Thread Identification & Pitch Chart

How to identify a thread, and the thread forms you will meet.

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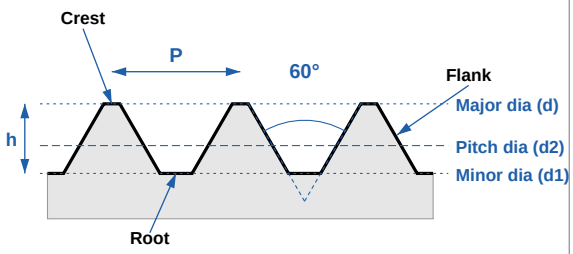
How to identify a thread

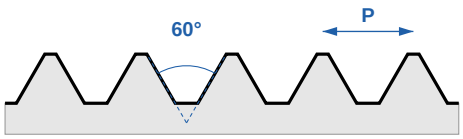
1. **Measure the diameter.** Calliper the outside of the bolt (worn bolts measure 0.1 - 0.2 mm under). For a nut or tapped hole, measure the bore and add about one pitch.
2. **Find the pitch.** Try a thread gauge - metric and inch leaves. Hold it along 10 or more threads: a near miss lets light in at one end. No gauge? Measure across 10 threads and divide by 10 (mm), or count threads in 1 inch (TPI).
3. **Check for taper.** Measure the diameter at both ends. A 1 in 16 taper means a sealing pipe thread (BSPT or NPT).
4. **Look at the form.** Rounded crests and roots = 55° Whitworth / BSP. Sharp V with flat crests = 60° metric, UNC / UNF or NPT. Flat-topped teeth = lead-screw thread (Tr, Acme, square).
5. **Look it up.** Diameter on pages 3 - 4, pitch on page 2, cycle, model engineering and other odd threads on page 5. Pipe threads are named after the pipe bore, so a 1/2" BSP thread measures about 21 mm across.

Thread terms



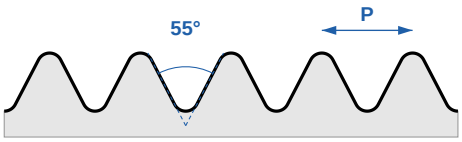
P = pitch: crest to crest, in mm (metric, BA, Tr).
TPI = threads per inch (Unified, Whitworth, pipe, Acme).
TPI = 25.4 / pitch mm pitch mm = 25.4 / TPI

ISO Metric and Unified (UNC / UNF) - 60°



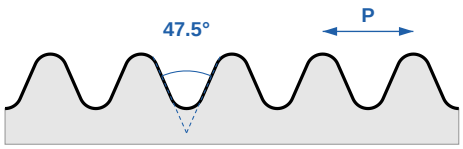
Sharp 60° V with flat crests and roots. Metric pitch in mm (M10 x 1.5); Unified in TPI (3/8"-16 UNC). Same form - tell them apart by the pitch and diameter.

Whitworth (BSW, BSF, BSP) - 55°



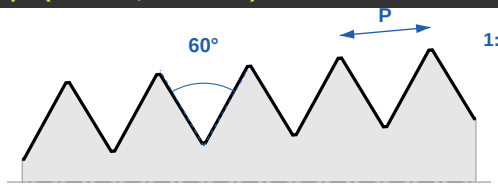
Rounded crests and roots. Pitch in TPI. BSW coarse, BSF fine, BSP (G) parallel pipe. A 60° gauge will not seat - light shows at the flanks.

British Association (BA) - 47.5°



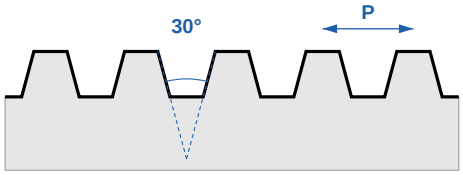
Small rounded thread, pitch in mm (0BA = 1 mm, 6 mm dia). 0BA to 10BA on old instruments, electrical and model engineering work.

