

Die nuts for external threads

The die nuts are threading tools, still widely used, although their use is limited to small series productions.

There are other systems, more modern, more efficient and cheaper to make external threads.

However there are applications where the die nut remains the cheapest tool, such as for example, the threads of individual parts for maintenance, the threads of pipes, for hydraulic installations etc.

This tool has the essential advantage to make a very precise thread.

The die nuts can be classified into two main types: *closed die nuts* and *open die nuts*.

The first rigid die nuts do not allow for any adjustment, because they are constructed from a continuous circular ring, which is why they are preferable in the production of parts that must all be equal (interchangeable).

The open die nuts instead have a radial cut that interrupts the ring and makes elastic the complex (see figure N°1).

This flexibility allows an adjustment of the diameter through which you can get the thread with the desired size.

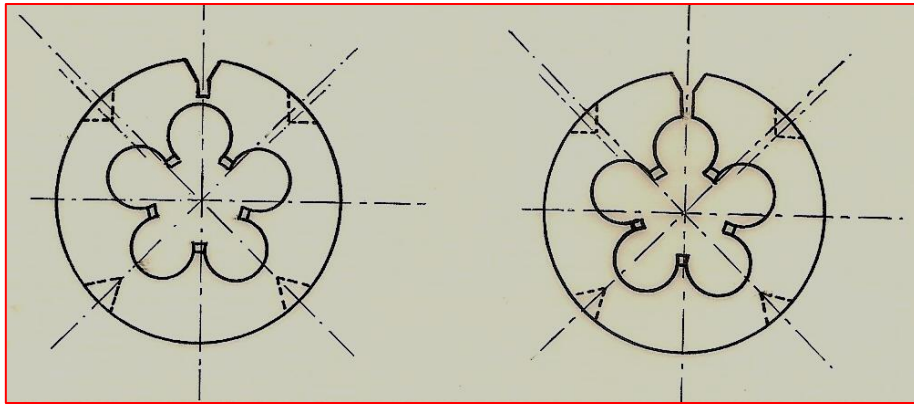


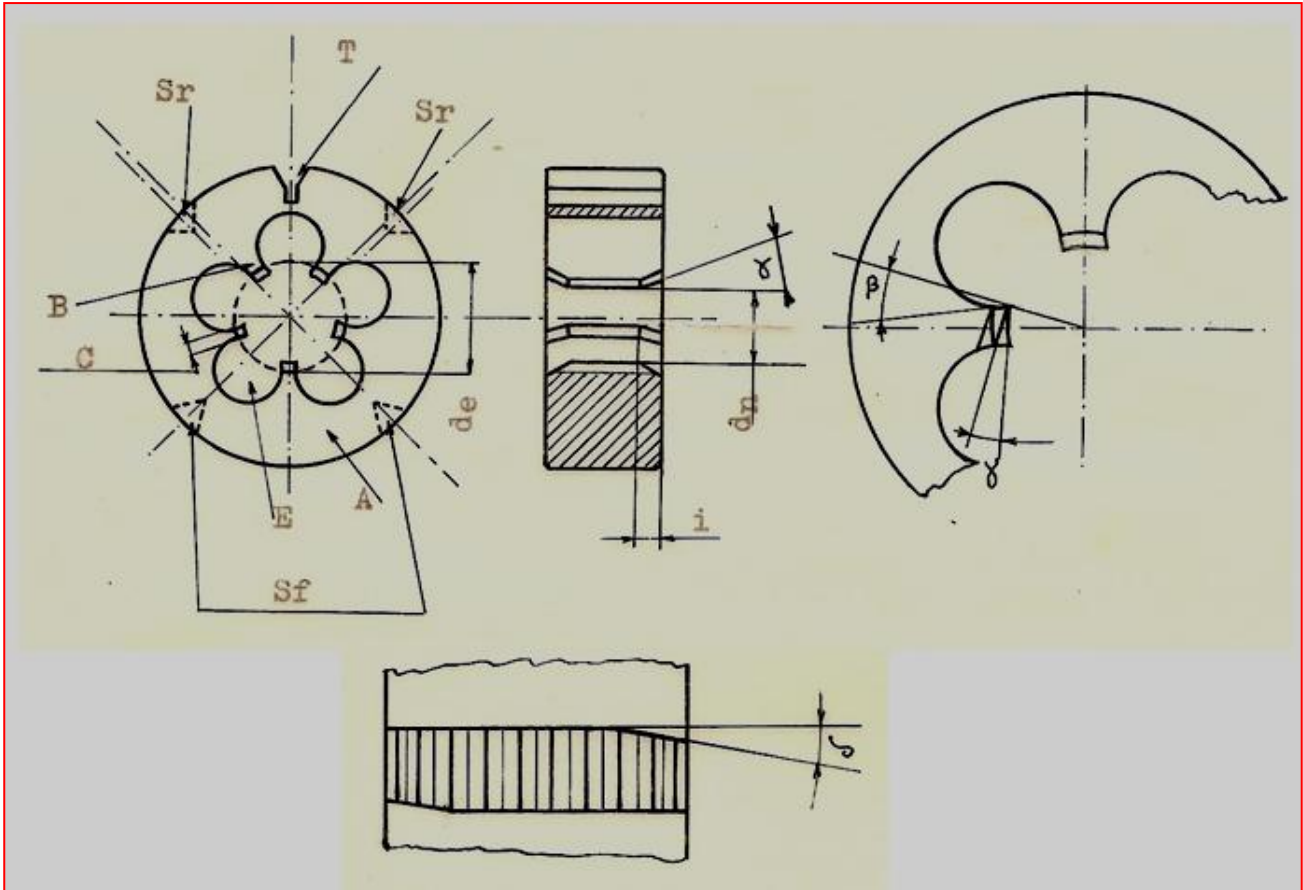
Fig. N°1 – Two types of die nuts

The adjustment must be done with care, however, in the sense that it must go not too far from the final size of the nominal diameter, otherwise you can cause pitch errors, and the surfaces are not well finished.



Fig. N°2- Round die nuts

Figure N°3 summarizes the names of various parts of the round die nuts .



A	Body	d_m	Medium diameter of the thread
