Technical CATALOGUE

S.T.I. Taps

RECOIL®

Recoil

World Wide consistency of quality

Total commitment to quality and service

Comprehensive range of products

Efficient international freight service

Highest quality manufacturing capability

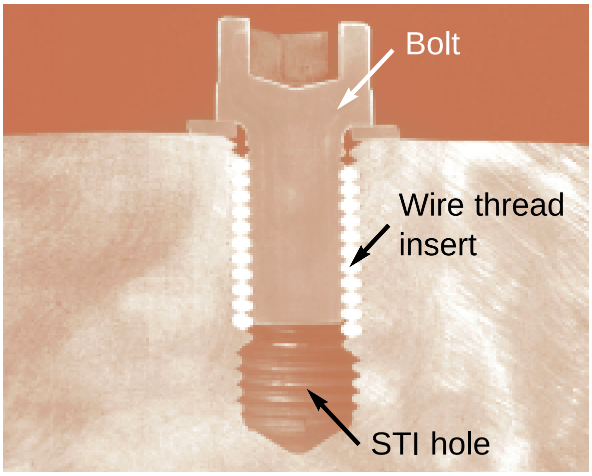
Contents

STI Taps

Recoil Screw Thread Inserts (STI) taps are special taps used to prepare holes for the installation of Recoil wire thread inserts. Generally wire thread inserts are used to gain extra strength in low strength materials such as aluminium and light alloys. STI taps are the same pitch as standard taps, but are larger in diameter to incorporate the width of the insert so that the original size bolt can be installed into the hole. A standard tap should never be used to prepare a hole for the installation of a wire thread insert

The tapping operation for STI holes is basically the same as for the tapping of standard holes. Recoil's STI Tap Technical Catalogue has been designed to contain relevant information specific to the correct tapping of STI holes to fit wire thread inserts.

Recoil offer high performance tap design for low torque tapping and longer tool life. High precision in manufacture and a short pod design enables Recoil STI taps to have minimal drag and consistently produce quality tapped holes.



Recoil STI Taps are available in taper, intermediate and bottoming leads for manual and machine applications; spiral flute, spiral point and threadflo machine taps are available for volume production purposes. All Recoil taps are suitable for use in a wide range of materials.

STI taps provide the appropriate internal thread tolerance to accommodate the same size bolt after installation of a wire thread insert as would be used in a standard tapped hole.

Recoil STI Taps are manufactured with a standard hook of 10% allowing stability with an optimum design for cutting into a wide range of materials. This is particularly well suited to a wide range of aluminium alloys where wire thread inserts are most commonly used.

Materials

STI taps are manufactured to precise standards from either HSS (high speed steel) or HSSE (more highly alloyed premium grade high speed steel). High performance taps that are made from HSSE have a higher hardness and longer life, are able to tap more difficult, high tensile materials than HSS taps and are ideally suited for production environments.

Main types of Ground Thread Taps

Straight flute taps are made in three styles; taper, intermediate and bottoming. These taps are identical in dimensions, however the starting chamfer style is different depending on varying requirements in tapping applications and operations.

All STI taps have a chamfer, which helps guide and start the tap into the hole. The straighter the tap, the more evenly the distribution of the cutting threads. Each of the three main tap types have a different number of threads chamfered as each is designed for a different type of hole situation.

Advantages of Recoil STI Taps

Features	Advantages
Modern design	Efficient cutting
Short Pod Length (Machine taps)	Minimal drag, reduced friction, able to tap deeper holes
High quality material (Machine taps HSSE)	HSSE longer tap life, able to tap higher tensile materials
CNC ground tap manufactured to precise tolerances	Greater consistency, higher quality of tapped hole
Specific STI design	Tap is designed for tapping alloys where most inserts are installed. Also suitable for general purpose materials
Tapped hole tolerance	Designed to produce 3B or 4H5H close tolerance hole except Thredflo taps which are made to a 2B or 6H tolerance
Coatings available	TiNite/TiCNite extend tap life, and increases productivity by allowing higher speeds and feed rates
Full range of special purpose taps	Special geometry and material,special tolerance
Uniformity of supply	Machine STI taps are sourced from a dedicated tap manufacturer exclusively for Recoil

General Purpose Taps

Taper

- Suitable for hand or general machine use
- This tap has a lead of eight threads, but no size reduction
- For use in medium tensile materials
- General purpose tap made from HSS

Intermediate

- Suitable for hand or general machine use
- The tap has a lead of four threads, but no size reduction
- For use in medium tensile materials
- Used in most general purpose applications
- Widely used in through and/or blind holes
- General purpose tap made from HSS

Bottoming

- Suitable for hand and general machine use
- The tap has a lead of two threads and would normally be preceded by a taper or an intermediate tap
- For use in medium tensile materials
- General purpose tap made from HSS

Pilot Nose

- Suitable for hand use
- This style of tap is widely used in repairing damaged spark plug threads, maintaining the original angles and alignment
- For use in medium tensile materials
- Eliminates the need for first drilling as this style of tap allows the use of the existing threads as a guide in tapping a straight hole
- Not suitable for use in original equipment manufacture
- General purpose tap made from HSS

High Performance Taps

Spiral Flute

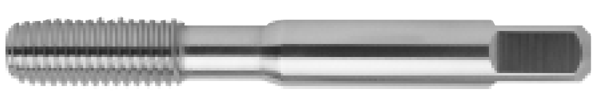
- Recommended for machine tapping for all blind hole applications, particularly in soft materials such as copper, magnesium and aluminium which produce long stringy swarf
- Modern design, shape and geometry incorporating short pod length
- The shear action provided by the spiral flutes draws the swarf out of the hole allowing a greater depth of threading without the swarf clogging
- High performance tap made from HSSE

Spiral Point (Gun Nose)

- Recommended for machine tapping through holes or blind holes providing that there is ample clearance beyond the threaded section to accommodate the chips
- Modern design, shape and geometry incorporating short pod length
- These taps provide for chip clearance by pushing the chips ahead of the tap
- Spiral Point taps have straight flutes supplemented by angular cutting faces at the point
- The shearing action of the angular cutting faces produce a fine finish on the threads
- Shallower flutes achieve a stronger cross section which allows the tap to withstand high cutting force
- Maybe successful for hand tapping on difficult to tap materials
- High performance tap made from HSSE

Thredflo 'Roll Thread' Taps

(Fluteless chipless tapping)



- Designed for machine tapping in ductile materials with higher elasticity eg, materials with a low silicon content, aluminium & some stainless steels
- Designed without flutes or cutting faces, but with special roll forming lobes
- Short tapered leads for through or blind holes
- Made from HSS

When used on ductile materials such as die-cast aluminium, copper, brass and some steels up to 700 N/mm^2, Thredflo taps have advantages of increased strength of the tapped hole, and the absence of chips. Normal tapping equipment can be used, with best results obtained from using a good lubricating oil. Higher than normal torque is required to drive these taps, therefore they are suited for machine use only.

Because the displacement of metal has to be considered, specially calculated drill sizes are necessary. Drill size should be confirmed when ordering this type of tap.

Thredflo Taps do not cut threads in the same manner as conventional taps, but actually form and flow the threads with the absence of chips. Used under suitable conditions, these taps produce threads with a high degree of finish not possible with ordinary taps.

Thredflo taps displace the surrounding material when tapping. This may cause the crests of the thread at the minor diameter to be slightly concave. Oversized minor diameters in STI tapped holes could lead to cross threading of the insert during installation. Also when using locking inserts consistent minor diameters are important as to minimize variation in locking torque. It is therefore critical that the minor diameters are kept within the limits stated in the Recoil Technical Catalogue (PN 1012).

