

English version

Pipe threads where pressure tight joints are made on the
threads - Part 1: Taper external threads and parallel internal
threads - Dimensions, tolerances and designation

Filetage de tuyauterie pour raccordement avec étanchéité
par le filetage - Partie 1: Filetages extérieurs coniques et
filetages intérieurs cylindriques - Dimensions, tolérances et
désignation

Rohrgewinde für im Gewinde dichtende Verbindungen - Teil
1: Kegelige Außengewinde und zylindrische Innengewinde -
Maße, Toleranzen und Bezeichnung

This European Standard was approved by CEN on 2 February 2004.

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Contents

	page
Foreword.....	3
1 Scope	4
2 Normative references	4
3 Terms and definitions	4
4 Symbols and explanations	6
5 Dimensions.....	6
6 Designation	6
7 Thread design	8
7.1 Thread form	8
7.2 Thread lengths	10
8 Gauging	12
9 Combination with fastening thread.....	12
Bibliography	13

Foreword

This document (EN 10226-1:2004) has been prepared by Technical Committee ECISS/TC 29, "Steel tubes and fittings for steel tubes", the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2005, and conflicting national standards shall be withdrawn at the latest by January 2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This standard is based, with editorial modifications on ISO 7-1 "Pipe threads where pressure-tight joints are made on the threads - Part 1 : Dimensions, tolerances and designation". Pipe threads to this standard are dimensionally identical to and fully interchangeable with pipe threads to ISO 7-1.

This standard has been prepared in three parts. Parts 1 and 2 reflect the two thread jointing systems in regular use in Europe and Worldwide - Part 1 details taper external and parallel internal pipe threads, and Part 2 details taper external and taper internal pipe threads. Part 3 will provide requirements for the gauging of pipe threads conforming to Parts 1 and 2.

The common requirements for the taper external pipe thread are given in Part 1 and in Part 2, so as to present the complete thread jointing system in each part.

Components having pipe threads produced to the dimensions and tolerances given in this standard can be assembled to give safe and effective pressure tight joints providing proper assembly techniques are used. The techniques used to assemble threaded joints are dependent on a number of factors including the internal thread (parallel or taper), the quality of the mating threads, the materials of the components being connected, the thread sealant or jointing compound used and the assembly torque.

Because of the different assembly techniques used for the taper / parallel and taper / taper systems, it is recommended that mixing of components having parallel internal threads and taper internal threads is avoided in the same piping system.

Relevant EN product or application standards will normally specify whether parallel and /or taper internal threads are permitted for these products or applications. Users should select the internal thread type to suit their product or application requirements.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This part of EN 10226 specifies the requirements for thread form, dimensions, tolerances and designation for jointing pipe threads, sizes 1/16 to 6 inclusive, for joints made pressure-tight by the mating of the threads. These threads are taper external and parallel internal and are intended for use with pipes suitable for threading and for valves, fittings or other pipeline equipment interconnected by threaded joints.

An appropriate thread sealant or jointing compound should be used on the thread to ensure pressure-tight joints.

NOTE 1 Threaded joints using taper external threads and taper internal threads are detailed in prEN 10226-2

NOTE 2 The requirements for taper external threads are identical in EN 10226-1 and prEN 10226-2

NOTE 3 For pipe threads where pressure-tight joints are not made on the threads see EN ISO 228-1

NOTE 4 prEN 10226-3 gives details of recommended gauging systems for the verification of thread dimensions and thread form.

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.

prEN 10226-3, *Pipe threads where pressure-tight joints are made on the threads - Part 3: Verification by means of limit gauges.*

EN ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation (ISO 228-1:2000)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply (see also Figures 3 and 4)

NOTE For consistency and clarity, common terms and definitions have been adopted for EN 10226-1 and prEN 10226-2, consequently some definitions may include terms which seem inappropriate to this part.

3.1

gauge diameter

major diameter of the thread, whether external or internal, at the gauge plane.

