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Rp (BSP) 55°
(cylindrical)

Nom. dia.	Thr. pr. 1"	Major dia.	Tap. drill
1/16	28	7,723	6,50
1/8	28	9,728	8,50
1/4	19	13,157	11,40
3/8	19	16,662	14,90
1/2	14	20,955	18,60
3/4	14	26,441	24,10
1	11	33,249	30,20
1 1/4	11	41,910	38,90
1 1/2	11	47,803	44,80
2	11	59,614	56,60
2 1/2	11	75,184	72,20
3	11	87,884	84,90

Rc (BSPT) 55°
(taper)

Nom. dia.	Thr. pr. 1"	Tap. drill
1/16	28	6,30
1/8	28	8,30
1/4	19	11,50
3/8	19	14,70
1/2	14	18,20
3/4	14	23,50
1	11	29,70
1 1/4	11	38,50
1 1/2	11	44,50
2	11	56,50
2 1/2	11	71,50
3	11	84,00

Pg 80°

Nom. dia.	Thread pr. 1"	Major dia.	Minor diameter min.	Minor diameter max.	Tap. drill
Pg 7	20	12,5	11,28	11,43	11,40
Pg 9	18	15,2	13,86	14,01	13,90
Pg 11	18	18,6	17,26	17,41	17,30
Pg 13,5	18	20,4	19,06	19,21	19,10
Pg 16	18	22,5	21,16	21,31	21,20
Pg 21	16	28,3	26,78	27,03	26,80
Pg 29	16	37,0	35,48	35,73	35,50
Pg 36	16	47,0	45,48	45,73	45,50
Pg 42	16	54,0	52,48	52,73	52,50
Pg 48	16	59,3	57,78	58,03	57,80

NPSM/NPSF- 60° Pipe threadtaper

Nom. dia.	Thr. pr. 1"	Tapping drill NPT	Tapping drill NTF
1/16	27	6,30	6,30
1/8	27	8,50	8,40
1/4	18	11,10	11,00
3/8	18	14,50	14,30
1/2	14	18,00	17,80
3/4	14	23,20	23,00
1	11 1/2	29,20	29,00
1 1/4	11 1/2	38,00	37,80
1 1/2	11 1/2	44,00	43,80
2	11 1/2	56,40	56,00
2 1/2	8	67,00	66,50
3	8	83,00	82,50

NPSM/NPSF- 60° Pipe thread

Nom. dia.	Thr. pr. 1"	Tapping drill NPSM	Tapping drill NPSF
1/16	27		6,30
1/8	27	9,10	8,60
1/4	18	11,90	11,20
3/8	18	15,50	14,70
1/2	14	19,00	18,20
3/4	14	24,50	23,50
1	11 1/2	30,50	29,50
1 1/4	11 1/2	39,50	
1 1/2	11 1/2	45,50	
2	11 1/2	57,50	
2 1/2	8	69,00	
3	8	85,00	

Tap selection

Hand tapping: The hand taps are straight fluted and are in sets of three for coarse threads: first taper, second tap and plug/bottoming tap. For fine threads in sets of two: second taper and plug/bottoming tap.

Machine tapping

Machine tapping taps are made in several designs.
For through holes a spiral point tap (gun nose tap) is preferred, allowing the materiel partials/chips to be forced forward.
For blind holes spiral fluted taps are suitable. Spiral fluted taps are available in three different angles: 15°, 35° and 45°. A general rule is that the more ductile the material and the deeper the hole, the greater the angle.
Taps and dies in standard versions are suited for most materials, but special ground taps and dies are required in some materials, e.g. soft brass and stainless steel.
In ductile materials a thread forming tap can be used (not preferred for medical, food or aerospace industries). Tap and die holders are subject to preference for forming of threads. The rigid /synchro method is preferred.

Cutting speeds

The most suitable cutting speed is generally found through experience, but cutting speed can be taken from the table below and afterwards corrected. The ideal cutting speed is influenced by many factors. Some of these are:

- The material
- The length, diameter and pitch of thread
- The type of tap/die
- The lubricant/coolant quality and quantity
- The tap drill diameter

Also the condition and type of the machine being used is an essential factor. It is therefore important to follow the specific machine instructions. Especially when CNC programming using tension compression it is important to follow the manufacturers recommendation.

Coolant/lubricant conditions

Correct cooling/lubricant will result in a prolonged life of the tap/die and a better result in thread quality.
The cutting speed depends also upon the temperature of the cutting edge. It is therefore essential to use plenty of lubricant/coolant. Coolant with low EP additives demands lower range of cutting speeds. Grease is less suitable.