Thredflo taps have certain advantages which are:

- Elimination of tap breakages. There are no chips to cause jamming, no cutting edges to wear, dull or break down
- Fluteless design which gives added strength - an important feature on small diameters
- Better control over tapped hole sizes. Thredflo taps cannot be forced into lead-error, or go oversize when changes occur in machine or operator pressure. The clamping of the work piece is important as the method of forming threaded holes compared with conventional tapping creates additional torque of up to 50%
- Blind hole tapping. No chips to cause interference at the bottom of the hole
- In plating operations there are no chips to cause rejects
- Longer tap life. The Thredflo tap is substantially stronger than a conventional tap; resulting in a longer tool life with reduced maintenance costs
- Faster tapping speeds. Produce more tapped pieces per hour

Percentage of thread required

A depth of 65% is recommended for ductile materials, but the percentage should be reduced for less ductile materials to maintain overall efficiency. Threads may be formed up to 80% of depth, but tool life will be reduced and work clamping will increase. Greater tapping speeds allow the metal to flow more readily, so 60 feet per minute (18 metres per minute) minimum may be used as a guide, but this could increase with the type of materials being tapped.

Thredflo taps have special drill size, lubrication and countersinking requirements. (page 16)

Roll Tap Sizes

When using threadflo taps the rollability and shrinkage properties of different materials varies considerably. Thredflo Taps do not normally re-enter the thread produced after tapping the hole due to material shrinkage. This shrinkage property requires the threadflo tap size to have a larger pitch diameter than an equivalent size hand, gun or spiral flute tap.

Specific applications, such as “preplating”, coating allowances, contractual casting stresses and post heat treatment distortions etc; must be considered when using threadflo taps.

To produce accurate thread limits for specific gauging requirements, it would be normal to test and evaluate each application for size, using stock standard threadflo taps. While the standard Recoil threadflo tap will suit the majority of applications, some of the above applications may require specific taps limits higher or lower than the standard limit stocked for Recoil threadflo Taps.

Recoil can offer any specific limit on request for such applications.

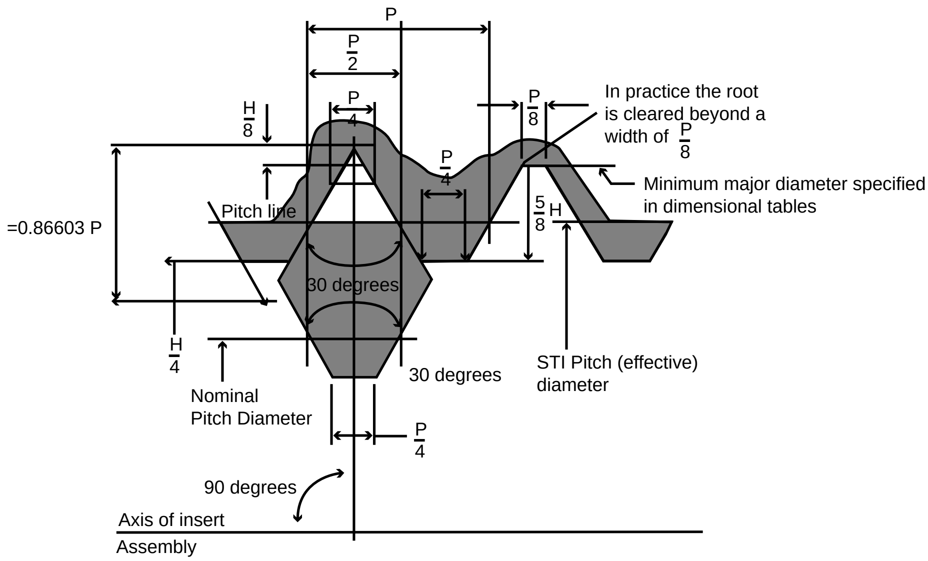
Taps - styles available

	ANSI HSS	ANSI HSSE	ISO HSS	ISO HSSE	JIS HSSE	DIN HSSE
METRIC HAND			Standard			Order
METRIC MACHINE				Standard	Standard	Order
UNIFIED HAND	Standard					
UNIFIED MACHINE		Standard				
BSW, BSF, BSP, BA			Standard			

Standard - supply as standard. Not special order. Other styles are also available as specials

Typical Metric/Unified Thread Insert Relationship

Insert tapped hole to ISO nut form



Recoil Tap Part Numbering System

The system of identification used for Recoil taps is categorised into 2 primary sections. 1) Inch threads, 2) metric threads. The tap annotation for both thread designations is very similar and therefore easy to follow.

Inch series	**Product**	**Thread Type**	**Thread Size**	**Tap Style**	**Suffixes for Special Requirements**
			Diameter in 1/16"		
	4=Tap	0= BSF	04 = 1/4"	4= taper	JIS=JIS
		1= BSP		5=intermediate	DIN=DIN
		2= BSW		6=bottoming	TIN=Titanium Nitride
		3= UNC		7=pilot nose	TICN= Titanium Carbonitride
		4= UNF		8=spiral point	-2B=2B tolerance
		6=NPT		9=spiral flute	-5H=5H tolerance
		6=UN 8 TPI		0=thredflo	
Metric Series			Diameters in mm		
		5=Coarse	04 = 4mm	4= taper	
		7=Medium		5=intermediate	
		8=Extra Fine		6=bottoming	
				7=pilot nose	
				8=spiral point	
				9=spiral flute	
				0= thredflo	
For example	**4**	**3**	**04**	**5**	
	4 = tap	3 = UNC	04 = 1/4”	5 = intermediate	

Metric Series

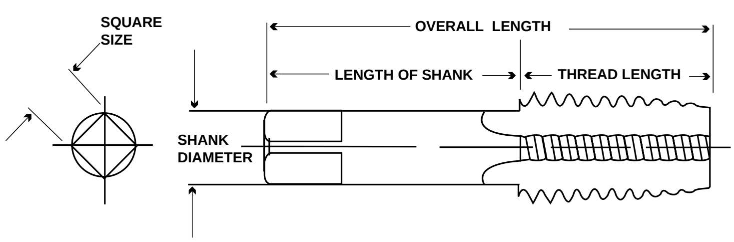
THREAD SIZE	TAPER	INTERMEDIATE	BOTTOMING	SPIRAL POINT	SPIRAL FLUTE	OVERALL LENGTH	THREAD LENGTH	SHANK DIAMETER	SQUARE DRIVE
METRIC COARSE									
M2 x 0.4	45024	45025	45026	45028	45029	45	10	2.80	2.24
M2.2 x 0.45	45014	45015	45016	45018	45019	48	11	3.15	2.50
M2.5 x 0.45	45254	45255	45256	45258	45259	48	11	3.15	2.50
M3 x 0.5	45034	45035	45036	45038	45039	50	13	3.55	2.80
M3.5 x 0.6	45354	45355	45356	45358	45359	53	13	4.50	3.55
M4 x 0.7	45044	45045	45046	45048	45049	58	16	5.00	4.00
M5 x 0.8	45054	45055	45056	45058	45059	66	19	6.30	5.00
M6 x 1	45064	45065	45066	45068	45069	72	22	8.00	6.30
M7 x1	45074	45075	45076	-	-	72	22	9.00	7.10
M8 x 1.25	45084	45085	45086	45088	45089	80	24	10.00	8.00
M9 x 1.25	45094	45095	45096	-	-	85	25	8.00	6.30
M10 x 1.5	45104	45105	45106	45108	45109	89	29	9.00	7.10
M11 x 1.5	45114	45115	45116	-	-	89	29	9.00	7.10
M12 x 1.75	45124	45125	45126	45128	45129	95	30	11.20	9.00
M14 x 2	45144	45145	45146	45148	45149	102	32	12.50	10.00
M15 x 2	45154	45155	45156	-	-	112	37	14.00	11.20
M16 x 2	45164	45165	45166	45168	45169	112	37	14.00	11.20
M18 x 2.5	45184	45185	45186	45188	45189	118	38	16.00	12.50
M20 x 2.5	45204	45205	45206	45208	45209	130	45	18.00	14.00
M22 x 2.5	45224	45225	45226	-	-	135	48	20.00	16.00
M24 x 3	45244	45245	45246	45248	45249	135	48	20.00	16.00
M27 x 3	45274	45275	45276	-	-	151	51	22.40	18.00
M30 x 3.5	45304	45305	45306	-	-	162	57	25.00	20.00
M30 x 3	45304-3	45305-3	45306-3	-	-	162	57	25.00	20.00
M33 x 3.5	45334	45335	45336	-	-	170	60	28.00	22.40
M36 x 4	45364	45365	45366	-	-	170	60	28.00	22.40
M39 x 4	45394	45395	45396	-	-	187	67	31.50	25.00
M42 x 4.5	45424	45425	45426	-	-	187	67	31.50	25.00
M42 X 4	45424-4	45425-4	45426-4	-	-	200	70	35.50	28.00
M52 X 5	45524	45525	45526	-	-	221	76	40.00	31.50
METRIC MEDIUM & FINE									
M8 X 1	47084	47085	47086	-	-	80	24	10.00	8.00
M9 X 1	47094	47095	47096	-	-	85	25	8.00	6.30
M10 X 1.25	47104	47105	47106	47108	47109	85	25	8.00	6.30
M10 X 1	48104	48105	48106	48108	48109	85	25	8.00	6.30
M11 x 1.25	47114	47115	47116	-	-	89	29	9.00	7.10
M11 x 1	48114	48115	48116	-	-	89	29	9.00	7.10
M12 x 1.5	47124	47125	47126	47128	47129	95	30	11.20	9.00
M12 x 1.25	48124	48125	48126	-	-	95	30	11.20	9.00
M14 x 1.5	47144	47145	47146	-	-	102	32	12.50	10.00
M14 x 1.25	48144	48145	48146	47148	47149	102	32	12.50	10.00
M15 x 1.5	47154	47155	47156	-	-	112	37	14.00	11.20
M16 x 1.5	47164	47165	47166	47168	47169	112	37	14.00	11.20
M18 x 2	47184	47185	47186	-	-	112	37	14.00	11.20
M18 x 1.5	48184	48185	48186	-	-	112	37	14.00	11.20
M20 x 2	47204	47205	47206	-	-	118	38	16.00	12.50
M20 x 1.5	48204	48205	48206	-	-	118	38	16.00	12.50
M22 x 2	47224	47225	47226	-	-	130	45	18.00	14.00
M22 x 1.5	48224	48225	48226	-	-	130	45	18.00	14.00
M24 x 2	47244	47245	47246	-	-	135	48	20.00	16.00
M24 x 1.5	48244	48245	48246	-	-	135	48	20.00	16.00