B	Tooth or cutting edge	d_n	Root diameter of the thread
C	Width of the cutting edge	i	Length of chamfer
E	Room for chips	p	Pitch
S_f	Conical countersinks for blocking	α	Angle of the chamfer
S_r	Conical countersinks for adjustment	β	Frontal rake angle
T	Preliminary notch for cut of adjustment	γ	Relief angle of the chamfer
d_e	Outside diameter of the thread	δ	Angle of the edge of the chamfer

Fig. N°3- Nomenclature of the part of die nuts

Diameter of the blank

Generally the diameter of the blank is equal to:

$$d_p = d_e - (0,1 \sim 0,2) \cdot p$$

The rake angles, cutting speeds and lubricants suitable for different processes indicated in the table below are indicative. They are bound to different operating conditions, the precise characteristics of the processed material, etc..

Machined material	Rake angle β	Cutting speed m/min	Lubricant
Aluminum and light alloys	20° - 25°	5	Petrolio – O.E.
Duraluminum	15° - 20°	4,5	Rapeseed oil– O.E.
Brass	3° - 5°	10	O.E.
Bronze	5° - 8°	6	Rapeseed oil
Copper	15° - 20°	6	Rapeseed oil– O.E.
Cast iron	5° - 8°	3,5	O.E.
Steel $R < 750 \text{ N/mm}^2$	12° - 18°	2,5	Oil sulfide– O.E.
Steel $R > 750 \text{ N/mm}^2$	10° - 12°	2	Idem
Hard steels	8° - 10°	4,5	Idem
Bakelite	3°	3	Dry with air jet

The angle of the chamfer is almost always 30 ° and the rake angle of chamfer is 6 °. The modification of the chamfer is applied primarily on dies for machining operations because it causes the expulsion of the chips in the sense of the feed and avoid clogging in the rooms.