3.2

major cone

imaginary cone which just touches the crests of a taper external thread or the roots of a taper internal thread.

3.3

gauge plane

plane, perpendicular to the axis of the taper thread, at which the major cone has the gauge diameter.

NOTE 1 For external threads the gauge plane is located at a distance equal to the gauge length from the small end of the thread.

NOTE 2 For parallel internal threads, theoretically there is no gauge plane because there is no major cone. However, the concept of a gauge plane is retained to assist with thread inspection and for this purpose the gauge plane is assumed to be located at a distance of half pitch behind the face of the threaded workpiece. This distance has been agreed in order to give consideration to the start of the thread that has been removed by chamfering.

3.4**gauge length**

on an external thread, the distance from the gauge plane to the small end of the thread.

3.5**reference plane**

visible surface of the internally and externally threaded parts, which facilitates the reading of the gauge when the thread is inspected.

For internal threads it is the face of the internally threaded part, for external threads it is the small end of the externally threaded part.

3.6**complete thread**

part of the thread which is fully formed at both crest and root.

NOTE When there is a chamfer at the start of the thread not exceeding one pitch in length, this is included in the length of the complete thread.

3.7**incomplete thread**

part of the thread which is fully formed at the root, but truncated at the crest by its intersection with the cylindrical surface of the product.

3.8**washout thread**

part of the thread which is not fully formed at the root.

NOTE The washout thread is produced by the bevel at the start of the threading tool.

3.9**useful thread**

complete thread plus incomplete thread, excluding the washout thread.

NOTE In practice, the total length of useful external thread may be longer than is necessary depending on the production techniques used for producing the threads and the external diameter of the workpiece. The provision of excessive lengths of useful external thread should be avoided.

3.10**assembly length**

useful thread length beyond the gauge plane of an external thread required to provide for assembly with an internal thread at the upper limit of the tolerance. It is inclusive of the wrenching length.

NOTE 1 See also 7.2.2

NOTE 2 This term is also known as "fitting allowance".

3.11**wrenching length**

useful thread length which is provided to accommodate the relative movement between the externally threaded part and the internally threaded part during the wrenching operation, following hand-tight engagement.

NOTE This term is also known as "wrenching allowance".

3.12

accommodation length

distance on internally threaded workpieces, from the face of the workpiece to the first obstruction which the externally threaded workpiece will encounter on assembly.

4 Symbols and explanations

R	Designation of taper external thread.
Rp	Designation of parallel internal thread.
P	Pitch
H	Height of the triangle of the thread profile perpendicular to the thread axis.
h	= $0,640\ 327P$; height of the thread profile between rounded crests and roots perpendicular to the thread axis
r	Radius of rounded crests and roots
D	Major diameter of the internal thread at the gauge plane (gauge diameter - see 3.1)
D ₁	= $D - 1,280\ 654\ P$; minor diameter of the internal thread at the gauge plane
D ₂	= $D - 0,640\ 327\ P$; pitch diameter of the internal thread at the gauge plane
d	Major diameter of the external thread at the gauge plane (gauge diameter - see 3.1)
d ₁	= $d - 1,280\ 654\ P$; minor diameter of the external thread at the gauge plane
d ₂	= $d - 0,640\ 327P$; pitch diameter of the external thread at the gauge plane
T ₁	Tolerance on the gauge length of an external thread
T ₂	Tolerance for the position of the gauge plane on an internal thread
L _a	Accommodation length (see 7.2.2)
L _i	Useful thread length for internally threaded workpieces (see 7.2.2)
L _e	Useful thread length for externally threaded workpieces (see 7.2.2)

5 Dimensions

Pipe thread dimensions are given in Table 1.