Taper pipe (NPT 60°, BSPT 55°)



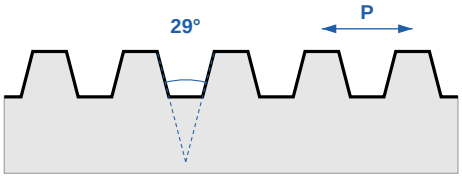
Taper 1 in 16 on diameter (drawn exaggerated); seals on the thread. NPT: 60° flat crests. BSPT (R / Rc): Whitworth 55° form. Both in TPI.

Trapezoidal (Tr, DIN 103) - 30°



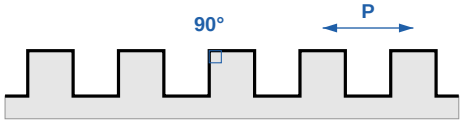
Flat crests and roots, depth half the pitch. Metric pitch: Tr20 x 4. Lead screws, vices, presses, valve stems.

Acme - 29°



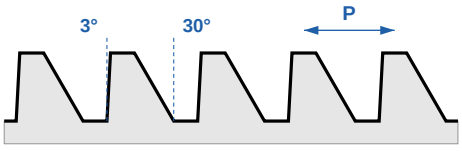
Inch cousin of Tr, pitch in TPI: 1"-5 Acme. Lathe and mill lead screws. Looks like Tr - the pitch tells them apart.

Square thread



Parallel flanks at 90° to the axis, depth half the pitch. Old vices, jacks and presses. Largely replaced by Acme and Tr, which are easier to cut.

Buttress (DIN 513) - 3° / 30°



One near-square flank takes the load, the other slopes 30°. Thrust in one direction only: vices, press screws, jacks, gun breeches.

Nominal basic dimensions for identifying threads. Drawings not to scale.

Thread Identification & Pitch Chart

Every pitch in this chart, finest to coarsest - with the threads that use it and the near misses.

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Metric pitch (mm) - TPI in brackets for comparison Inch thread (TPI)

Red = a pitch from the other system within 4%. Over 20 threads a 1.6% miss (1.25 mm vs 20 TPI) adds up to a third of a pitch - hold the gauge along the full length.