Inspection of the thread

For inspection of threads, thread gauges are used: Go / No Go plug gauges to verify internal thread and Go / No Go thread ring gauges to verify external thread. When using thread gauges pitch diameters, pitch error and thread angles to a certain degree are verified. Please note that the other errors may still occur e.g. errors in thread shapes and angle.

Tap drill non listed

For non listed metric (M) sizes and UN, the tap drill size can be easily found: Major thread diameter minus pitch equals drill diameter. For forming threads (roll taps): tap drill size is found by subtracting half the pitch from the major diameter .
The larger the drilled hole, the easier the cutting of the thread will be, thereby prolonging the life of the tap.

Material	M.P.M.
Aluminium, long chip Aluminium, short chip	25-45 15-25
Brass, long chip Brass, short chip	20-25 15-20
Copper, long chip Copper, short chip	20-25 12-15
Cast iron, grey Cast iron, malleable	10-15 15-25
Steel, 50 ton Steel, 50-70 Steel, 70+	12-16 6-10 3-5
Stainless steel, free cutting Stainless steel, austenitic Stainless steel, ferritic <850 Stainless steel, ferritic >850	10-15 4-8 4-8 3-5
Zinc	20-25
Plastic, thermoplastic Plastic, duroplastic	20-30 10-15

Nominal BSP	Nominal Inch	Nominal mm	Rpm. When cutting speed V (m/min.) from table is: 4	6	8	10	12	15	20	25	30	45	50
	1/8	3	420	636	850	1060	1270	1590	2120	2750	3180	4770	5300
	5/32	4	320	478	638	800	955	1195	1600	2000	2390	3585	3980
	3/16	5	260	382	510	635	764	955	1270	1590	1910	2865	3180
	1/4	6	212	318	425	535	636	800	1070	1335	1600	2400	2650
	5/16	8	160	240	318	400	478	600	800	1000	1200	1800	1990
1/8	3/8	10	128	190	255	320	382	480	640	800	960	1440	1590
1/4	1/2	12	105	158	212	265	318	400	530	665	800	1200	1325
	9/16	14	90	135	182	230	274	340	460	570	680	1020	1140
3/8	5/8	16	80	120	160	200	240	300	400	500	600	900	990
		18	72	106	142	175	212	265	350	430	530	795	885
1/2	3/4	20	64	96	128	160	190	240	320	400	480	720	795
5/8	7/8	22	60	88	116	145	174	220	290	365	440	660	720
		24	52	80	106	134	160	200	268	335	400	600	665
3/4	1	26	48	74	98	124	146	185	248	310	370	555	612
	1 1/8	28	46	68	90	114	138	170	228	285	340	510	570
		30	44	64	85	106	128	160	212	270	320	480	530
1	1 1/4	32	40	60	80	100	120	150	200	250	300	450	500
	1 3/8	35	36	54	72	90	110	135	180	225	270	405	450
1 1/4	1 1/2	40	32	48	64	80	96	120	160	200	240	360	397
1 1/2	1 3/4	45	28	42	56	70	85	105	140	175	210	315	350
	2	50	26	38	50	64	76	95	128	160	190	285	320