6 Designation

6.1 The designation of threads according to this part of EN 10226 shall consist of the following elements in the sequence given:

6.2 The description block shall be:

Pipe thread

6.3 The document number block shall be:

EN 10226

Table 1 — Dimensions

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Thread size	Number of threads in 25,4 mm	Pitch	Height of thread	Diameters at gauge plane			Gauge length (external thread)					Assembly length		Length of useful external thread not less than			Tolerance on position of gauge plane on internal thread			
		<i>P</i>	<i>h</i>	Major (gauge diameter) <i>d=D</i>	Pitch <i>d₂=D₂</i>	Minor <i>d₁=D₁</i>	Nominal mm	Tolerance <i>T₁/2</i>		max. mm	min. mm	Turns of thread	mm ^b	Turns of thread	For nominal gauge length mm	For maximum gauge length mm	For minimum gauge length mm	Tolerance <i>T₂/2</i>		Equivalent diametral tolerance ^a on parallel internal threads mm ^b
								mm ^b	Turns of thread									mm ^b	Turns of thread	
1/16	28	0,907	0,581	7,723	7,142	6,561	4	+/-0,9	1	4,9	3,1	2,5	2.3/4	6,5	7,4	5,6	+/-1,1	1.1/4	+/- 0,071	
1/8	28	0,907	0,581	9,728	9,147	8,566	4	+/-0,9	1	4,9	3,1	2,5	2.3/4	6,5	7,4	5,6	+/-1,1	1.1/4	+/- 0,071	
1/4	19	1,337	0,856	13,157	12,301	11,445	6	+/-1,3	1	7,3	4,7	3,7	2.3/4	9,7	11	8,4	+/-1,7	1.1/4	+/- 0,104	
3/8	19	1,337	0,856	16,662	15,806	14,950	6,4	+/-1,3	1	7,7	5,1	3,7	2.3/4	10,1	11,4	8,8	+/-1,7	1.1/4	+/- 0,104	
1/2	14	1,814	1,162	20,955	19,793	18,631	8,2	+/-1,8	1	10,0	6,4	5,0	2.3/4	13,2	15	11,4	+/-2,3	1.1/4	+/- 0,142	
3/4	14	1,814	1,162	26,441	25,279	24,117	9,5	+/-1,8	1	11,3	7,7	5,0	2.3/4	14,5	16,3	12,7	+/-2,3	1.1/4	+/- 0,142	
1	11	2,309	1,479	33,249	31,770	30,291	10,4	+/-2,3	1	12,7	8,1	6,4	2.3/4	16,8	19,1	14,5	+/-2,9	1.1/4	+/- 0,180	
1 ¼	11	2,309	1,479	41,910	40,431	38,952	12,7	+/-2,3	1	15,0	10,4	6,4	2.3/4	19,1	21,4	16,8	+/-2,9	1.1/4	+/- 0,180	
1 ½	11	2,309	1,479	47,803	46,324	44,845	12,7	+/-2,3	1	15,0	10,4	6,4	2.3/4	19,1	21,4	16,8	+/-2,9	1.1/4	+/- 0,180	
2	11	2,309	1,479	59,614	58,135	56,656	15,9	+/-2,3	1	18,2	13,6	7,5	3.1/4	23,4	25,7	21,1	+/-2,9	1.1/4	+/- 0,180	
2 ½	11	2,309	1,479	75,184	73,705	72,226	17,5	+/-3,5	1.1/2	21,0	14,0	9,2	4	26,7	30,2	23,2	+/-3,5	1.1/2	+/- 0,216	
3	11	2,309	1,479	87,884	86,405	84,926	20,6	+/-3,5	1.1/2	24,1	17,1	9,2	4	29,8	33,3	26,3	+/-3,5	1.1/2	+/- 0,216	
4	11	2,309	1,479	113,030	111,551	110,072	25,4	+/-3,5	1.1/2	28,9	21,9	10,4	4.1/2	35,8	39,3	32,3	+/-3,5	1.1/2	+/- 0,216	
5	11	2,309	1,479	138,430	136,951	135,472	28,6	+/-3,5	1.1/2	32,1	25,1	11,5	5	40,1	43,6	36,6	+/-3,5	1.1/2	+/- 0,216	
6	11	2,309	1,479	163,830	162,351	160,872	28,6	+/-3,5	1.1/2	32,1	25,1	11,5	5	40,1	43,6	36,6	+/-3,5	1.1/2	+/- 0,216	