Pitch mm	TPI	Used on	Close to (other system)
0.25	**(101.6)**	coarse M1, M1.2	
0.3	**(84.7)**	coarse M1.4	
0.318	**80**	UNF #0	
0.35	**(72.6)**	coarse M1.6, M1.8; BA 10BA	72 TPI (+0.8%)
0.353	**72**	UNF #1	0.35 mm (-0.8%)
0.39	**(65.1)**	BA 9BA	64 TPI (+1.8%)
0.397	**64**	UNC #1; UNF #2	0.39 mm, 0.4 mm (-1.7%, +0.8%)
0.4	**(63.5)**	coarse M2	64 TPI (-0.8%)
0.43	**(59.1)**	BA 8BA	
0.45	**(56.4)**	coarse M2.2, M2.5	56 TPI (+0.8%)
0.454	**56**	UNC #2; UNF #3; cycle spokes	0.45 mm (-0.8%)
0.48	**(52.9)**	BA 7BA	
0.5	**(50.8)**	coarse M3	
0.529	**48**	UNC #3; UNF #4	0.53 mm (+0.2%)
0.53	**(47.9)**	BA 6BA	48 TPI (-0.2%)
0.577	**44**	UNF #5	0.59 mm, 0.6 mm (+2.2%, +3.9%)
0.59	**(43.1)**	BA 5BA	44 TPI (-2.2%)
0.6	**(42.3)**	coarse M3.5	44 TPI (-3.8%)
0.635	**40**	UNC #4, #5; UNF #6; BSW 1/8"; ME 1/8" to 1/2" (10)	0.66 mm (+3.9%)
0.66	**(38.5)**	BA 4BA	40 TPI (-3.8%)
0.7	**(36.3)**	coarse M4	36 TPI (+0.8%)
0.706	**36**	UNF #8; RMS objective	0.7 mm, 0.73 mm (-0.8%, +3.5%)
0.73	**(34.8)**	BA 3BA	36 TPI (-3.3%)
0.75	**(33.9)**	coarse M4.5; fine M6x0.75, M8x0.75, M10x0.75	
0.794	**32**	UNC #6, #8; UNF #10; UNEF #12 to 3/8" (4); BSF 3/16"; ME 1/4" to 1" (10); cycle valves	0.8 mm, 0.81 mm (+0.8%, +2.0%)
0.8	**(31.7)**	coarse M5	32 TPI (-0.8%)
0.81	**(31.4)**	BA 2BA	32 TPI (-2.0%)
0.9	**(28.2)**	BA 1BA	28 TPI (+0.8%)
0.907	**28**	UNF #12, 1/4"; UNEF 7/16", 1/2"; BSF 7/32"; BSP/BSPT 1/8"	0.9 mm (-0.8%)
0.941	**27**	NPT 1/16"; NPT/NPS 1/8"	
0.977	**26**	BSF 1/4", 9/32"; BSB 1/4" to 2" (14); cycle axles	1 mm (+2.4%)
1	**(25.4)**	coarse M6, M7; fine M8x1, M10x1, M12x1; BA 0BA; cycle crank bolt, axles, hanger, BB	26 TPI (-2.3%)
1.058	**24**	UNC #10, #12; UNF 5/16", 3/8"; UNEF 9/16", 5/8", 11/16"; BSW 3/16"; cycle headset, BB, freewheel	
1.155	**22**	BSF 5/16"	
1.25	**(20.3)**	coarse M8, M9; fine M10x1.25, M12x1.25	20 TPI (+1.6%)
1.27	**20**	UNC 1/4"; UNF 7/16", 1/2"; UNEF 3/4" to 1" (5); BSW 1/4"; BSF 3/8"; cycle pedals	1.25 mm (-1.6%)
1.337	**19**	BSP/BSPT 1/4", 3/8"	
1.411	**18**	UNC 5/16"; UNF 9/16", 5/8"; UNEF 1.1/16" to 1.1/2" (5); BSW 5/16"; BSF 7/16"; NPT/NPS 1/4", 3/8"	
1.5	**(16.9)**	coarse M10, M11; fine M12x1.5 to M30x1.5 (8)	
1.587	**16**	UNC 3/8"; UNF 3/4"; BSW 3/8"; BSF 1/2", 9/16"	
1.75	**(14.5)**	coarse M12	14 TPI (+3.7%)
1.814	**14**	UNC 7/16"; UNF 7/8"; BSW 7/16"; BSF 5/8", 11/16"; BSP/BSPT 1/2", 3/4"; BSP 5/8", 7/8"; NPT/NPS 1/2", 3/4"	1.75 mm (-3.5%)
1.954	**13**	UNC 1/2"	2 mm (+2.4%)
2	**(12.7)**	coarse M14, M16; fine M24x2, M27x2, M30x2	13 TPI (-2.3%)
2.117	**12**	UNC 9/16"; UNF 1" to 1.1/2" (5); BSW 1/2", 9/16"; BSF 3/4"	
2.209	**11.1/2**	NPT/NPS 1" to 2" (4)	
2.309	**11**	UNC 5/8"; BSW 5/8"; BSF 7/8"; BSP/BSPT 1" to 2" (4)	
2.5	**(10.2)**	coarse M18, M20, M22	10 TPI (+1.6%)
2.54	**10**	UNC 3/4"; BSW 3/4"; BSF 1"	2.5 mm (-1.6%)
2.822	**9**	UNC 7/8"; BSW 7/8"; BSF 1.1/8", 1.1/4"	
3	**(8.5)**	coarse M24, M27	
3.175	**8**	UNC 1"; BSW 1"; BSF 1.1/2"	
3.5	**(7.3)**	coarse M30, M33	7 TPI (+3.7%)
3.629	**7**	UNC 1.1/8", 1.1/4"; BSW 1.1/8", 1.1/4"	3.5 mm (-3.5%)
4	**(6.3)**	coarse M36, M39	
4.233	**6**	UNC 1.3/8", 1.1/2"; BSW 1.1/2"	
4.5	**(5.6)**	coarse M42, M45	
5	**(5.1)**	coarse M48, M52	5 TPI (+1.6%)
5.08	**5**	UNC 1.3/4"; BSW 1.3/4"	5 mm (-1.6%)
5.5	**(4.6)**	coarse M56, M60	4.1/2 TPI (+2.6%)
5.644	**4.1/2**	UNC 2"; BSW 2"	5.5 mm (-2.6%)
6	**(4.2)**	coarse M64	