Note: The Taps listed above represent the most popular of the Recoil Taps available. Other sizes and types are available including BSF, BSW, NPT, BA, 8UN ETC.

Note: Tap dimensions based upon international (ISO) standard

Unified Thread Series

THREAD SIZE	TAPER	INTERMEDIATE	BOTTOMING	SPIRAL POINT	SPIRAL FLUTE	OVERALL LENGTH	THREAD LENGTH	SHANK DIAMETER	SQUARE DRIVE
UNC									
2-56	43524	43525	43526	43528	43529	1.875	0.562	0.141	0.110
3-48	43534	43535	43536	43538	43539	1.937	0.625	0.141	0.110
4-40	43544	43545	43546	43548	43549	2.000	0.687	0.141	0.110
5-40	43554	43555	43556	43558	43559	2.125	0.750	0.168	0.131
6-32	43564	43565	43566	43568	43569	2.375	0.875	0.194	0.152
8-32	43584	43585	43586	43588	43589	2.375	0.937	0.220	0.165
10-24	43604	43605	43606	43608	43609	2.500	1.000	0.255	0.191
12-24	43624	43625	43626	43628	43629	2.718	1.125	0.318	0.238
1/4-20	43044	43045	43046	43048	43049	2.718	1.125	0.318	0.238
5/16-18	43054	43055	43056	43058	43059	2.937	1.250	0.381	0.286
3/8-16	43064	43065	43066	43068	43069	3.375	1.656	0.367	0.275
7/16-14	43074	43075	43076	43078	43079	3.593	1.656	0.429	0.322
1/2-13	43084	43085	43086	43088	43089	3.812	1.812	0.480	0.360
9/16-12	43094	43095	43096	43098	43099	4.031	1.812	0.542	0.406
5/8-11	43104	43105	43106	43108	43109	4.250	2.000	0.590	0.442
3/4-10	43124	43125	43126	43128	43129	4.687	2.218	0.697	0.523
7/8-9	43144	43145	43146	43148	43149	5.125	2.500	0.800	0.600
1-8	43164	43165	43166	43168	43169	5.750	2.562	1.021	0.766
11/8-7	43184	43185	43186	-	-	6.062	3.000	1.108	0.831
11/4-7	43204	43205	43206	-	-	6.375	3.000	1.233	0.925
13/8-6	43224	43225	43226	-	-	6.687	3.187	1.305	0.979
11/2-6	43244	43245	43246	-	-	7.000	3.187	1.430	1.072
UNF									
3-56	44534	44535	44536	-	-	1.937	0.625	0.141	0.110
4-48	44544	44545	44546	44548	44549	2.000	0.687	0.141	0.110
6-40	44564	44565	44566	44568	44569	2.125	0.750	0.168	0.131
8-36	44584	44585	44586	44588	44589	2.375	0.937	0.220	0.165
10-32	44604	44605	44606	44608	44609	2.500	1.000	0.255	0.191
12-28	44624	44625	44626	-	-	2.718	1.125	0.318	0.238
1/4-28	44044	44045	44046	44048	44049	2.718	1.125	0.318	0.238
5/16-24	44054	44055	44056	44058	44059	2.937	1.250	0.381	0.286
3/8-24	44064	44065	44066	44068	44069	3.156	1.438	0.323	0.242
7/16-20	44074	44075	44076	44078	44079	3.375	1.656	0.367	0.275
1/2-20	44084	44085	44086	44088	44089	3.593	1.656	0.429	0.322
9/16-18	44094	44095	44096	44098	44099	3.812	1.812	0.480	0.360
5/8-18	44104	44105	44106	44108	44109	4.031	1.812	0.542	0.406
3/4-16	44124	44125	44126	44128	44129	4.468	2.000	0.652	0.489
7/8-14	44144	44145	44146	-	-	5.125	2.500	0.800	0.600
1-12	44164	44165	44166	-	-	5.437	2.562	0.896	0.672
1-14	44164-14	44165-14	44166-14	-	-	5.437	2.562	0.896	0.672
11/8-12	44184	44185	44186	-	-	5.750	2.562	1.021	0.766
11/4-12	44204	44205	44206	-	-	6.062	3.000	1.108	0.831
13/8-12	44224	44225	44226	-	-	6.375	3.000	1.233	0.925
11/2-12	44244	44245	44246	-	-	6.687	3.187	1.305	0.979



Note: Tap dimensions are based on American Standards (ANSI)

