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**Road vehicles — Hydraulic braking  
systems —**

**Part 1:**

Double-flare pipes, tapped holes, male fittings  
and tube seats

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*Véhicules routiers — Dispositifs de freinage hydraulique —*

*Partie 1: Tuyauteries à double renflement, logements, raccords mâles et  
siège-guides rapportés*

ISO 13486-1:1999

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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.

International Standard ISO 13486-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 2, *Braking systems and equipment*.

ISO 13486 consists of the following parts, under the general title *Road vehicles — Hydraulic braking systems*:

- *Part 1: Double-flare pipes, tapped holes, male fittings and tube seats*
- *Part 2: Flare-to-flare connections*

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# Road vehicles — Hydraulic braking systems —

## Part 1:

## Double-flare pipes, tapped holes, male fittings and tube seats

### 1 Scope

This part of ISO 13486 specifies the essential dimensional and physical characteristics for double flares of metallic pipes (with and without surface protection), tapped holes, male fittings, and driving fit seats used in hydraulic braking systems for road vehicles.

### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 13486. 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 13486 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 4038:1996, *Road vehicles — Hydraulic braking systems — Simple flare pipes, tapped holes, male fittings and hose end fittings.*

ISO 9227:1990, *Corrosion tests in artificial atmospheres — Salt spray tests.*

### 3 Pipes

#### 3.1 Pipe without flares

Double-walled, rolled pipes shall be in accordance with ISO 4038 and Table 1.

#### 3.2 Double-flare pipes

Double-flare pipes shall meet the requirements of Figure 1 and Table 2.

#### 3.3 Material requirements

The material shall meet the requirements of Table 3.

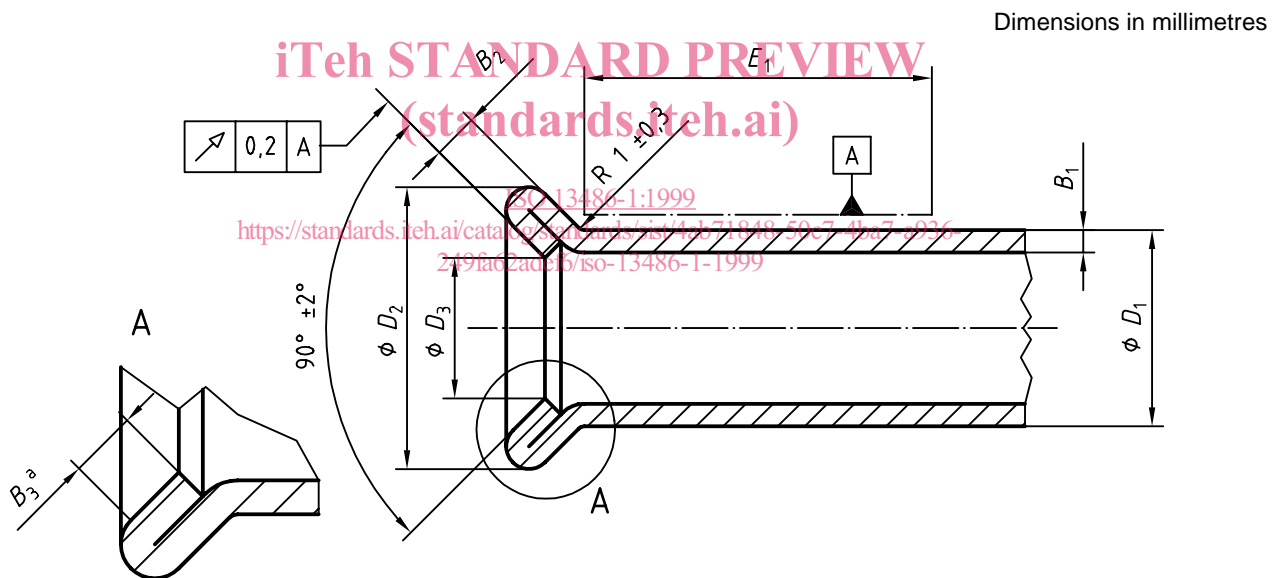
#### 3.4 Condition

The inner and outer surfaces shall be free from oxidation. The outer surface shall be protected against corrosion and shall withstand the salt spray test according to ISO 9227 for at least 96 h.

**Table 1 — Pipes**

Dimensions and tolerances in millimetres

Outside diameter without surface protection <sup>a</sup> , $D_1$	nom.	6,35
	tol.	$\pm 0,07$
Wall thickness, $B_1$	nom.	0,7
	tol.	$\pm 0,07$
Outside diameter, with surface protection, $D_1$	max.	6,57
Minimum burst pressure	MPa	85
Average mass per metre	kg/m	0,1
NOTE Pipes with additional plastic coatings may be used; however, these pipes shall be compatible with male fittings, tapped holes, and flares as specified in this part of ISO 13486.		
<sup>a</sup> In this context, a "bare pipe" means a pipe without surface treatment (nevertheless pipes which have been manufactured from surface-treated sheet material are considered as bare pipes).		



