Thürmer Tools
Sophienlund Allé 5 - DK 3250 Gilleleje
Telephone: +45 7027 5727
www.thurmer.dk
E-mail: info@thurmer.com

Rp sealing pipe thread (BSPP) (Cylindrical) 55°			
Nom. dia.	Threads per.1"	Outer. dia.	Thread 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

Rp sealing pipe thread (BSPT) (Tapered) 55°		
Nom. dia.	Thread per.1"	Thread 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	56,60
2 1/2	11	71,50
3	11	84,00

Pg-armored conduit thread 80°					
Nom. dia.	Thread per.1"	Outer dia.	Inner Diameter		Thread Drill
			min	max	
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

NPT/NPTF (American pipe thread) 60°			
Nom, dia.	Thread per.1"	Thread Drill	
		NPT	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	111/2	29,20	29,00
1 1/4	111/2	38,00	37,80
1 1/2	111/2	44,00	43,80
2	111/2	56,40	56,00
2 1/2	8	67,00	66,50
3	8	83,00	82,50

NPSM/NPSF (American pipe thread) 60°			
Nom. dia.	Thread per.1"	Thread Drill	
		NPSM	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	111/2	30,50	29,50
1 1/4	111/2	39,50	
1 1/2	111/2	45,50	
2	111/28	57,50	
2 1/2	8	69,00	
3	8	85,00	

Choice of Tap

The most suitable tap is determined based on hole type and material. The hole type determines the chip evacuation direction, and the material determines the cutting angle.

Hand taps come as taper tap, intermediate tap, and bottoming tap, depending on the thread profile. A hand tap typically consists of 3 parts, each with a different thread profile and specific purpose. First comes the taper tap, then the intermediate, and finally the bottoming tap, which finishes the thread profile. Taps can also be used individually, for example in repair kits where damaged or contaminated threads need to be cleaned or re-tapped.

Machine taps come in various designs, with the most common being spiral point taps, chip breakers, or spiral flute taps. A machine tap can cut thread holes in, for example, serial production and may have small channels for cooling.

For through holes, a chip breaker is ideal since the chips are pushed out in front of the tap.

For blind holes, the chips must be evacuated along the flutes, making spiral flute taps the best choice. Spiral taps are available in several angles—12°–17°, 30°–35°, and 45°–50°. The more ductile the material, the higher the angle and spiral pitch required. Spiral fluted taps provide an opportunity for efficient chip evacuation in advanced thread forms.

Standard taps and dies are suitable for most materials, except brass and rustproof steel, which require special cutting geometry due to their properties.

Taps and dies for brass must not be used in other materials. Special advanced materials may require specially designed taps and dies.

Cutting Speeds

The best cutting speed is determined through practical experience. A number of factors influence it, including:

- Material being cut
- Thread length
- Thread diameter
- Thread pitch
- Type of tap / die
- Lubricant / coolant
- Tap drill diameter
- Horizontal or vertical cutting
- Clamping
- Machinery

The cutting speed can initially be selected from a table and then adjusted based on the specific conditions related to the factors above. Cutting speed is often determined by how hot the cutting edge becomes, and it is crucial that sufficient coolant/lubricant reaches the cutting edge. It's also important to pay attention to the specific machine instructions.

Coolant/Lubricant Conditions

Longer tool life, better dimensional accuracy, smoother surfaces, and easier chip removal are all associated with using the right type of coolant, which must reach the cutting edge in sufficient quantity. It is also important that the coolant is clean, as the only cutting done should be by the tool itself, not by chips returning to the cutting area. Small impurities in the coolant can enter the fluting and damage the threads. When cutting with dies, coolant is also important because heat buildup can result in poor thread quality. Oil is usually suitable, while grease is less so.

Thread Inspection

During thread production, several types of errors can occur. Outer diameter, pitch diameter, and inner diameter, as well as thread pitch and profile angle, must be checked. Visual inspection can reveal some thread defects. Thread gauges and inspection tools check the pitch diameter and sometimes the profile angle. A thread gauge that fits into the thread without too much resistance is often used for control. Profile and angle errors are checked with a thread microscope.

Unspecified Tap Drill

For unspecified metric fine threads, it is easy to find the correct tap drill diameter: Outer thread diameter minus pitch gives the tap drill diameter. This applies to cut threads. For rolled (formed) threads, the tap drill diameter is found by subtracting half the pitch from the outer diameter. The larger the drilled hole, the easier the threading becomes, and this extends the life of the tap.

Materialer	Cutting Speed (m/min)
Aluminum, long chip	25-45
Aluminum, short chip	15-25
Brass, long chip	20-25
Brass, short chip	15-20
Copper, long chip	20-25
Copper, short chip	12-15
Cast iron, gray	10-15
Cast iron, malleable	15-25
Steel, 50 ton	12-16
Steel 50–70	6-10
Steel 70+	3-5
Stainless steel, free cutting	10-15
Stainless steel, austenitic	4-8
Stainless steel, iron <850	4-8
Stainless steel, iron >850	3-5
Zinc	20-25
Plastic, thermoplastic	20-30
Plastic, duroplastic	10-15

Thread Diameter			Revolutions per Minute (RPM)									
Pipe Thread ↓	TOMME (inch) ↓	ISO-M mm ↓	When the cutting speed V (m/min) from the 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	1 2	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
		1 8	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
5/6	7/8	22	60	88	116	145	174	220	290	365	440	660	720
		2 4	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
		3 0	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	4 0	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

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Metric Thread 60°

Nom, dia.	Pitch mm	Inner Diameter 6 H min	Inner Diameter 6 H max	Thread Drill Cut-ting	Thread Drill For-ming
M1	0.25	0.729	0.785	0.75	0.90
M 1.1	0.25	0.829	0.786	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	2.242	3.422	3.30	2.70
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	43.297	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-pipe Thread(BSP) 55°

Nom, dia.	Threads per. 1"	Outer dia.mm	Inner Diameter min	Inner Diameter max	Thread Drill Cut-ting	Thread Drill 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	

Trapezoidal Thread 30°

Nom, dia.	Pitch mm	Inner Diameter min	Inner Diameter max	Thread Drill
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°

Nom, Dia.	Pitch mm	Inner Diameter 6 H min	Inner Diameter 6 H max	Thread Drill Cut-ting	Thread Drill For-ming
M 3	0.35	2.621	2.677	2.65	2.83
M 4	0.35	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	16.577	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

BSW (Whitworth) 55°

Nom, dia.	Threads per.1"	Outer dia.mm	Thread Drill Cut-ting	Thread Drill For-ming
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	22.60
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 (Whitworth fine thread) 55°

Nom, dia.	Threads per.1"	Outer dia.mm	Thread Drill Cut-ting	Thread Drill For-ming
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-Thread 60°

Nom, dia.	Threads per.1"	Outer dia.mm	Inner Diameter 2 B min	Inner Diameter 2 B max	Thread Drill Cut-ting	Thread Drill 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
Nr. 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-Thread 60°

Nom, dia.	Threads per.1"	Outer dia.mm	Inner Diameter 2 B min	Inner Diameter 2 B max	Thread Drill Cut-ting	Thread Drill 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	5367	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-Thread 60°

Nom, dia.	Threads per.1"	Outer dia.mm	Inner Diameter 2 B min	Inner Diameter 2 B max	Thread Drill Cut-ting	Thread Drill 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	25.576	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	