Recoil Tap Part Numbers and Dimensional Data

British Series

THREAD SIZE	REGULAR STRAIGHT FLUTES TAPER	INTERMEDIATE	BOTTOMING	SPIRAL POINT	SPIRAL FLUTE	OVERALL LENGTH	THREAD LENGTH	SHANK DIAMETER	SQUARE DRIVE
BSW	Dimensions in mm								
1/8-40	42024	42025	42026			53	13	4	3.15
3/16-24	42034	42035	42036	42038	42039	67	19	6.3	5
1/4-20	42044	42045	42046	42048	42049	72	22	8	6.3
5/16-18	42054	42055	42056	42058	42059	80	24	10	8
3/8-16	42064	42065	42066	42068	42069	85	25	8	6.3
7/16-14	42074	42075	42076			95	30	11.2	9
1/2-12	42084	42085	42086			95	30	11.2	9
9/16-12	42094	42095	42096			102	32	12.5	10
5/8-11	42104	42105	42106			112	37	14	11.2
3/4-10	42124	42125	42126			118	38	16	12.5
7/8-9	42144	42145	42146			135	48	20	16
1 - 8	42164	42165	42166			135	48	20	16
1 1/8-7	42184	42185	42186			151	51	22.4	18
1 1/4-7	42204	42205	42206			162	57	25	20
1 3/8-6	42224	42225	42226			170	60	28	22.4
1 1/2-6	42244	42245	42246			187	67	31.5	25
BSF	Dimensions in mm								
3/16-32	40034	40035	40036			67	19	6.3	5
1/4-26	40044	40045	40056			72	22	8	6.3
5/16-22	40054	40055	40056			80	24	8	6.3
3/8-20	40064	40065	40066			85	25	8	6.3
7/16-18	40074	40075	40076			89	29	9	7.1
1/2-16	40084	40085	40086			95	30	11.2	9
9/16-16	40094	40095	40096			102	32	12.5	10
5/8-14	40104	40105	40106			112	37	14	11.2
3/4-12	40124	40125	40126			118	38	16	12.5
7/8-11	40144	40145	40146			135	48	20	16
1 - 10	40164	40165	40166			135	48	20	16
1 1/8-9	40184	40185	40186			151	51	22.4	18
1 1/4-9	40204	40205	40206						
BSC	Dimensions in mm								
5/16-26	46504	46505	46506			73	22	9	7.1
3/8-26	46604	46605	46606			85	25	8	6.3
7/16-26	46704	46705	46706			89	29	9	7.1
1/2-26	46804	46805	46806			95	30	11.2	9
BSP	Dimensions in mm								
1/8-28	41024	41025	41026			85	25	8	6.3
1/4-19	41044	41045	41046			95	30	11.2	9
3/8-19	41064	41065	41066			112	37	14	11.2
1/2-14	41084	41085	41086			130	45	18	14
5/8-14	41104	41105	41106			130	42	18	14
3/4-14	41124	41125	41126			135	48	20	16
1 - 11	41164	41165	41166			162	57	25	20
BA	Dimensions in mm								
0BA	40504	40505	40506			72	22	8	6.3
1BA	40514	40515	40516			66	19	6.3	5
2BA	40524	40525	40526			66	19	6.3	5
4BA	40544	40545	40546			53	13	4.5	3.55
6BA	40564	40565	40566			50	13	3.55	2.8

Note: Tap dimensions based upon international (ISO) standard. Dimensions are in millimetres.

Recoil Tap Part Numbers and Dimensional Data

THREAD SIZE	REGULAR STRAIGHT FLUTES INTERMEDIATE	REGULAR STRAIGHT FLUTES BOTTOMING	SPIRAL POINT	SPIRAL FLUTE	OVERALL LENGTH	THREAD LENGTH	SHANK DIAMETER	SQUARE DRIVE
NPT ANSI	**American ANSI B94.9**		**Dimensions in Inches**					
1/8-27	46025	46026			2 1/8	3/4	0.438	0.328
1/4-18	46045	46046			2 7/16	1 1/16	0.563	0.420
3/8-18	46065	46066			2 9/16	1 1/6	0.700	0.531
1/2-14	46085	46086			3 5/32	1 3/8	0.687	0 515
3/4-14	46125	46126			3 9/32	1 3/8	0.906	0.679
1 - 11 1/2	46165	46166			3 3/4	4 3/4	1.125	0.893

THREAD SIZE	REGULAR STRAIGHT FLUTES TAPER	REGULAR STRAIGHT FLUTES INTERMEDIATE	REGULAR STRAIGHT FLUTES BOTTOMING	SPIRAL POINT	SPIRAL FLUTE	OVERALL LENGTH	THREAD LENGTH	SHANK DIAMETER	SQUARE DRIVE
8 TPI UN Series tap dimensions data				**Dimensions in Inches**					
1 1/8-8	46184	46185	46186	—	—	5.945	2.007	0.881	0.708
1 1/4-8	46204	46205	46206	—	—	6.378	2.244	0.984	0.787
1 3/8-8	46224	46225	46226	—	—	6.692	2.362	1.102	0.881
1 1/2-8	46244	46245	46246	—	—	6.692	2.362	1.102	0.881
1 5/8-8	46264	46265	46266	—	—	7.362	2.637	1.240	0.984
1 3/4-8	46284	46285	46286	—	—	7.362	2.637	1.240	0.984
1 7/8-8	46304	46305	46306	—	—	7.874	2.755	1.397	1.102
2-8	46324	46345	46326	—	—	7.874	2.755	1.397	1.102

THREAD SIZE	SPIRAL POINT	SPIRAL FLUTE	OVERALL LENGTH	THREAD LENGTH	SHANK DIAMETER	SQUARE DRIVE
JIS J TYPE Dimensions - HSSE		**Dimensions in mm**				
M2 X 0.4	45028JIS	45029JIS	44	14	3	2.5
M2.2 X 0.4	45018JIS	45019JIS	46	11	4	3.2
M2.5 X 0.45	45258JIS	45259JIS	46	11	4	3.2
M3 x 0.5	45038JIS	45039JIS	52	13	5	4
M3.5 X 0.6	45358JIS	45359JIS	52	13	5	4
M4 x 0.7	45048JIS	45049JIS	60	22	5.5	4.5
M5 x 0.8	45058JIS	45059JIS	62	24	6	4.5
M6 x 1.0	45068JIS	45069JIS	70	22	6.2	5
M8 X 1.0	47088JIS	47089JIS	75	24	7	5.5
M8 x 1.25	45088JIS	45089JIS	75	24	7	5.5
M10 X 1.25	47108JIS	47109JIS	82	29	8.5	6.5
M10 x 1.5	45108JIS	45109JIS	82	29	8.5	6.5
M12 X 1.5	47128JIS	47129JIS	88	30	10.5	8
M12 x 1.75	45128JIS	45129JIS	88	30	10.5	8
M14 X 1.5	47148JIS	47149JIS	95	32	12.5	10
M14 X 2	45148JIS	45149JIS	100	37	14	11
M16 X 1.5	47168JIS	47169JIS	100	37	14	11
M16 X 2	45168JIS	45169JIS	105	37	14	11
M18 X 2.5	45188JIS	45189JIS	115	38	17	13
M20 X 2.5	45208JIS	45209JIS	120	45	19	15
M24 X 3	45248JIS	45249JIS	120	45	19	15

Tap Measurements

There are two important size measurements on a tap. These are the outside diameter which clears the nominal size and the pitch diameter which is the basis of the limit of fit nominated by the relevant standard. The pitch diameter is the most difficult to measure.

Two factors in the tap design which affect the measurement and must be considered are:

1. Back taper, a gradual decrease in the thread diameter towards the shank
2. Radial thread relief, gradually decreases the thread diameter towards the heel of the land (one of the threaded sections between the flutes on a tap. See page 23)

Note: The size measurement must be determined with accurately calibrated and sensitive equipment otherwise the actual measurements are of doubtful accuracy and misleading results may occur.

When measuring a thread of a tap the basic major diameter, the basic pitch diameter and the basic minor diameter are measured. (See diagram on page 21) These are measured between the crest and root of the threads. It is possible and practical to establish limits to which the deviation must not exceed. These are called the maximum and minimum limits. If the thread size is no smaller than the minimum limit and no larger than the maximum limit, then it is within the size limits required. This difference between the specified maximum and minimum limits is called the tolerance.

The class of fit is the system of effective diameter tolerance on a tap. All taps are made oversize on their effective diameter. The degree that they are made oversize is governed by standards for limits of fit for the tap and have been calculated for fastening system to have an optimum fit between the nut and the bolt. The class of fit for STI taps have been calculated to allow for the fit of the wire thread insert into the tapped hole.

The class of fit is classified as a number, and the letter classifies the grade of the tap. Tolerances are measured by the degree of magnitude of difference between the pitch and crest of the threads. The larger the number, the greater the magnitude of tolerance. For pitch and crest diameter, there are a number of tolerance grades reflecting the varying magnitudes of tolerances.

