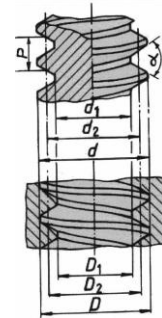


## FINDING NOMINAL PITCH DIAMETER ( $d_2 / D_2$ )

Nominal pitch diameter ( $d_2 / D_2$ ) for a standard thread is often given on the various technical tables issued by companies supplying threaded or thread cutting components. If the major diameter and the pitch diameter for a specific thread type and pitch is known then the pitch diameter for the same thread type and pitch can be calculated as shown below.



*N.B. Even when the results are given in 0,001mm or less, it is most practical to round the final result up or down to the nearest 0,01mm. Only when the pitch diameter tolerance is less than 0,1mm should it be relevant to go to 0,005mm or 0,001mm*

### Example :

#### M16x2

Nominal major diameter ( $D/d$ ) = 16,000 mm

Nominal pitch diameter ( $D_2/d_2$ ) = 14,701 mm (ref. ISO 724)

i.e. the difference between the major diameter ( $D/d$ ) and the pitch diameter ( $D_2/d_2$ ) is  $16,000 - 14,701 = 1,299$  mm

Nominal pitch diameter ( $D_2/d_2$ ) for a metric thread (M) regardless of major diameter size ( $D/d$ ) and with a **2 mm pitch**, can be found by simply subtracting **1,299** from the nominal major diameter ( $D/d$ ).

**Nominal pitch diameter ( $D_2/d_2$ ) for the following metric threads with a 2 mm pitch are :**

$$M16x2 = 16,000 - 1,299 = 14,701$$

$$M36x2 = 36,000 - 1,299 = 34,701$$

$$M60x2 = 60,000 - 1,299 = 58,701$$

$$M120x2 = 120,000 - 1,299 = 118,701$$

**UNC 1/4 – 20** (the pitch in mm for 20 T.P.I. =  $25,4 : 20 = 1,270$  mm)

Nominal major diameter ( $D/d$ ) =  $1/4'' = 0,250'' = 0,250 \times 25,4 = 6,35$  mm

Nominal pitch diameter ( $D_2/d_2$ ) = 5,5245 mm (ref. ISO 725)

i.e. the difference between the major diameter ( $D/d$ ) and the pitch diameter ( $D_2/d_2$ ) is  $6,35 - 5,5245 = 0,8255$  mm

Nominal pitch diameter ( $D_2/d_2$ ) for a ISO Inch thread (UNC, UNF, UNEF, UN etc.) for any major diameter ( $D/d$ ) and a **20 T.P.I. pitch**, can be calculated by simply subtracting **0.8255** mm from the nominal major ( $D/d$ ).

**Nominal pitch diameter ( $D_2/d_2$ ) for the following ISO Inch threads with a 20 T.P.I. pitch are :**

$$1/4 \text{ UNC} - 20 = 6,35 - 0,8255 = 5,5245$$

$$1/2 \text{ UNF} - 20 = 12,70 - 0,8255 = 11,8745$$

$$3/4 \text{ UNEF} - 20 = 19,05 - 0,8255 = 18,2245$$

$$1 1/2 \text{ UN} - 20 = 38,10 - 0,8255 = 37,2745$$

The number to be subtracted from the nominal major diameter ( $D / d$ ) to find nominal pitch diameter is hereafter called **PD<sub>N</sub>**. The following tables on page 2 of 2 show **PD<sub>N</sub>** for a number of standard thread types.

### N.B.

*Tolerance limits for  $D_2$  on a nut are always from nominal  $D_2$  and over and tolerance limits for  $d_2$  on a bolt are always from nominal  $d_2$  and below. This means that the size of  $D_2$  for a nut must always be larger than the nominal pitch diameter and the size for  $d_2$  must always be smaller than the nominal pitch diameter.*

Nominal pitch diameter ( $D_2/d_2$ ) = Nominal major diameter ( $D/d$ ) -  $PD_N$

*T.P.I. = Threads Per Inch*

M (metric) – 60°		UN (ISO Inch) - 60°		Whitworth - 55°		Tr – 30°		ACME – 29°	
Pitch P	PD <sub>N</sub>	T.P.I.	PD <sub>N</sub>	T.P.I.	PD <sub>N</sub>	Pitch P	PD <sub>N</sub>	T.P.I.	PD <sub>N</sub>
0.5	0.325	48	0.343	28	0.581	1,5	0,75	16	0,794
0.6	0.390	44	0.376	26	0.626	2	1	14	0,907
0.7	0.455	40	0.411	22	0.740	3	1,5	12	1,058
0.8	0.520	36	0.457	20	0.813				
1	0.650	32	0.516	19	0.856	4	2	10	1,270
1.25	0.812	28	0.589	18	0.903	5	2,5	8	1,5875
1.5	0.974	24	0.688	16	1.017	6	3	6	2,117
1.75	1.137	20	0.825	14	1.162	7	3	5	2,540
2	1.299	18	0.917	12	1.356	8	4,5	4	3,175
2.5	1.624	16	1.031	11	1.479	9	5	3	4,233
3	1.949	14	1.179	10	1.626	10	5	2 1/2	5,080
3.5	2.273	13	1.270	9	1.807	12	6	2	6,350
4	2.598	12	1.374	8	2.033	14	7	1 1/2	8,467
4.5	2.923	11	1.499	7	2.323	16	8	1 1/3	9,525
5	3.248	10	1.651	6	2.711	18	9	1	12,700
5.5	3.572	9	1.834	5	3.253	20	10		
6	3.897	8	2.062	4 1/2	3.614	22	11		
8	5.196	7	2.357	4	4.066	24	12		
		6	2.751	3 1/2	4.647	28	14		
		5	3.299	3 1/4	5.004				
		4 1/2	3.665	3	5.422	32	16		
		4	4.125	2 7/8	5.657	36	18		
				2 3/4	5.914	40	20		
				2 5/8	6.196	44	22		
				2 1/2	6.506				

*N.B. Whitworth includes both BSW, BSF and ISO228 Pipe threads. On pipe threads please note that the outside diameter (in inches) is not in fact the correct diameter. A one inch (1" = 25.4mm) pipe has in fact a diameter of 33.25 mm*

If the pitch to be used is not given on the tables above it can be calculated from the following :

$$P = \text{pitch in mm} \quad P \text{ for TPI} = TPI : 25,4 \quad (\text{e.g. } 12TPI = 12:25.4 = 0.475\text{mm})$$

$$\mathbf{M \text{ (metric) } - 60^\circ = \text{Nominal pitch diameter } (D_2/d_2) = \text{major diameter } (D/d) - 0,6495P}$$

$$\mathbf{UN \text{ (ISO Inch) } - 60^\circ = \text{Nominal pitch diameter } (D_2/d_2) = \text{major diameter } (D/d) - 0,6495P}$$

$$\mathbf{Whitworth - 55^\circ = \text{Nominal pitch diameter } (D_2/d_2) = \text{major diameter } (D/d) - 0,64P}$$

$$\mathbf{TR \text{ (Trapez) } - 30^\circ = \text{Nominal pitch diameter } (D_2/d_2) = \text{major diameter } (D/d) - 0,5P}$$

$$\mathbf{ACME - 29^\circ = \text{Nominal pitch diameter } (D_2/d_2) = \text{major diameter } (D/d) - 0,5P}$$