NOTE The main dimensions were converted into millimetres on the basis of 1 inch = 25,4 mm, beginning with the number of threads per inch, which determines the pitch *P*, the formula *h* (the height of thread) = 0,640 327 *P* and the major diameter at the gauge plane. Pitch diameter and minor diameter were then compiled by subtracting once or twice respectively the height of thread *h* from the major diameter. The nominal gauge length, the tolerances and the assembly length were directly computed. The remaining lengths given in table 1 were obtained by subtracting or adding the tolerances or assembly length respectively to the nominal gauge length. Tolerances and assembly lengths are expressed in millimetres and in number of turns of thread.

^a For parallel internally threaded parts the diametral tolerances are derived from the tolerances in column 19 by multiplying with the corresponding pitch in column 3 and with 1/16, the amount of taper.

^b Informative tolerances, in millimetres, are obtained from the mandatory values in turns of threads by multiplying with the corresponding pitch in column 3 and rounding to the nearest 0,1 mm.

6.4 The individual item block shall be composed of:

- a) symbol for type of pipe thread
 - R for external taper pipe thread
 - Rp for parallel internal pipe thread
- b) the thread size, from column 1 of table 1

EXAMPLE The complete designation for a right-hand thread size 1 1/2:

External taper thread: **Pipe thread EN10226 R 1 1/2**

Internal parallel thread: **Pipe thread EN10226 Rp 1 1/2**

6.5 For left hand threads, the letters LH shall be added to the designation. Right hand threads require no special designation.

7 Thread design

7.1 Thread form

7.1.1 Direction of thread helix

Unless otherwise specified, the EN 10226-1 thread shall be a right-hand thread (see 6.5)

7.1.2 Taper external thread

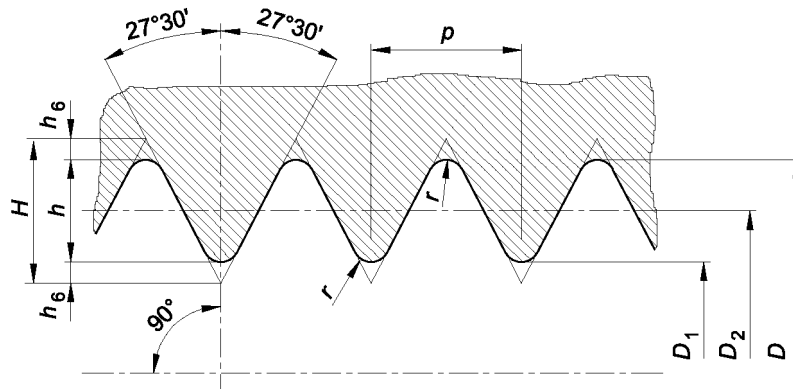
The basic form of the taper pipe thread shall be as shown in Figure 2. The taper is 1 to 16 measured on the diameter. The angle between the flanks, measured in an axial plane section is 55° , the flanks making equal angles with the axis.

The thread profiles are rounded off equally at crests and roots by circular arcs blending tangentially with the flanks in such a manner as to give the same thread height h as for parallel threads (see Figure 1).

7.1.3 Parallel internal thread

The basic form of the parallel pipe thread shall be as shown in Figure 1. The angle between the flanks, measured in an axial plane section is 55° .