The ISO standard is the international measuring standard and recognises two groups of screw threads. The first is ISO metric, a complete thread system in metric units and ISO unified which is covered by British Standards BS 1580 and American Standards ANSI unified screw systems.

The Whitworth and BA screw threads are obsolete but are still used during the period of transition. The minimum pitch diameter of a threaded hole is equivalent to the basic pitch diameter (calculated on the basis of a full thread form). This is only a control point or base from which to start measurements as it is only a theoretical figure. Standard taps are manufactured to various tolerance positions. Depending on the class of fit required, STI taps are manufactured to dimensions greater than the standard basic measurement required. This measurement has been calculated to install the wire thread insert to the original size hole.

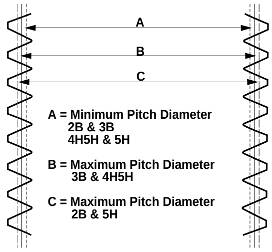
For unified sizes, a number 2 or 3 expresses the class of fit. The letter B expresses the internal thread, the letter A expresses the external thread. For metric sizes, a number 4 and 5 express the tolerance grades. For tolerance positions, the letter H applies to Recoil STI taps. (Upper case for internal threads, lower case for external threads).

In the unified thread system, the minimum pitch diameter for a 2B hole (medium fit) or 3B hole (close fit) are the same, while the maximum pitch diameter is greater on the 2B hole (medium fit). Standard Recoil taps for unified threads are made to a 3B hole (close fit) tolerance. 2B taps are available on request.

In the metric system the minimum pitch diameter for a 5H hole (medium fit) or 4H5H hole (close fit) are the same, while the maximum pitch diameter is greater on the 5H hole (medium fit). Standard Recoil STI taps for metric threads are made to a 4H5H hole (close fit) tolerance. 5H taps are available on request.

Note: Recoil STI taps are made to a close fit tolerance (3B or 4H5H), however a close fit may only be obtained under optimum machining conditions and processes. Thredflo taps are made to a 2B/6H tolerance, however various limits are available to suit different materials and manufacturing specifications referred to as GH (Ground High) limits. Full specification and GH tolerance limit should be sought when ordering.

THREAD TOLERANCE EQUIVALENTS STANDARDS		
	STANDARD	RECOIL STANDARDS
Metric Medium	Metric 6H	5H
Metric Close	Metric 5H	4H5H
Unified Medium	2B	2B
Unified Close	3B	3B



Minimum and Maximum pitch diameter

Surface Coatings

In some applications, the performance of taps can be improved by the application of a special surface treatment or coating. The benefits of surface coatings include:

- Longer tool life
- Tools can be run at higher feeds and speeds
- Increased productivity
- Lower maintenance costs
- Prevent chip build-up

Titanium Carbonitride — TiCNite (TiCN)

TiCNite is generally used in heat generated applications for longer tap wear life. TiCNite coated taps have a very high surface hardness, over 3000 Vickers (approximately 90 HRc). TiCNite is harder and tougher than other coating materials, consequently it has high resistance to edge chipping and abrasive wear. This coating is black/gray in colour and is suitable for all HSS grade ground thread taps (will soften carbon steel taps).

When ordering Titanium Carbonitride coating, part number suffix should be TiCN.

Titanium Nitride — TiNite (TiN)

TiNite is generally used in abrasive applications for low cutting temperatures such as cast iron, silicon and aluminium. Physical vapour deposition coating with surface hardness around 2300 Vickers (85HRc). This coating is gold in colour, with excellent resistance to cold welding and very good abrasion resistance. TiNite is a good choice for protecting the tap, can achieve a longer life than uncoated taps, lowers friction, allows smoother cutting and can be used at higher speeds.

When taps are coated with Titanium Nitride, the following suggested speeds are recommended, however it is better to start at uncoated speeds and slowly build up to a higher speed. This extends tap worklife and avoids breakages.

When ordering Titanium Nitride coating, part number suffix should be TiN.

Note: Additional lead time is required for tap coatings. Request availability from Recoil.

Note: Tap life depends on machine conditions, application and physical strength of tap.

Note:TiCNite and TiNite coatings will increase the life expectancy of the tap by a minimum of 3 or more times, however the coatings are subject to consistent machining only. These coatings will not correct machining faults. Coated spiral flute taps will not suit all applications.

Suggested Speeds

WORK MATERIAL	SPEED FEET PER MINUTE	
	UNCOATED	TiN/TiCN
Alloy Steels:		
125-225 Brinell	30-60	60-120
225-325 Brinell	20-45	40-90
325-425 Brinell	10-35	20-70
Aluminium Alloys	75-150	150-300*
Carbon steels, 225 Brinell or less:		
Low Carbon (0.10-0.25c)	50-75	100-150
Medium Carbon (0.30-0.055c)	40-65	80-130
High Carbon (0.60-0.95c)	30-55	90-110
Cast Iron:		
Ductile, Annealed	40-60	80-120
Ductile, As Cast	20-45	40-90
Gray (Class 20, 25)	40-80	80-160
Gray (Class 30-50)	25-50	50-100
Malleable, 200 Brinell or less	30-60	60-120
Magnesium	100-150	150-200*
Plastics	25-50	50-100
Titanium:		
Pure	25-55	50-100*
Alloys (Ti-6A1-4V)	10-25	20-50*
Zinc Alloys	100-150	150-250*

* Success of TiN and TiCN taps in non-ferrous materials depends on the machining conditions used

Tapping Speeds

Tapping speeds depend on many factors, including the machine, the material being tapped, the design of the hole, the lubricant and the style of tap used. There are no exact rules to follow that consider these variables, however the following information can be used to determine a starting point and course to follow to obtain maximum performance.

Coarse thread taps should be run near the low range while higher speeds may be used for fine threads. The values in the table should be modified according to the following suggestions:

Reduce speeds for:

- Large diameters
- Coarse pitches
- Deep holes
- High percentage of threads
- Short chamfer taps
- Hard metals

Typical modifications include:

- Particularly true of spiral flute and straight flute taps, speeds must be reduced as the depth of the hole increases. This is because of the accumulated chip build up and increased friction in long holes
- Taps with long chamfers can be run faster in short holes, however in long holes these taps must be run at slower speeds
- The speed for bottoming taps must be lower than Taper or Intermediate taps
- Coarse thread taps in larger diameters must be run more slowly than fine thread taps of the same diameter
- Cutting fluids may affect permissible speeds

Taper thread taps should be run at 50% to 75% of normal speed. In a few isolated cases, the use of lower speeds is not detrimental except that it affects production efficiency