The angle δ varies from 8° for machining of steel at 12° for machining of light alloys. With reference to figure N°4, the size of the dies, according to the standards DIN EN 22 568, and DIN-EN 24 231 are shown in the tables below (taken from the catalog Vergnano).

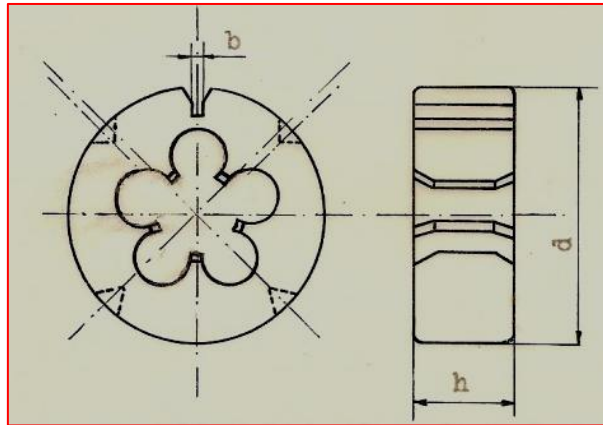


Fig. N°4- References for sizing according to DIN

Metric thread ISO Coarse thread – DIN 13	Tolerance ISO/6g	
	Length of chamfer	1,75 x P
Nominal diameter	Pitch P (mm)	d x h
2	0,40	16 x 5
2,2	0,45	16 x 5
2,5	0,45	16 x 5
3	0,50	20 x 5
3,5	0,60	20 x 5
4	0,70	20 x 5
5	0,80	20 x 7
6	1,0	20 x 7
7	1,0	25 x 9
8	1,25	25 x 9
9	1,25	25 x 9
10	1,5	30 x 11
11	1,5	30 x 11
12	1,75	38 x 14
14	2,0	38 x 14
16	2,0	45 x 18
18	2,5	45 x 18
20	2,5	45 x 18
22	2,5	55 x 22
24	3,0	55 x 22
27	3,0	65 x 25
30	3,5	65 x 25
33	3,5	65 x 25
36	4,0	65 x 25
39	4,0	75 x 30

Metric thread ISO Fine Thread– DIN 13	Tolerance ISO/6g	
	Length of chamfer 1,75 x P	
<i>Nominal diameter</i>	<i>Pitch P (mm)</i>	<i>d x h</i>
2	0,25	16 x 5
2,2	0,25	16 x 5
2,5	0,35	16 x 5
3	0,35	20 x 5
4	0,50	20 x 5
5	0,50	20 x 5
6	0,75	20 x 7
7	0,75	25 x 9
8	0,75	25 x 9
8	1,0	25 x 9
9	1,0	25 x 9
10	0,75	30 x 11
10	1,0	30 x 11
10	1,25	30 x 11
11	1,0	30 x 11
12	1,0	38 x 10
12	1,25	38 x 10
12	1,5	38 x 10
14	1,0	38 x 10
14	1,25	38 x 10
14	1,5	38 x 10
15	1,0	38 x 10
15	1,5	38 x 10
16	1,0	45 x 14
16	1,5	45 x 14
18	1,0	45 x 14
18	1,5	45 x 14
18	2,0	45 x 14
20	1,0	45 x 14
20	1,5	45 x 14
20	2,0	45 x 14
22	1,0	55 x 16
22	1,5	55 x 16
22	2,0	55 x 16
24	1,0	55 x 16
24	1,5	55 x 16
24	2,0	55 x 16
25	1,0	55 x 16
25	1,5	55 x 16
25	2,0	55 x 16
26	1,5	55 x 16
27	1,5	65 x 18
27	2,0	65 x 18
28	1,5	65 x 18
28	2,0	65 x 18
30	1,0	65 x 18
30	1,5	65 x 18
30	2,0	65 x 18
32	1,5	65 x 18
32	2,0	65 x 18
33	2,0	65 x 18
35	1,5	65 x 18
36	1,5	65 x 18
36	2,0	65 x 18
36	3,0	65 x 25