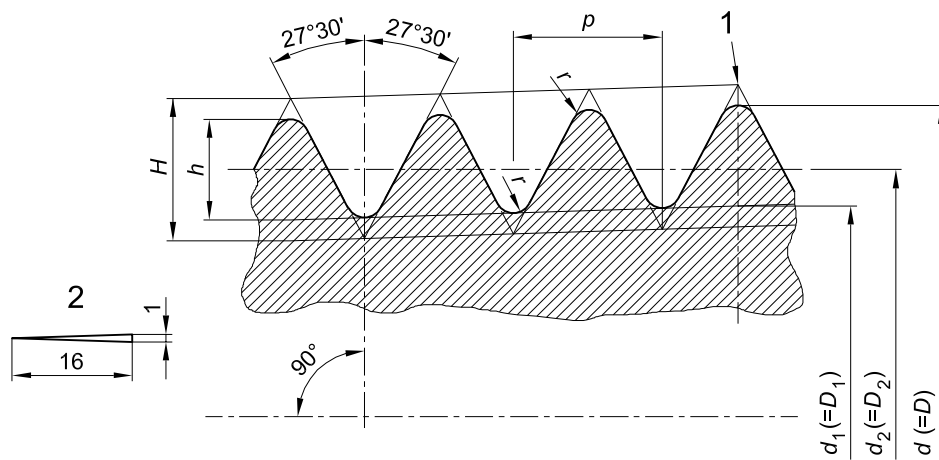
The thread profiles are rounded equally at crests and roots by circular arcs blending tangentially with the flanks.



Key

<i>P</i>	pitch
<i>H</i>	$0,960491P$
<i>h</i>	$0,640327P$
<i>r</i>	$0,137329P$

Figure 1 — Parallel thread (internal)



Key

1	gauge plane
2	taper
<i>P</i>	pitch
<i>H</i>	$0,960237P$
<i>h</i>	$0,640327P$
<i>r</i>	$0,137278P$

Figure 2 — Taper thread (external)

7.2 Thread lengths

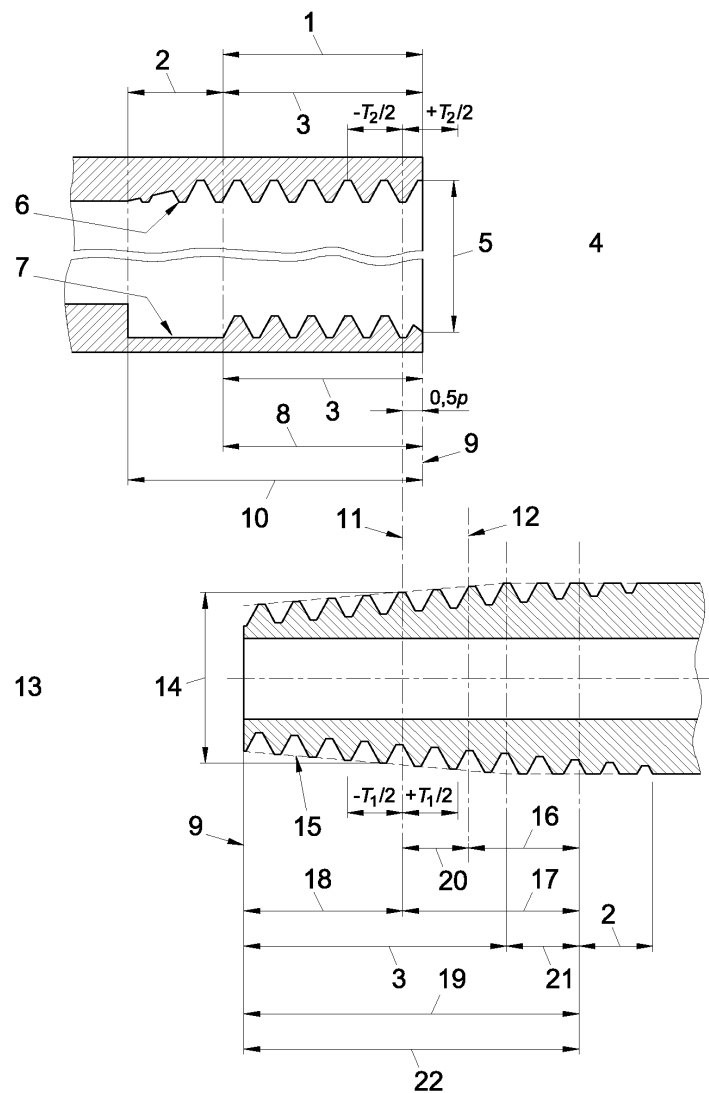
7.2.1 External thread

The terms relating to the external taper pipe thread are given in Figure 3.