<sup>a</sup> Minimum sealing surface.

**Figure 1 — Double-flare pipe**

**Table 2 — Double-flare pipe — Dimensions**

Dimensions in millimetres

$D_1$	$B_1$ $\pm 0,07$	$B_2$ $\pm 0,2$	$B_3$ min.	$D_2$ $\pm 0,3$	$D_3$ $\pm 0,35$	$E_1$ min.
4,75	0,7	1,4	1	6,9	3,35	19
6	0,7	1,4	1	8,4	4,55	21
6,35	0,7	1,4	1	8,85	4,85	21
8	0,7	1,4	1,6	10,8	6,55	21
10	0,7	1,4	1,6	13,3	8,55	21

**Table 3 — Material requirements**

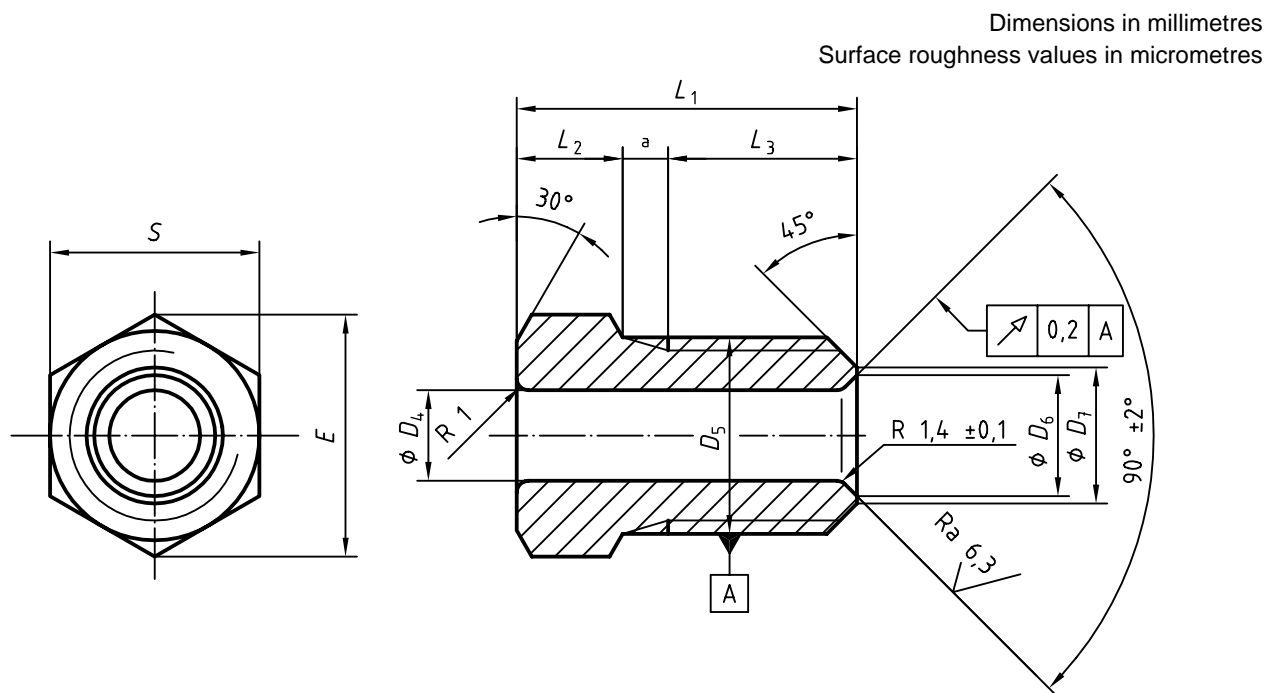
Material	Steel
Tensile strength <sup>a</sup> , MPa	$\geq 290$
Yield strength, MPa	$\geq 200$
Percentage elongation at break <sup>a</sup>	$\geq 25$
<sup>a</sup> For pipes which are to be bent.	

## 4 Type A male fittings and type AS tapped holes

### 4.1 Type A male fittings

Type A male fittings shall meet the requirements of Figure 2 and Table 4.

The inner and outer surfaces shall be free from oxidation. The outer surface shall be protected against corrosion and shall withstand the salt spray test according to ISO 9227 for at least 96 h.



<sup>a</sup> Depending on manufacturing methods, an undercut is optional.