Thread Cutting Tools Since 1898

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Metric ISO thread 60°

Nominal diameter	Pitch mm	Minor diameter		Tapping drill	
		6 H min.	6 H max	Cut-ting	For-ming
M 1	0,25	0,729	0,785	0,75	0,90
M 1,1	0,25	0,829	0,885	0,85	1,00
M 1,2	0,25	0,929	0,985	0,95	1,10
M 1,4	0,3	1,075	1,160	1,10	1,25
M 1,6	0,35	1,221	1,321	1,25	1,45
M 1,8	0,35	1,421	1,521	1,45	1,65
M 2	0,4	1,567	1,679	1,60	1,80
M 2,2	0,45	1,713	1,838	1,75	2,00
M (2,3)	0,4	1,867	1,979	1,90	2,10
M 2,5	0,45	2,013	2,138	2,05	2,30
M (2,6)	0,45	2,113	2,238	2,20	2,40
M 3	0,5	2,459	2,599	2,50	2,80
M 3,5	0,6	2,850	3,010	2,90	3,20
M 4	0,7	3,242	3,422	3,30	3,70
M 4,5	0,75	3,688	3,878	3,75	4,20
M 5	0,8	4,134	4,334	4,20	4,60
M 6	1,0	4,917	5,153	5,00	5,50
M 7	1,0	5,917	6,153	6,00	6,50
M 8	1,25	6,647	6,912	6,80	7,40
M 9	1,25	7,647	7,912	7,80	8,40
M 10	1,5	8,376	8,676	8,50	9,30
M 11	1,5	9,376	9,676	9,50	10,30
M 12	1,75	10,106	10,441	10,25	11,20
M 14	2,0	11,835	12,210	12,00	13,00
M 16	2,0	13,835	14,210	14,00	15,00
M 18	2,5	15,294	15,744	15,50	16,80
M 20	2,5	17,294	17,744	17,50	18,80
M 22	2,5	19,294	19,744	19,50	20,80
M 24	3,0	20,752	21,252	21,00	22,50
M 27	3,0	23,752	24,252	24,00	25,50
M 30	3,5	26,211	26,771	26,50	
M 33	3,5	29,211	29,771	29,50	
M 36	4,0	31,670	32,270	32,00	
M 39	4,0	34,670	35,270	35,00	
M 42	4,5	37,129	37,799	37,50	
M 45	4,5	40,129	40,799	40,50	
M 48	5,0	42,587	43,297	43,00	
M 52	5,0	46,587	47,297	47,00	
M 56	5,5	50,046	50,796	50,50	
M 60	5,5	54,046	54,796	54,50	
M 64	6,0	57,505	58,305	58,00	
M 68	6,0	61,505	62,305	62,00	

G (BSP.F) ISO pipe thread 55°

Nom. dia	Thread pr. 1"	Major dia.	Minor diameter		Tapping drill	
			min.	max.	Cut-ting	For-ming
1/16	28	7,723	6,561	6,843	6,70	7,40
1/8	28	9,728	8,566	8,848	8,70	9,40
1/4	19	13,157	11,445	11,890	11,75	12,60
3/8	19	16,662	14,950	15,395	15,25	16,00
1/2	14	20,955	18,631	19,172	19,00	20,20
5/8	14	22,911	20,587	21,128	21,00	22,10
3/4	14	26,441	24,117	24,658	24,50	25,70
7/8	14	30,201	27,877	28,418	28,30	29,40
1	11	33,249	30,291	30,931	30,50	32,30
1 1/8	11	37,897	34,939	35,579	35,50	
1 1/4	11	41,910	38,952	39,592	39,50	
1 3/8	11	44,323	41,365	42,005	41,50	
1 1/2	11	47,803	44,845	45,485	45,00	
1 3/4	11	53,746	50,788	51,428	51,00	
2	11	59,614	56,656	57,296	57,00	
2 1/4	11	65,710	62,752	63,392	63,00	
2 1/2	11	75,184	72,226	72,866	72,50	
2 3/4	11	81,534	78,576	79,216	79,00	
3	11	87,884	84,926	85,566	85,50	

Tr ISO thread 30°

Nom. dia	Pitch mm	Minor diameter		Tapping drill
		min.	max.	
Tr. 8	1,5	6,500	6,690	6,60
Tr. 10	2	8,000	8,236	8,20
Tr. 10	3	7,000	7,315	7,30
Tr. 12	3	9,000	9,315	9,30
Tr. 14	3	11,000	11,315	11,30
Tr. 14	4	10,000	10,375	10,30
Tr. 16	4	12,000	12,375	12,30
Tr. 18	4	14,000	14,375	14,30
Tr. 20	4	16,000	16,375	16,30
Tr. 22	5	17,000	17,450	17,40
Tr. 24	5	19,000	19,450	19,40
Tr. 26	5	21,000	21,450	21,40
Tr. 28	5	23,000	23,450	23,40
Tr. 30	6	24,000	24,500	24,40
Tr. 32	6	26,000	26,500	26,40
Tr. 36	6	30,000	30,500	30,40
Tr. 40	7	33,000	33,560	33,40