Unified Coarse thread UNC-ASME- B1.1		Tolerance 2A	
		Length of chamfer 1,75 x P	
UNC	Thread diameter (mm)	Pitch P (threads/1")	d x h
Nr.2	2,184	56	16 x 5
Nr.4	2,845	40	20 x 5
Nr.5	3,175	40	20 x 5
Nr.6	3,505	32	20 x 7
Nr.8	4,166	32	20 x 7
Nr.10	4,826	24	20 x 7
Nr.12	5,486	24	20 x 7
1/4"	6,35	20	20 x 7
5/16"	7,938	18	25 x 9
3/8"	9,525	16	30 x 11
7/16"	11,113	14	30 x 11
1/2"	12,7	13	38 x 14
9/16"	14,288	12	38 x 14
5/8"	15,875	11	45 x 18
3/4"	19,05	10	45 x 18
7/8"	22,225	9	55 x 22
1"	25,4	8	55 x 22

DIN-EN 22 568

Unified fine thread - UNF-ASME- B1.1		Tolerance 2A	
		Length of chamfer 1,75 x P	
UNF	Thread diameter (mm)	Pitch P (Threads/1")	d x h
Nr.3	2,515	56	16 x 5
Nr.4	2,845	48	20 x 5
Nr.5	3,175	44	20 x 5
Nr.6	3,505	40	20 x 5
Nr.8	4,166	36	20 x 7
Nr.10	4,826	32	20 x 7
Nr.12	5,486	28	20 x 7
1/4"	6,35	28	20 x 7
5/16"	7,938	24	25 x 9
3/8"	9,525	24	30 x 11
7/16"	11,113	20	30 x 11
1/2"	12,7	20	38 x 10
9/16"	14,288	18	38 x 10
5/8"	15,875	18	45 x 14
3/4"	19,05	16	45 x 14
7/8"	22,225	14	55 x 16
1"	25,4	12	55 x 16

DIN-EN 22 568

Thread Gas Whirtworth UNI – ISO 228		Tolerance Class A	
		Length of chamfer 1,75 x P	
G	Thread diameter (mm)	Pitch P (Threads/1")	d x h
G 1/8"	9,73	28	30 x 11
1/4"	13,16	19	38 x 10
3/8"	16,66	19	45 x 14
1/2"	20,96	14	45 x 14
5/8"	22,91	14	55 x 16
3/4"	26,44	14	55 x 16
7/8"	30,20	14	65 x 18
1"	33,25	11	65 x 18
1 – 1/4"	41,91	11	75 x 20
1 – 1/2"	47,80	11	90 x 22
2"	59,61	11	105 x 22

DIN-EN 24 231

Thread Whirtworth BSW - BS 84		Tolerance Class A	
		Length of chamfer 1,75 x P	
G	Thread diameter (mm)	Pitch P (Threads/1")	d x h
3/32"	2,38	48	20 x 5
1/8"	3,18	40	20 x 5
3/16"	4,76	24	20 x 7
1/4"	6,35	20	25 x 9
5/16"	7,94	18	25 x 9
3/8"	9,53	16	30 x 11
7/16"	11,11	14	30 x 11
1/2"	12,70	12	38 x 14
5/8"	15,88	11	45 x 18
3/4"	19,05	10	45 x 18
7/8"	22,23	9	55 x 22
1"	25,40	8	55 x 22

DIN-EN 22 568

American tapered pipe thread taper 1/16 According to ANSI B 1.20.1		Tolerance ---	
		Length of chamfer 1,75 x P	
NPT	Pitch P (Threads/1")	d x h	
1/16"	27	25 x 10	
1/8"	27	30 x 10	
1/4"	18	38 x 15	
3/8"	18	45 x 15,3	
1/2"	14	45 x 20	
3/4"	14	55 x 20,2	
1"	11 -1/2	65 x 25	

DIN-EN 22 568



Fig. N°5- Die nut with hexagonal body



Fig. N°6- Die nut with modified chamfer