tubes shall be manufactured from unalloyed quality steel or an equivalent quality steel produced by a steel-making process that ensures a very homogeneous structure.

If requested by the customer, the supplier shall state the method of manufacture and the deoxidation process used.

4.2 Manufacturing of tubes

The final reduction(s) of the tube shall be followed by heat treatment to achieve the specified mechanical properties.

Recommended inside and outside diameters (in millimetres)

Inside diameter [a] (d)		Outside diameter (D)													
		4		5											
	Preferred		4,5		6	6,35	7	8	9	10	12	15	19	24	30
1		■													
	1,12	■	■												
	1,25	■	■	■											
	1,4	■	■	■											
1,5		■	■	■	■										
	1,6	■	■	■	■										
1,7		■	■	■	■	■									
	1,8	■	■	■	■	■	■								
1,9		■	■	■	■	■	■								
	2	■	■	■	■	■	■	■							
2,12			■	Size combinations to be used appear in shaded cells											
	2,24		■						■						
2,36				■	■	■	■	■	■						
	2,5			■	■	■	■	■	■	■					
2,65					■	■	■	■	■	■					
	2,8				■	■	■	■	■	■					
	3										■				
	3,15										■				
3,35							■	■	■	■	■				
	3,55							■	■	■	■				
3,75												■			
	4									■	■	■			
4,25									■	■	■	■			
	4,5								■	■	■	■			
4,75									■	■	■	■	■		
	5								■	■	■	■	■		
5,3											■	■	■		
	5,6										■	■	■		
6											■	■	■	■	
	6,3											■	■	■	
6,7												■	■	■	
	7,1											■	■	■	
7,5												■	■	■	■
	8												■	■	■
8,5													■	■	■
	9												■	■	■
9,5													■	■	■
	10													■	■
10,6														■	■
	11,2													■	■
11,8														■	■
	12,5														■

NOTE The diameter sizes have been established with the ratio of outside to inside diameter within the range of 2 to 4.

[a] Based on ISO 3.