**Figure 2 — Type A male fitting**

Table 4 — Type A male fitting — Dimensions

Dimensions in millimetres

$D_1^a$	$D_4^b$ $+0,15$ $0$	$D_5$ 6g	$D_6$ $+0,1$ $0$	$D_7$ $\pm 0,2$	$E$ $\approx$	$L_1$ js14	$L_2$	$L_3$ min.	$S$	
									nom.	tol.
4,75	4,98	M10 × 1	6,8	7,8	11,5	16	5	9	10	$0$ $-0,22$
6,35	6,59	M12 × 1	8,4	9,4	13,9	17	6	9	12	$0$ $-0,27$
8	8,29	M14 × 1,5	10,4	11,4	16,2	20,5	6	11,5	14	
10	10,29	M16 × 1,5	12,4	13,4	19,6	22,5	8	11,5	17	

<sup>a</sup> Type A male fittings are not applicable to  $D_1 = 6$  mm.  
<sup>b</sup> Depending on the thickness of the surface protection of the pipe, diameter  $D_4$  may be adapted according to the agreement between manufacturer and user.

4.2 Type AS tapped holes

Type AS tapped holes shall meet the requirements of Figures 3 and 4, and Table 5.

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Dimensions in millimetres  
 Surface roughness values in micrometres

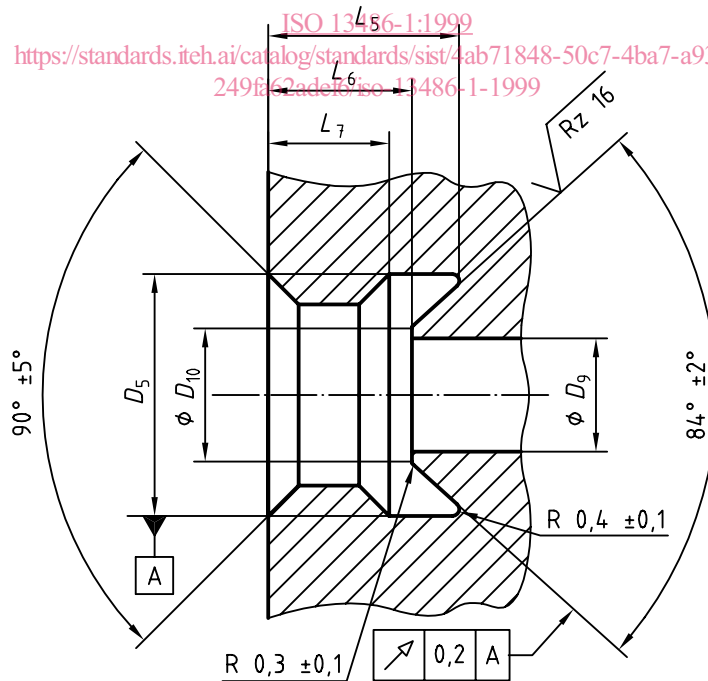
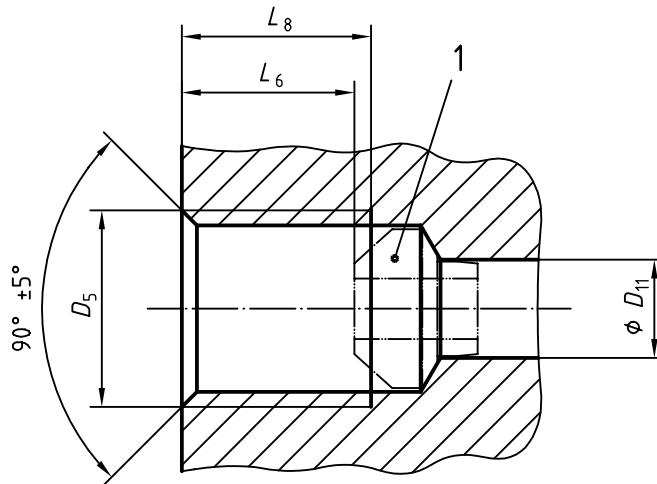


Figure 3 — Type AS 1 tapped hole



Dimensions in millimetres



**Key**

- 1 Tube seat (see clause 6)

**Figure 4 — Type AS 2 tapped hole**

**Table 5 — Type AS tapped hole — Dimensions**  
 Dimensions in millimetres

$D_1$ <sup>a, b</sup>	$D_5$ 6H	$D_9$	$D_{10}$ $\pm 0,3$	$D_{11}$ $+0,15$ $+0,05$	$L_5$	$L_6$ $\pm 0,5$	$L_7$ min.	$L_8$ min.
4,75	M10 × 1	3,2	3,8	5	9,5	7,5	6	8,5
6,35	M12 × 1	4,5	5,3	6,4	9,5	7,5	6	8,5
8	M14 × 1,5	5,5	6,8	7,6	11,5	9,5	8	10,5
10	M16 × 1,5	7,5	8,8	9,5	11,5	9,5	8	10,5

<sup>a</sup> For indication only.  
<sup>b</sup> Type AS tapped holes are not applicable to  $D_1 = 6$  mm.

**5 Type B male fittings and type BS tapped holes**

**5.1 Type B male fittings**

Type B male fittings shall meet the requirements of Figure 5 and Table 6.

The inner and outer surfaces shall be free from oxidation. The outer surface shall be protected against corrosion and shall withstand the salt spray test according to ISO 9227 for at least 96 h.