SPEEDS FOR RECOIL STI TAPS (INCH) CONVERSION CHART — FPM TO RPM

SPEEDS FOR RECOIL STI TAPS (METRIC) CONVERSION CHART - M/MIN TO RPM																			
METRES PER MINUTE		6	8	9	11	12	15	17	18	20	21	24	27	30	34	49	55	61	67
FEET PER MINUTE		20	25	30	35	40	50	55	60	65	70	80	90	100	110	160	180	200	220
SIZE MM	MAJOR DIA. SIZE MM	REVOLUTIONS PER MINUTE																	
2	2.581	702	878	1053	1229	1404	1755	1931	2106	2282	2458	2809	3160	3511	3862	5617	6319	7022	7724
2.2	2.845	682	853	1023	1194	1364	1705	1876	2046	2217	2387	2728	3069	3410	3752	5457	6139	6821	7503
2.5	3.145	617	771	926	1080	1234	1543	1697	1851	2006	2160	2468	2777	3085	3394	4937	5554	6171	6788
3	3.716	522	653	783	914	1044	1305	1436	1567	1697	1828	2089	2350	2611	2872	4177	4700	5222	5744
3.5	4.354	446	557	669	780	891	1114	1226	1337	1449	1560	1783	2006	2229	2451	3566	4011	4457	4903
4	5.007	388	484	581	678	775	696	1066	1163	1260	1357	1550	1744	1938	2132	3101	3488	3876	4264
5	6.145	316	395	474	553	632	790	868	947	1026	1105	1263	1421	1579	1737	2526	2842	3158	3474
6	7.422	261	327	392	458	523	654	719	784	850	915	1046	1177	1307	1438	2092	2353	2614	2876
7	8.422	230	288	346	403	461	576	634	691	749	806	922	1037	1152	1267	1843	2073	2304	2534
8	9.787	198	248	297	347	397	496	545	595	644	694	793	892	991	1090	1586	1784	1983	2181
9	10.787	180	225	270	315	360	450	495	540	585	630	720	809	899	898	1439	1619	1799	1979
10	12.131	160	200	240	280	320	400	440	480	520	560	640	720	800	880	1280	1440	1600	1760
11	13.131	148	185	222	259	296	369	406	443	480	517	591	665	739	813	1182	1330	1478	1625
12	14.478	134	168	201	235	268	335	369	402	436	469	536	603	670	737	1072	1206	1340	1474
14	16.822	115	144	173	202	231	288	317	346	375	404	461	519	577	634	923	1038	1153	1269
16	18.822	103	129	155	180	206	258	284	309	335	361	412	464	515	567	825	928	1031	1134
18	21.513	90	113	135	158	180	225	248	271	293	316	361	406	451	496	722	812	902	992
20	23.513	83	103	124	144	165	206	227	248	268	289	330	371	413	454	660	743	825	908
22	25.513	76	95	114	133	152	190	209	228	247	266	304	342	380	418	608	685	761	837
24	28.238	69	86	103	120	137	172	189	206	223	241	275	309	344	378	550	618	687	756
27	31.238	62	78	93	109	124	155	171	186	202	217	248	280	311	342	497	559	621	683
30	34.925	56	69	83	97	111	139	153	167	181	194	222	250	278	306	444	500	556	611
33	37.925	51	64	77	90	102	128	141	153	166	179	205	230	256	281	409	460	512	563
36	41.615	47	58	70	82	93	117	128	140	152	163	187	210	233	256	373	420	466	513
39	44.615	43	54	65	76	87	109	120	130	141	152	174	196	217	239	348	319	4358	478

SPEEDS FOR RECOIL STL TAPS (METRIC) CONVERSION CHART — FPM TO RPM

SPEEDS FOR RECOIL STI TAPS (METRIC) CONVERSION CHART - M/MIN TO RPM																			
METRES PER MINUTE		6	8	9	11	12	15	17	18	20	21	24	27	30	34	49	55	61	67
FEET PER MINUTE		20	25	30	35	40	50	55	60	65	70	80	90	100	110	160	180	200	220
SIZE MM	MAJOR DIA. SIZE MM	REVOLUTIONS PER MINUTE																	
2	2.581	702	878	1053	1229	1404	1755	1931	2106	2282	2458	2809	3160	3511	3862	5617	6319	7022	7724
2.2	2.845	682	853	1023	1194	1364	1705	1876	2046	2217	2387	2728	3069	3410	3752	5457	6139	6821	7503
2.5	3.145	617	771	926	1080	1234	1543	1697	1851	2006	2160	2468	2777	3085	3394	4937	5554	6171	6788
3	3.716	522	653	783	914	1044	1305	1436	1567	1697	1828	2089	2350	2611	2872	4177	4700	5222	5744
3.5	4.354	446	557	669	780	891	1114	1226	1337	1449	1560	1783	2006	2229	2451	3566	4011	4457	4903
4	5.007	388	484	581	678	775	696	1066	1163	1260	1357	1550	1744	1938	2132	3101	3488	3876	4264
5	6.145	316	395	474	553	632	790	868	947	1026	1105	1263	1421	1579	1737	2526	2842	3158	3474
6	7.422	261	327	392	458	523	654	719	784	850	915	1046	1177	1307	1438	2092	2353	2614	2876
7	8.422	230	288	346	403	461	576	634	691	749	806	922	1037	1152	1267	1843	2073	2304	2534
8	9.787	198	248	297	347	397	496	545	595	644	694	793	892	991	1090	1586	1784	1983	2181
9	10.787	180	225	270	315	360	450	495	540	585	630	720	809	899	898	1439	1619	1799	1979
10	12.131	160	200	240	280	320	400	440	480	520	560	640	720	800	880	1280	1440	1600	1760
11	13.131	148	185	222	259	296	369	406	443	480	517	591	665	739	813	1182	1330	1478	1625
12	14.478	134	168	201	235	268	335	369	402	436	469	536	603	670	737	1072	1206	1340	1474
14	16.822	115	144	173	202	231	288	317	346	375	404	461	519	577	634	923	1038	1153	1269
16	18.822	103	129	155	180	206	258	284	309	335	361	412	464	515	567	825	928	1031	1134
18	21.513	90	113	135	158	180	225	248	271	293	316	361	406	451	496	722	812	902	992
20	23.513	83	103	124	144	165	206	227	248	268	289	330	371	413	454	660	743	825	908
22	25.513	76	95	114	133	152	190	209	228	247	266	304	342	380	418	608	685	761	837
24	28.238	69	86	103	120	137	172	189	206	223	241	275	309	344	378	550	618	687	756
27	31.238	62	78	93	109	124	155	171	186	202	217	248	280	311	342	497	559	621	683
30	34.925	56	69	83	97	111	139	153	167	181	194	222	250	278	306	444	500	556	611
33	37.925	51	64	77	90	102	128	141	153	166	179	205	230	256	281	409	460	512	563
36	41.615	47	58	70	82	93	117	128	140	152	163	187	210	233	256	373	420	466	513
39	44.615	43	54	65	76	87	109	120	130	141	152	174	196	217	239	348	319	4358	478

Lubricants

General Taps

The use of a lubricant is recommended on most tapping operations. The use of tapping lubricants is often of extreme importance and can be responsible for the success or failure of a tapping operation. The general principle is to have more EP (extreme pressure) additives for the degree of difficulty which usually increases by the degree of hardness in the material to be tapped.

Application

To be effective, ample quantities of the tapping fluid must reach the chamfer or cutting portion of the tap during the entire tapping operation. In many cases, the lubricant may also aid in controlling or disposing of the chips.

Flow

The flow of the tapping fluid should be directed into the hole rather than at the tap and should have sufficient pressure to wash the chips away from the hole. If the flow is not continuous, it should start before the tap enters the hole and continue until the tap is completely reversed out of the hole. In this way ample oil is provided at the start of the cut and loose chips will be suspended in the oil so that they do not interfere with the tap backing out of the hole. On machines where the work revolves and the tap is stationary, it is desirable to use several streams of lubricant on opposite sides of the tap, especially on horizontal tapping.

Cleanliness

Tapping lubricants must always be clean. If filter equipment is not used, the lubricant must be replaced periodically to eliminate fine chips, grit and foreign matter that accumulate in the tank. The dilution of lubricants often changes during use so that additions may be necessary to maintain the recommended proportion of active materials.

Cutting Fluids

The use of proper lubricants (lubricants especially developed for use under certain conditions for exact requirements) and cutting fluids have many advantages including longer tap life, better size control, more accurate threads and more efficient removal of chips.

There are many lubricants and cutting fluids that have been developed for differing usages. These lubricants and cutting fluids should be chosen to suit your exact requirements as there is no one fluid that can be used under all conditions at all times.

The fluid should be regularly changed and machinery cleaned of dust, grit and other foreign matter. A thorough cleaning of both fluid and machinery will ensure optimum tapping results.

Note: For specific recommendations, refer to your local oil supplier.

Thredflo Taps

In general it is best to use a good cutting oil or lubricant rather than a coolant for Thredflo tapping. Sulphur base and mineral oils, along with most friction reducing lubricants recommended for use in cold extrusion or metal drawing, have been proven best for this work. Make sure lubricant is clean, free from chips, swarf and filings in suspension, which produce a poor finish and jamming, sometimes breakage - extra filtration may be required.