The useful thread length L_e , allowable in practice, is the sum of the lengths of the complete and incomplete threads, excluding the washout thread. The useful thread length shall not be less than the gauge length plus the assembly length.

7.2.2 Internal thread

The terms relating to the internal parallel pipe thread are given in Figure 3. The design of an internally threaded workpiece shall be such that the accommodation length L_a and useful thread length L_i in the case of threads without free run out, can receive external threads up to the length given in column 16 of Table 1.

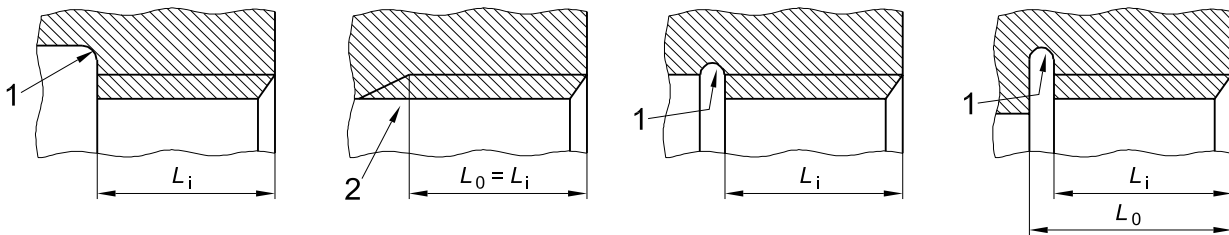
**Key**

- 1 accommodation length (L_a) useful thread length (L_i)
- 2 washout thread
- 3 complete thread
- 4 parallel internal threads (Rp)
- 5 gauge diameter (D)
- 6 without free runout
- 7 with free runout
- 8 useful thread length
- 9 reference plane
- 10 accommodation length
- 11 gauge plane
- 12 face of internally threaded part at upper limit of tolerance, at hand tight condition
- 13 taper external threads
- 14 gauge diameter (D)
- 15 major cone
- 16 wrenching length
- 17 assembly length
- 18 gauge length
- 19 useful thread
- 20 length equivalent to positive tolerance on internal thread plus $0,5P$
- 21 incomplete thread
- 22 useful thread length (not less than gauge length plus assembly length)

Figure 3 — Terms relating to pipe threads

NOTE The actual value of the accommodation length, and useful thread length in the case of threads without free run out, may be reduced from the length given in column 16 of Table 1 if the diameter of the internal thread is reduced accordingly (see column 20 of Table 1)

Only in the case of internal threads with free run out, the useful thread length (see Figure 4) may be reduced to not less than 80% of the value given in column 17 of Table 1.



Key

- 1 with free runout
- 2 without free runout

Figure 4 — Typical design of components with internal parallel threads

8 Gauging

The gauging system described in prEN 10226-3 provides a practical verification of workpieces having pipe threads to this document.

Other gauging systems may be used, but in this case the manufacturer shall demonstrate that the system used gives equivalent gauging results to those obtained using the gauges in prEN 10226-3.

9 Combination with fastening thread

The combination of an external parallel thread G, tolerance class A or B in accordance with EN ISO 228-1 with an internal parallel thread Rp in accordance with this document needs special consideration.

When it is necessary to have this combination, the positive or negative tolerance of the internal thread to this document shall be considered in the relevant product standards, where external parallel threads type G are used.

Such a combination of threads may not necessarily achieve a pressure-tight joint.

Bibliography

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads - Part 1: Dimensions, tolerances and designation*

prEN 10226-2, *Pipe threads where pressure-tight joints are made on the threads - Part 2: Taper external threads and taper internal threads - Dimensions, tolerances and designation.*