Metric fine thread 60°

Nominal diameter	Pitch mm	Minor diameter		Tapping drill	
		6 H min.	6 H max.	Cut-ting	For-ming
M 3	0,35	2,621	2,677	2,65	2,83
M 4	0,5	3,459	3,599	3,50	3,75
M 5	0,5	4,459	4,599	4,50	4,75
M 6	0,75	5,189	5,379	5,25	5,63
M 7	0,75	6,189	6,379	6,25	6,63
M 8	0,75	7,189	7,379	7,25	7,63
M 8	1,0	6,918	7,154	7,00	7,50
M 9	1,0	7,918	8,154	8,00	8,50
M 10	0,75	9,189	9,379	9,25	9,63
M 10	1,0	8,918	9,154	9,00	9,50
M 10	1,25	8,648	8,913	8,75	9,38
M 11	1,0	9,918	10,154	10,00	10,50
M 12	1,0	10,918	11,154	11,00	11,50
M 12	1,25	10,648	10,913	10,75	11,38
M 12	1,5	10,377	10,677	10,50	11,25
M 13	1,0	11,918	12,154	12,00	12,50
M 14	1,0	12,918	13,154	13,00	13,50
M 14	1,25	12,648	12,913	12,75	13,38
M 14	1,5	12,377	12,677	12,50	13,25
M 15	1,0	13,918	14,154	14,00	14,50
M 15	1,5	13,377	13,677	13,50	14,25
M 16	1,0	14,918	15,154	15,00	15,50
M 16	1,5	14,377	14,677	14,50	15,25
M 17	1,0	15,918	16,154	16,00	16,50
M 18	1,0	16,918	17,154	17,00	17,50
M 18	1,5	16,377	16,677	16,50	17,25
M 18	2,0	15,836	16,211	16,00	17,00
M 20	1,0	18,918	19,154	19,00	19,50
M 20	1,5	18,377	18,677	18,50	19,25
M 20	2,0	17,836	18,211	18,00	19,00
M 22	1,0	20,918	21,154	21,00	21,50
M 22	1,5	20,377	20,677	20,50	21,25
M 22	2,0	19,836	20,211	20,00	21,00
M 24	1,0	22,918	23,154	23,00	23,50
M 24	1,5	22,377	22,677	22,50	23,25
M 24	2,0	21,836	22,211	22,00	23,00
M 25	1,0	23,918	24,154	24,00	24,50
M 25	1,5	23,377	23,677	23,50	24,25
M 26	1,5	24,377	24,677	24,50	25,25

M EG (Helicoil) 60°

Nominal diameter	Pitch mm	Tapping drill	Major diameter
M 5	0,8	5,2	6,04
M 6	1,0	6,3	7,30
M 8	1,25	8,4	9,62
M 8x1	1,0	8,3	9,30
M 10	1,5	10,50	11,95
M 12	1,75	12,50	14,27
M 12x1,5	1,5	12,50	13,95

BSW/BSF - (Whiteworth) Brutish inch thread 55°

Nom. dia	Thr. pr. 1"	Major dia.	Tapping drill	
			Cutting	Forming
BSW				
1/16	60	1,588	1,20	
3/32	48	2,381	1,90	
1/8	40	3,175	2,60	2,80
5/32	32	3,969	3,20	3,50
3/16	24	4,762	3,80	4,10
7/32	24	5,556	4,60	4,90
1/4	20	6,350	5,20	5,60
5/16	18	7,938	6,60	7,10
3/8	16	9,525	8,00	8,60
7/16	14	11,112	9,40	10,00
1/2	12	12,700	10,50	11,50
9/16	12	14,288	12,00	13,00
5/8	11	15,875	13,50	14,50
3/4	10	19,050	16,50	17,50
7/8	9	22,225	19,50	20,60
1	8	25,400	22,50	
1 1/8	7	28,575	25,00	
1 1/4	7	31,750	28,00	
1 3/8	6	34,925	31,00	
1 1/2	6	38,100	34,00	
1 3/4	5	44,450	39,50	
2	4 1/2	50,800	45,50	
BSF				
3/16	32	4,762	4,00	
7/32	28	5,556	4,60	
1/4	26	6,350	5,40	
5/16	22	7,938	6,80	
3/8	20	9,525	8,30	
7/16	18	11,112	9,80	
1/2	16	12,700	11,00	
9/16	16	14,288	12,50	
5/8	14	15,875	14,00	