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Find a thread by its measured major (outside) diameter - smallest to largest.

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Pipe threads are named after the pipe bore - the diameter shown is the thread OD. BSPT / NPT: OD at the gauge plane.
Metric: coarse pitch first, fine pitches in brackets. Unified / British: TPI after the name. BA: pitch in mm.

Dia mm	Inch	Metric	Unified	British	Pipe (thread OD)
1	0.039	M1 x 0.25			
1.2	0.047	M1.2 x 0.25			
1.4	0.055	M1.4 x 0.3			
1.52	0.060		#0 UNF 80		
1.6	0.063	M1.6 x 0.35			
1.7	0.067			10BA (0.35 mm)	
1.8	0.071	M1.8 x 0.35			
1.85	0.073		#1 UNC 64 / UNF 72		
1.9	0.075			9BA (0.39 mm)	
2	0.079	M2 x 0.4			
2.2	0.087	M2.2 x 0.45	#2 UNC 56 / UNF 64	8BA (0.43 mm)	
2.5	0.098	M2.5 x 0.45	#3 UNC 48 / UNF 56	7BA (0.48 mm)	
2.8	0.110			6BA (0.53 mm)	
2.84	0.112		#4 UNC 40 / UNF 48		
3	0.118	M3 x 0.5			
3.17	0.125		#5 UNC 40 / UNF 44	1/8" BSW 40, 5BA (0.59 mm)	
3.5	0.138	M3.5 x 0.6	#6 UNC 32 / UNF 40		
3.6	0.142			4BA (0.66 mm)	
4	0.157	M4 x 0.7			
4.1	0.161			3BA (0.73 mm)	
4.17	0.164		#8 UNC 32 / UNF 36		
4.5	0.177	M4.5 x 0.75			
4.7	0.185			2BA (0.81 mm)	
4.76	0.187			3/16" BSW 24 / BSF 32	
4.83	0.190		#10 UNC 24 / UNF 32		
5	0.197	M5 x 0.8			
5.3	0.209			1BA (0.9 mm)	
5.49	0.216		#12 UNC 24 / UNF 28 / UNEF 32		
5.56	0.219			7/32" BSF 28	
6	0.236	M6 x 1 (fine 0.75)		0BA (1 mm)	
6.35	0.250		1/4" UNC 20 / UNF 28 / UNEF 32	1/4" BSW 20 / BSF 26	
7	0.276	M7 x 1			
7.14	0.281			9/32" BSF 26	
7.94	0.312		5/16" UNC 18 / UNF 24 / UNEF 32	5/16" BSW 18 / BSF 22	1/16" NPT 27
8	0.315	M8 x 1.25 (fine 1, 0.75)			
9	0.354	M9 x 1.25			
9.52	0.375		3/8" UNC 16 / UNF 24 / UNEF 32	3/8" BSW 16 / BSF 20	
9.73	0.383				1/8" BSP/BSPT 28
10	0.394	M10 x 1.5 (fine 1.25, 1, 0.75)			
10.29	0.405				1/8" NPT/NPS 27
11	0.433	M11 x 1.5			
11.11	0.438		7/16" UNC 14 / UNF 20 / UNEF 28	7/16" BSW 14 / BSF 18	
12	0.472	M12 x 1.75 (fine 1.5, 1.25, 1)			
12.7	0.500		1/2" UNC 13 / UNF 20 / UNEF 28	1/2" BSW 12 / BSF 16	
13.16	0.518				1/4" BSP/BSPT 19
13.72	0.540				1/4" NPT/NPS 18
14	0.551	M14 x 2 (fine 1.5)			