Drill Size

General Taps

The tapping operation follows the drilling operation, and will not correct a poorly tapped hole. As such, the quality of the drilled hole is important. Tap breakage, difficulty in tapping, more power to tap, and unnecessary strain on the teeth can be caused if the hole is out of shape, too small, if a dull drill has been used or if there are chips left in the bottom of the hole.

It is an advantage to keep the minor diameter as large as possible. As the thread size increases, the width of the tap and amount of material removed increases rapidly. Also, when a tap enters a drilled hole (with the exception of a spiral point and spiral flute), it starts cutting chips which will usually remain in the flutes as the tap advances. If stringy chips result, they roll over and over between the minor diameter of the hole and the bottom of the flutes, compacting and causing considerable friction. As the drilled hole becomes smaller, the amount of chips to be removed becomes so great that the friction generated may require as much power as does the actual cutting.

Thredflo Taps

The formula to calculate the theoretical hole size for a required percentage of thread is:

Drill size=major diameter of STI tap - 0.007 x % of thread / TPI

It is to be noted that the drill size for fluteless tapping is always larger than the pitch diameter of the thread. A drill size equal to the pitch diameter of the thread would produce 100% of thread, but this is NOT recommended.

As the additional driving torque is only increased by up to 50%, any conventional driving equipment using the square as a drive is suitable for Thredflo tapping.

In die castings where the core pinholes are tapered, the hole size should be approximately half way along the desired length of engagement of thread to be formed.

It is also critical that the minor diameter is kept within limits stated in the Recoil Technical catalogue (PN 1012).

Tapping of Difficult to Machine Materials

With rapid advancement of new technology, new materials have been developed that have characteristics of retaining high strength at varying temperatures such as Titanium Alloys, Nickel Alloys, High Tensile Steels and special Stainless Steels.

Machinability of these materials becomes difficult, and therefore require special material taps with specific geometry. Prices and availability are available on request.

Note: In higher strength materials a HSSE tap is recommended.

Countersinking

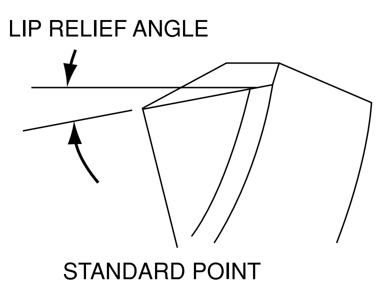
Thredflo taps

Because the Thredflo tap displaces metal, some metal will be displaced above the mouth of the hole during tapping. Countersinking or chamfering the hole prior to tapping will reduce the extrusion within the countersink and not interfere with the mating part.

MATERIAL			CUTTING SPEED M/MIN *	IDEAL RAKE	COOLANT
Low Alloyed Steels	<500 N/mm2	Free Machining	10~20	18°-20°	D-A
	149HB	Low Carbon Steels			
Easy Chipping Steels	50-750 N/mm2	Annealed	6~15	12°-18°	D-A
	221HB	Structural Hot Rolled			
Cold Worked Steels	<600N/mm2	Magnetic Soft Steels	10~15	15°-20°	D-A
Pressed Steels	180HB				
Heat Treated Steels	750-1000 N/mm2	"Alloy Steels, Tools Steels"	4~8	8°-12°	B
	300HB	Alloyed Cast Steels			
High Alloyed Steels	1100-1300 N/mm2	High temperature Structural	2~5	6°	B
	383HB				
Stainless Steels	<850 N/mm2	Free Machining Stainless Steels	5~10	12°	B
	250HB	304			
Cast Iron	Malleable <290HB	High Strength	6~12	8°-10°	D-B
	Nodular <200HB	Higher Strength Graphite	5~15	5°	D-B
	Grey <850 N/mm2	Graphite Grades	6~20	5°	D-B
Aluminium Alloys	Long Chip Si <10%	Unalloyed and Cast Al.	20~40	18°-20°	D-B
	Short Chip Si <10%		6~15	15°-15°	D-B
Copper	<250N/mm2	Unalloyed	8~14	15°-18°	C
Brass	Short Chip <700 N/mm2		20~30	6°	C-D
	Long Chip		10~20	15°-20°	C-D
Bronze	Short Chip <700 N/mm2		4~10	8°	B-C
	Long Chip		6~15	15°	C
Magnesium Alloys			10~20	6°	E-D
Nickel	<500 N/mm2	Unalloyed	2~4	3°-6°	B
Titanium Alloys	<900N/mm2		2~4	8°-10°	B
Plastics	Thermosetting plastics		6~15	4°-6°	D
	Thermoplastic		20~30	20°-25°	E-D

Coolant
A = Cutting Oil
B = Alloyed Cutting oil
C = Non-sulphur Cutting oil
D = Oil Emulsion
E = Dry

*Cutting speed metres/min
Note: The cutting speeds are guidelines and represent starting values only, not optimised
Standard stock taps have general purpose rakes suitable for most applications. Rake may be changed by customer if optimised performance is required.



Tap Sharpening

Taps, like all other tools, become dull through use. Dull taps can produce either oversize or undersize threads. They may chip, produce poor threads, or break in extreme cases.

Wear is greatly accelerated by the dullness of the tap. A tap may be used to re-thread 2000 holes and be able to be re sharpened, however a tap that has cut 4000 holes may not be able to be re sharpened satisfactorily at all.

Smaller sizes of taps are generally reconditioned by grinding the chamfer portion only, while larger taps may also require flute face grinding. Taper pipe taps must be sharpened by grinding the flutes and spiral pointed taps must usually be reground in the angular portion of the flute as well as on the chamfer. Flute grinding or spiral point grinding should also be done on a tap reconditioning machine or on a cutter grinder.

In any type of resharpening, it is generally advisable to duplicate the previous grind as close as possible. The chamfer must be true and uniform and the original amount of relief should be maintained.

Tapping problems and trouble shooting

There are many problems that can be encountered when tapping which are often the result of the tapping machine, tap holding devices and conditions of the hole to be tapped.

The tapping machine should be checked for:

- spindle
- fixture
- work alignment
- slipping belts
- wear
- power

The tap holding device should be checked as to:

- correct type
- wear
- alignment with the hole

The drilled hole should be checked for:

- diameter
- trueness in round and axis to assure correct percentage of tread engagement
- blind holes should have enough chip room at the bottom
- alignment