UNC - Unified screw thread 60°

Nom. dia.	Thr. pr. 1"	Major dia. mm	Minor diameter		Tapping drill	
			2 B min.	2 B max.	Cut-ting	For-ming
No. 1	64	1,854	1,425	1,582	1,55	
No. 2	56	2,184	1,694	1,872	1,85	1,96
No. 3	48	2,515	1,941	2,146	2,10	2,25
No. 4	40	2,845	2,156	2,385	2,35	2,50
No. 5	40	3,175	2,487	2,697	2,65	2,85
No. 6	32	3,505	2,642	2,896	2,85	3,10
No. 8	32	4,166	3,302	3,531	3,50	3,80
No. 10	24	4,826	3,683	3,962	3,90	4,30
No. 12	24	5,486	4,343	4,597	4,50	5,00
1/4	20	6,350	4,976	5,268	5,10	5,70
5/16	18	7,938	6,411	6,734	6,60	7,20
3/8	16	9,525	7,805	8,164	8,00	8,70
7/16	14	11,112	9,149	9,550	9,40	10,20
1/2	13	12,700	10,584	11,013	10,80	11,70
9/16	12	14,288	11,996	12,456	12,20	13,30
5/8	11	15,875	13,376	13,868	13,50	14,80
3/4	10	19,050	16,299	16,833	16,50	
7/8	9	22,225	19,169	19,748	19,50	
1	8	25,400	21,693	22,598	22,25	
1 1/8	7	28,576	24,648	25,349	25,00	
1 1/4	7	31,750	27,823	28,524	28,00	
1 3/8	6	34,925	30,343	31,120	30,75	
1 1/2	6	38,100	33,518	34,295	34,00	
1 3/4	5	44,450	38,951	39,814	39,50	
2	4 1/2	50,800	44,689	45,598	45,00	
2 1/4	4 1/2	57,150	51,028	51,943	51,50	
2 1/2	4	63,500	56,617	57,582	57,00	
2 3/4	4	69,850	62,967	63,932	63,50	
3	4	76,200	69,317	70,282	70,00	

UNF - Unified inch screw trhead 60°

Nom. dia	Thr. pr. 1"	Major dia. mm	Minor diameter		Tapping drill	
			2 B min.	2 B max.	Cut-ting	For-ming
No. 0	80	1,524	1,181	1,306	1,25	
No. 1	72	1,854	1,473	1,613	1,55	
No. 2	64	2,184	1,755	1,913	1,90	2,00
No. 3	56	2,515	2,024	2,197	2,15	2,30
No. 4	48	2,845	2,271	2,459	2,40	2,60
No. 5	44	3,175	2,550	2,741	2,70	2,90
No. 6	40	3,505	2,819	3,023	2,95	3,20
No. 8	36	4,166	3,404	3,607	3,50	3,80
No. 10	32	4,826	3,962	4,166	4,10	4,40
No. 12	28	5,486	4,496	4,724	4,70	5,10
1/4	28	6,350	5,367	5,580	5,50	5,90
5/16	24	7,938	6,792	7,038	6,90	7,40
3/8	24	9,525	8,379	8,626	8,50	9,00
7/16	20	11,112	9,738	10,030	9,90	10,50
1/2	20	12,700	11,326	11,618	11,50	12,10
9/16	18	14,288	12,761	13,084	12,90	13,70
5/8	18	15,875	14,348	14,671	14,50	15,30
3/4	16	19,050	17,330	17,689	17,50	
7/8	14	22,225	20,262	20,663	20,40	
1	12	25,400	23,109	23,569	23,25	
1 1/8	12	28,576	26,284	26,744	26,50	
1 1/4	12	31,750	29,459	29,919	29,50	
1 3/8	12	34,925	32,634	33,094	32,75	
1 1/2	12	38,100	35,809	36,269	36,00	

UNEF - Unified inch screw trhead 60°

Nom. dia.	Thr. pr. 1"	Major dia. mm	Minor diameter		Tapping drill	
			2 B min.	2 B max.	Cut-ting	For-ming
No. 12	32	5,486	4,623	4,826	4,80	5,10
1/4	32	6,350	5,486	5,690	5,60	6,00
5/16	32	7,938	7,087	7,264	7,20	7,60
3/8	32	9,525	8,661	8,865	8,80	9,20
7/16	28	11,112	10,134	10,338	10,30	10,70
1/2	28	12,700	11,709	11,938	11,80	12,30
9/16	24	14,288	13,132	13,386	13,30	13,80
5/8	24	15,875	14,732	14,986	15,00	15,40
11/16	24	17,462	16,307	16,561	16,50	17,00
3/4	20	19,050	17,678	17,958	18,00	18,50
13/16	20	20,638	19,253	19,558	19,50	
7/8	20	22,225	20,853	21,133	21,00	
1	20	25,400	24,028	24,308	24,30	
1 1/16	18	26,988	25,451	25,781	25,70	
1 1/8	18	28,576	27,051	27,381	27,20	
1 1/4	18	31,750	30,226	30,556	30,50	
1 3/8	18	34,925	33,401	33,731	33,50	
1 1/2	18	38,100	36,576	36,881	36,80	