Nominal basic dimensions for identifying threads. Drawings not to scale.

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Metric: coarse pitch first, fine pitches in brackets. Unified / British: TPI after the name. BA: pitch in mm.

Dia mm	Inch	Metric	Unified	British	Pipe (thread OD)
14.29	0.562		9/16" UNC 12 / UNF 18 / UNEF 24	9/16" BSW 12 / BSF 16	
15.88	0.625		5/8" UNC 11 / UNF 18 / UNEF 24	5/8" BSW 11 / BSF 14	
16	0.630	M16 x 2 (fine 1.5)			
16.66	0.656				3/8" BSP/BSPT 19
17.14	0.675				3/8" NPT/NPS 18
17.46	0.688		11/16" UNEF 24	11/16" BSF 14	
18	0.709	M18 x 2.5 (fine 1.5)			
19.05	0.750		3/4" UNC 10 / UNF 16 / UNEF 20	3/4" BSW 10 / BSF 12	
20	0.787	M20 x 2.5 (fine 1.5)			
20.64	0.812		13/16" UNEF 20		
20.95	0.825				1/2" BSP/BSPT 14
21.34	0.840				1/2" NPT/NPS 14
22	0.866	M22 x 2.5 (fine 1.5)			
22.22	0.875		7/8" UNC 9 / UNF 14 / UNEF 20	7/8" BSW 9 / BSF 11	
22.91	0.902				5/8" BSP 14
23.81	0.938		15/16" UNEF 20		
24	0.945	M24 x 3 (fine 2, 1.5)			
25.4	1.000		1" UNC 8 / UNF 12 / UNEF 20	1" BSW 8 / BSF 10	
26.44	1.041				3/4" BSP/BSPT 14
26.67	1.050				3/4" NPT/NPS 14
27	1.063	M27 x 3 (fine 2)	1.1/16" UNEF 18		
28.57	1.125		1.1/8" UNC 7 / UNF 12 / UNEF 18	1.1/8" BSW 7 / BSF 9	
30	1.181	M30 x 3.5 (fine 2, 1.5)			
30.2	1.189				7/8" BSP 14
31.75	1.250		1.1/4" UNC 7 / UNF 12 / UNEF 18	1.1/4" BSW 7 / BSF 9	
33	1.299	M33 x 3.5			
33.25	1.309				1" BSP/BSPT 11
33.4	1.315				1" NPT/NPS 11.1/2
34.92	1.375		1.3/8" UNC 6 / UNF 12 / UNEF 18		
36	1.417	M36 x 4			
38.1	1.500		1.1/2" UNC 6 / UNF 12 / UNEF 18	1.1/2" BSW 6 / BSF 8	
39	1.535	M39 x 4			
41.91	1.650				1.1/4" BSP/BSPT 11
42	1.654	M42 x 4.5			
42.16	1.660				1.1/4" NPT/NPS 11.1/2
44.45	1.750		1.3/4" UNC 5	1.3/4" BSW 5	
45	1.772	M45 x 4.5			
47.8	1.882				1.1/2" BSP/BSPT 11
48	1.890	M48 x 5			
48.26	1.900				1.1/2" NPT/NPS 11.1/2
50.8	2.000		2" UNC 4.1/2	2" BSW 4.1/2	
52	2.047	M52 x 5			
56	2.205	M56 x 5.5			
59.61	2.347				2" BSP/BSPT 11
60	2.362	M60 x 5.5			
60.32	2.375				2" NPT/NPS 11.1/2
64	2.520	M64 x 6			

Nominal basic dimensions for identifying threads. Drawings not to scale.

