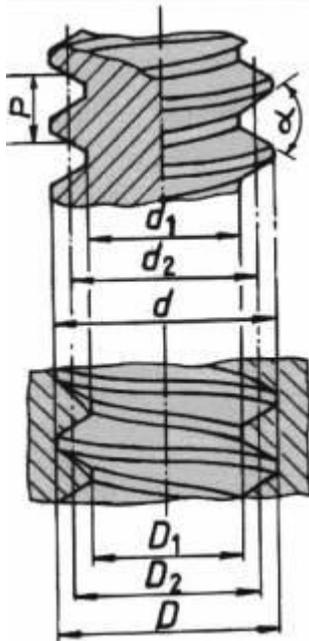


Information on metric screw threads and pitch diameter tolerances d_2/D_2

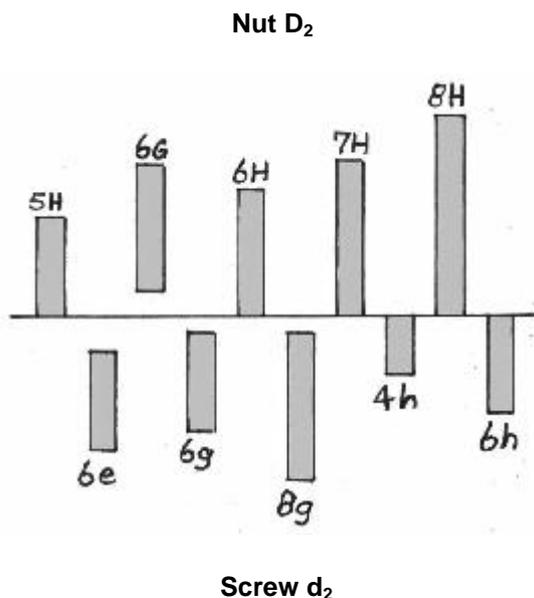


Metric threads have the same tolerance build-up as axles and holes but with a few exceptions. The number and the letter are turned around. The number for a thread gives a significantly larger tolerance than for a comparable hole or axle. The tolerance is also larger for a nut than for a screw – even with the "same" letter. Nuts (internal threads) always use a capitol letter and screws (external threads) always use a small letter.

If a drawing states **M36x4-6H/6g**, then this means that the nut is to be **M36x4-6H**, and the screw **M36x4-6g**. This again means that the nut's minimum pitch diameter size shall equal the nominal pitch diameter, and the screw's pitch diameter size shall have an allowance of a few hundredths of a millimetre under nominal pitch diameter.

M36x4-6H & M36x4-6g

M means **Metric**, **36** is the thread's major diameter (**D/d**), **x4** means a **4 mm pitch**, **6** is the tolerance size and the letter (**H** or **g**) gives the tolerance's position in relation to the nominal pitch diameter. An **H** on a nut tolerance means that the minimum pitch diameter dimension on a nut will be equal to the nominal pitch diameter. An **h** on a screw tolerance means that the maximum pitch diameter dimension on a screw will be equal to the nominal pitch diameter. The letter **g** on a screw means that the largest pitch diameter on a screw will always have clearance to a nut with an **H** tolerance.



6H is the standard tolerance for a nut (internal thread) and 6g is the standard tolerance for a screw (external thread).

The following pitch diameter tolerance sizes and positions on pitch diameter D_2 may be used if relevant: 4,5,6,7 and 8 with G or H

The following pitch diameter tolerance sizes and positions on pitch diameter d_2 may be used if relevant: 3,4,5,6,7,8 and 9 with e,f,g or h

A thread tolerance with a high number has a greater tolerance than that with a low number.

Note also that even although both internal and external threads have the same tolerance "number" the tolerance on the internal thread will be approximately 30% greater than that for the external thread. Compare 6H and 6h on the sketch to the left.