Thread Identification & Pitch Chart

Odd and special threads - model engineering, brass, cycle, instrument and lead-screw threads.

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Special thread series

Series	Form	TPI	Sizes	Where you find it
ME 40	55° Whitworth	40	1/8" to 1/2"	Model engineering - small fittings, glands, unions
ME 32	55° Whitworth	32	1/4" to 1"	Live steam - boiler fittings, injectors, unions
BSB (brass)	55° Whitworth	26	1/4" to 2"	Thin-wall brass tube, lamp and gas fittings, brassware
BSC / CEI (cycle)	60°	26 (24, 20)	1/8" to 1.3/8"	Old British bicycles and motorcycles - see the cycle table
UNEF	60° Unified	32 to 18	#12 to 1.1/2"	Aircraft, instruments, thin-wall parts - sizes in the table below
RMS (microscope)	55° Whitworth	36	0.800" (20.32 mm)	Microscope objectives
Camera / tripod	60° UNC	20 / 16	1/4" and 3/8"	Camera mounts, tripods, light stands

Cycle threads

Cycle part	Thread	Note
Bottom bracket - English (BSA)	1.370" x 24 TPI	Drive side left-hand
Bottom bracket - Italian	36 mm x 24 TPI	Both sides right-hand
Bottom bracket - French (old)	35 x 1 mm	Both sides right-hand
Freewheel / screw-on hub	1.370" x 24 TPI	Same as English BB
Threaded headset (1")	1" x 24 TPI	
Pedal - 3-piece crank	9/16" x 20 TPI	Left pedal left-hand
Pedal - 1-piece crank / kids	1/2" x 20 TPI	Left pedal left-hand
Axle - front, solid	5/16" x 26 TPI	BSC / CEI
Axle - rear, solid	3/8" x 26 TPI	BSC / CEI
Axle - front, quick release	9 x 1 mm	Hollow axle
Axle - rear, quick release	10 x 1 mm	Hollow axle
Crank bolt (square taper)	M8 x 1	
Derailleur hanger	10 x 1 mm	
Spoke (14 G / 2 mm)	2.2 mm x 56 TPI	Rolled thread
Valve - Presta	5.2 mm x 32 TPI	5V1
Valve - Schrader (car type)	7.7 mm x 32 TPI	8V1

Lead-screw threads (drawings on page 1)

Trapezoidal (DIN 103)	Major mm	Pitch mm
Tr8 x 1.5	8	1.5
Tr10 x 2	10	2
Tr12 x 3	12	3
Tr14 x 3	14	3
Tr16 x 4	16	4
Tr18 x 4	18	4
Tr20 x 4	20	4
Tr22 x 5	22	5
Tr24 x 5	24	5
Tr26 x 5	26	5
Tr28 x 5	28	5
Tr30 x 6	30	6
Tr32 x 6	32	6
Tr36 x 6	36	6
Tr40 x 7	40	7
Tr44 x 7	44	7
Tr50 x 8	50	8
Tr60 x 9	60	9

Acme (ASME B1.5)	Major mm	TPI
1/4"-16	6.35	16
5/16"-14	7.94	14
3/8"-12	9.53	12
7/16"-12	11.11	12
1/2"-10	12.70	10
5/8"-8	15.88	8
3/4"-6	19.05	6
7/8"-6	22.23	6
1"-5	25.40	5
1.1/8"-5	28.58	5
1.1/4"-5	31.75	5
1.3/8"-4	34.93	4
1.1/2"-4	38.10	4
1.3/4"-4	44.45	4
2"-4	50.80	4

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