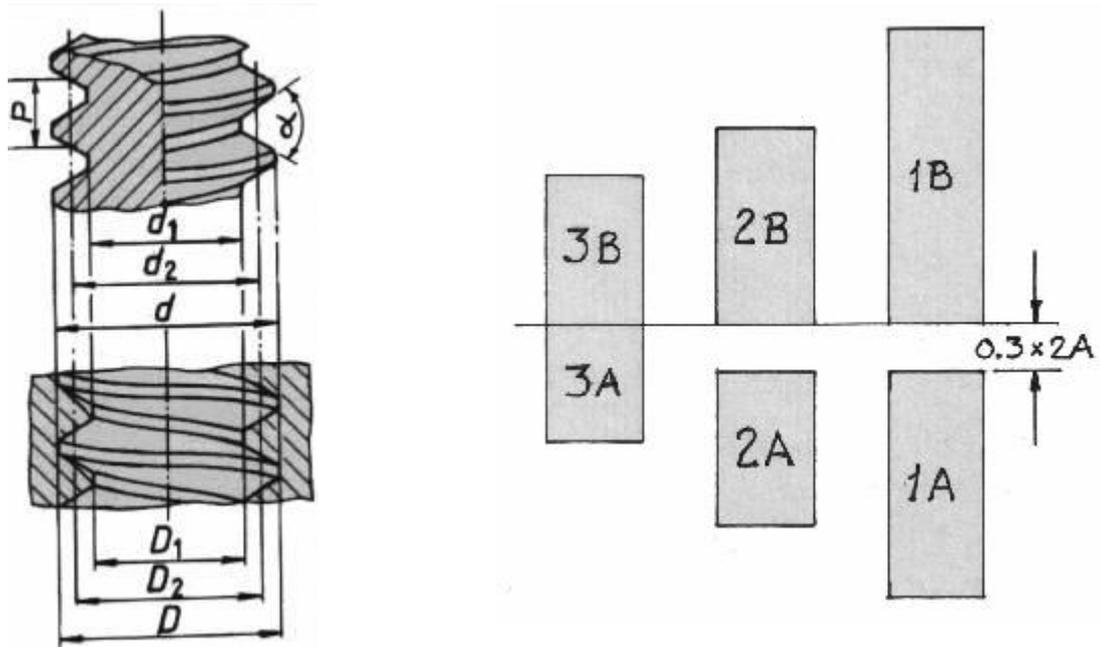
For further detail and information see ISO 965-1, -2 og -3

When a thread is to be surface coated it should be specified (apart from coating thickness) thread pitch diameter tolerances for both before and after surface coating – especially if the machining and surface coating is carried out by two different companies.

Note that a surface coating of, for example 10µm (0,010mm), will change the pitch diameter by approximately 40µm (0,040mm) as all four thread flanks will be coated.

Information on ISO INCH threads and pitch diameter tolerances d_2/D_2

Ref. ASME B1.1 1989 Unified Inch Screw Threads



Relationship between the tolerances - A is external (screw) and B internal (nut)

Tolerance class 2A is the basis	
1A = 1,500 x 2A 2A = 1,000 x 2A 3A = 0,750 x 2A	1B = 1,500 x 2A 2B = 1,000 x 2A 3B = 0,750 x 2A
Allowance from the nominal pitch diameter for 2A and 1A is 0,3 x 2A tolerance	

Example: On a 1/2-13 UNC-2A screw the pitch diameter tolerance is 0,127mm	
1A is 0,127 x 1,5 = 0,1905 2A is 0,127 x 1 = 0,127 3A is 0,127 x 0,75 = 0,095	1B is 0,127 x 1,950 = 0,248 2B is 0,127 x 1,300 = 0,165 3B is 0,127 x 0,975 = 0,124
Allowance is 0,127 x 0,3 = 0,038	

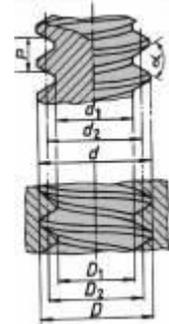
INFORMATION ON PIPE THREADS

There are 2 types of pipe threads - parallel og taper

1. Parallel pipe threads are usually used when pressure-tight joints are **not** made on the threads.
2. Taper pipe threads are usually used where pressure-tight joints **are** made on the threads.

There are 2 systems for pipe threads - British (Whitworth 55°) and American (60°)

1. Whitworth, apart from having a flank angle of 55°, has 4 standard pitches
 - 28, 19, 14 and 11 TPI
2. American, apart from having a flank angle of 60°, has 5 standard pitches
 - 27, 18, 14, 11½ and 8 TPI



One important thing to notice is that the diameter (d/D) on a pipe thread is not in fact the actual diameter. The diameter is based on the pipe diameter hole as it is this diameter (hole) that is important. For example, the actual diameter of a 1" Whitworth pipe thread is not $1 \times 25.4 = 25.4$ mm - but **33.25 mm** and a 1" American pipe thread is not $1 \times 25.4 = 25.4$ mm - but **33.40 mm**. (33.25 mm = 1.31 ins. and 33.40 mm = 1.315 ins.)

The relevant standard should always be checked for the the correct dimension. The difference between British and American sizes is probably because of the difference in the flank angle as a 55° thread will be "deeper" than 60°

As Whitworth (British) pipe threads (in my opinion) are more simple than American (and more wide-spread in Europe), this thread type is dealt with first.

Whitworth (parallel) pipe thread ref. ISO 228-1 (BSP = British Standard Pipe)

This thread has the following recognised abbreviations : **G, BSP**

An internal thread has only one tolerance class but the external thread has - **A** and **B**. The internal thread's pitch diameter tolerance is the same as for **A** in the external thread and the tolerance **B** is exactly twice that of **A**.



In the standrd ISO 228-1 the correct denomination for example of a 1½ ins. pipe thread is as follows :

Internal thread **ISO 228-G 1½** and external thread **ISO 228-G 1½ A** or **ISO 228-G 1½ B** depending on the chosen tolerance.

The pitch diameter tolerance on an external thread is always from nominal and minus and for an internal thread from nominal and plus. In theory both threads (external and internal) have exactly the same pitch diameter - i.e. nominal.

Whitworth (taper) pipe thread ref. ISO 7-1 (BSPT = British Standard Pipe Taper)

This thread has the following recognised abbreviations : **R, Rc, Rp, BSPT**



An internal thread can be either parallel or taper. E.g. for a 1½" pipe thread :

An internal and parallel pipe thread has the abbreviation (denomination) **ISO 7 - Rp 1½**

An internal and taper pipe thread has the abbreviation (denomination) **ISO 7 - Rc 1½**

An external thread is always taper and has the abbreviation (denomination) **ISO 7 - R 1½**

The pitch diameter tolerance on a taper thread is approximately the same size as **B** tolerance on a parallel pipe thread.

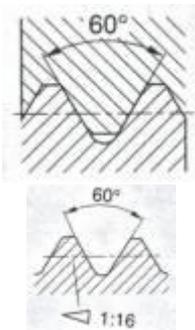
For more information read standard ISO 7-1 or page 3.06 of this FMS Thread Manual

American (NP) pipe thread

There are many more types of American pipe threads than there are Whitworth. This information is therefore only general, and it is recommended that the relevant standards be used when specifying, manufacturing and/or inspecting.

Symbols (abbreviations) used for American pipe threads

N	National Standard
P	Pipe
T	Taper
C	Coupling
S	Straight
M	Mechanical
L	Locknut
H	Hose Coupling
R	Railing Fitting
F	Fine



Some thread denominations for American parallel pipe threads
NPSI, NPSM, NPSL, NPSH, NPSF, NPSI

Some thread denominations for American taper pipe threads
NPT, NPTR, NPTF

References to relevant standards for pipe threads :

ISO 7-1
ISO 228-1

Pipe threads where pressure-tight joints are made on the threads
 Pipe threads where pressure-tight joints are not made on the threads

ANSI/ASME B1.20.1
 ANSI/ASME B1.20.2
ANSI/ASME B1.20.3
 ANSI/ASME B1.20.4

Pipe Threads, General Purpose (Inch)
 Pipe Threads, General Purpose (Metric Translation)
 Inch Dryseal Pipe Threads
 Dryseal Pipe Threads (Metric Translation)