Through Hole Tapping

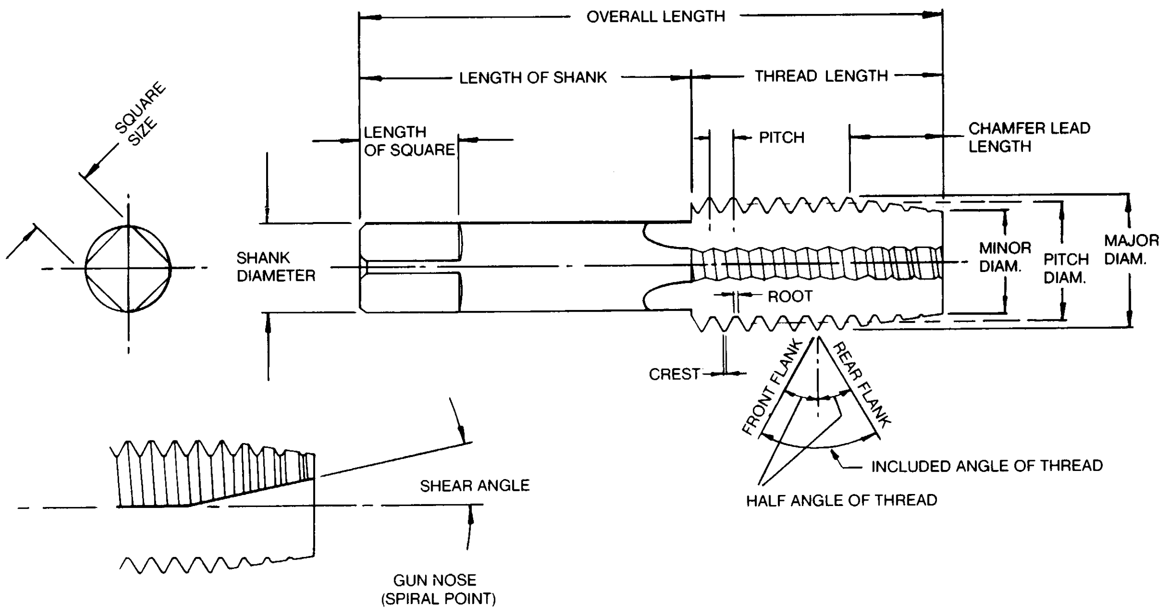
Tapping trouble	Possible cause
Chips clogging flutes	Wrong type of tap, insufficient chamfer, incorrect cutting-face angle, rough flutes, flutes improperly reground, lack of or wrong type of lubrication or insufficient chip space
Stripped or chipped tap threads	Misalignment, careless handling, dull tap, tap too hard, improper application of surface treated taps, improper sharpening of tap
Torn threads in tapped part	Incorrect cutting face angle (usually too small), tap drill too small, chips clogging flutes, broken threads on taps, improper resharpening of tap, lack of or wrong type of lubrication
Tap sticking or binding	Tap drill too small, tap lands too wide, incorrect cutting face angle, lack of or wrong type of lubrication, surface treatment (lubrication needed), tap may require sharpening
Excessive tap wear	Material is abrasive or inclusions are present (surface treated or premium grade of HSSE tap required), misalignment or insufficient lubrication
Cutting face breakdown	Incorrect cutting face angle, surface treatment needed
Overheating of tap	Excessive land width, lack of or wrong type of lubrication, dull tap, excessive flank contact (pitch diameter relief required), excessive tapping speed
Poor finish on thread in tapped part	Incorrect cutting face angle (usually too small), tap drill too small, insufficient number of chamfered threads, dull tap, lack or wrong type of lubrication
Excessive frictional drag and power required	Point size on tap too large, dull tap, incorrect cutting face angle, incorrect tapping speed, lack of or wrong type of lubrication, incorrect or inadequate equipment, misalignment

Tapping trouble	Possible cause
Tap breakage	Wrong type of tap, dull tap, tap incorrectly ground, tap drill too small, drilled hole too shallow, misalignment of tap and hole, wrong machine, incorrect fixture or tap holding device, work hardened material, lack of or wrong type of lubrication.
Tap failure on reversal	Tap cutting tightly (increase cutting face angle), tap galling (increase face angle on back of land), chips may be wedged between the flutes.
Tap cuts oversize	Tap not running true. Check tap holder and machine spindle. Tap not aligned with hole. Use fixture to assure alignment. Chamfer too short. Increase length of chamfer four or five threads. Resharpen or replace if tap is dull. Misalignment as evidenced by sharp thread crests on one side of hole, flat crests on opposite side. Align spindle and work piece. Check for worn tap driver or loose spindle. Loading or smearing of work material on tap threads. Consider surface treated tap. Too much feed or reversal pressure. Reduce pressure. Let tap establish its lead. Too much radial thread relief in tap threads. Change to tap with less or no thread relief.
Tap cuts rough or poor threads	If the tap is dull or chipped recommend that length of chamfer be increased. Change to another style or modify cutting face angle of present tap. Loading or smearing of work material on tap threads. Use recommended cutting Fluid or lubricant. Consider a surface treated tap. Poorly prepared hole. Make sure hole is straight and of correct size. Drill with a sharp drill. Avoid hardened or torn surfaces. Over clogging of chips. Use gun or spiral fluted tap depending on nature of the hole to remove swarf as cutting.
Tap chips on cutting edge or breaks	Tap reversed too frequently or carelessly. Tap hitting bottom of blind hole. Recommend limiting depth of travel or reducing torque control in attachment. If the length of chamfer too short increase length to reduce cutting load per tooth. Align spindle and work piece. Over clogging of chips in flutes. Use gun or spiral fluted tap when applicable. Use tap with larger or more flutes. Use more coolant. Poorly resharpened tap. Closing in of thin walled work piece. Alter tap to cut freer: thread relief,narrower lands, increased back taper. Too heavy a machine for size of tap. Work or tap not held securely. Check fixture holding work. Work hardened material. Check drilling operation. Suggest proper design and condition of drill so that it cuts freely with no rubbing.
Tap loads or smears	Tapping head loose, spindle sloppy, loose fixture. Correct faults in tapping thread or machine. Surface of tap unsuitable or rough. Suggest polished flutes. Relief insufficient or excessive. Recommend using greater relief if loading occurs during forward rotation, less relief if on reverse. Use gun or spiral fluted tap to eliminate chips. Also consider supplementary surface treatment. Lack of or insufficient lubricant or improperly applied. Use recommended cutting fluid, properly directed or pressure applied.

Tapping trouble	Possible cause
Tapped hole is bell mouthed	Check holding fixtures, tap holder and machine spindle. Tap may be misaligned.
Tapped holes vary in size	Work location varies. Check fixtures holding work, tap holder and machine spindle. Holes before tapping are out of round or varying size. Ream holes before tapping.
Tap wears rapidly	Hole too small. Recommend using largest possible drill size. Work hardened material. Suggest proper design and condition of drill so that it cuts freely with no rubbing.

Blind Hole Tapping

Tapping trouble	Possible cause
Tap size decreases and or the thread becomes coarser.	Carefully prepare the holes to be tapped.Use the right drills for the material and keep them sharp.
Chips become increasingly stringy.	Use plenty of cutting fluid while drilling and tapping.
Depth of tapped hole increases.	Use as short a thread length as is consistent with maintaining strength of assembly.
Distance decreases between end of tapped thread and bottom of the drilled hole increases.	Use gun taps wherever possible in materials that give long, stringy chips .
Strength and hardness of material to be tapped.	Use as fine a thread pitch and as large a diameter as possible.
Cutting fluid becomes less efficient, either in quality application or volume.	Try surface treated taps to combat loading.
Work material increases tendency to load or gall.	Use the lowest practical tapping speed.
Structure of prepared hole varies in surface condition and accuracy.	If trouble persists in spite of these precautions, consider designed-for-the-job taps.



Actual Size
An actual size is a measured size

Allowance
An allowance is the prescribed difference between the design (maximum material) size and the basic size. It is numerically equal to the absolute value of the ISO term fundamental deviation.

Angle of thread
The included angle between the flanks of a thread measured in an axial plane

Back Taper
A slight taper on the threaded portion of the tap making the pitch diameter near the shank smaller than that at the centre

Basic
The theoretical or nominal standard size from which all variations are made

Chamfer
The tapered and relieved cutting teeth at the front end of the threaded section. Common types of chamfer are taper, intermediate or bottoming

Crest
The top surface joining the two sides or flanks of a thread

Crest Clearance
The space between the crest of a thread and the root of it's component

Cutting Face
The leading face of the land

Flank
The surface of the thread, sometimes referred to as the side of the thread, which connects the crest with the root

Flute
The longitudinal channels formed on a tap to create cutting edges on the thread profile

Hand of Threads
A Right Hand Thread is advanced by turning it to the right, or clockwise

A Left Hand Thread is advanced by turning it to the left, or anti clockwise

All left handed threads are designated LH

Heel
The following side of the land

Height of the Thread
In profile, the distance between the crest and bottom section of the thread measured normal to the axis

Helix Angle - Flute
Flutes of taps are sometimes cut helically instead of straight. This helix angle is the angle made by the flute with the axis of the tap. (Helical Flutes are commonly referred to as spiral flutes)

Hook Face
A concave cutting face of the land. This may be varied for different materials and conditions

Interrupted Thread
Alternative teeth are removed in the thread helix on a tap having an odd number of flutes

Land
One of the threaded sections between the flutes of a tap

Lead of Thread
The distance a screw thread advances axially in one complete turn

Major Diameter
The largest diameter of the screw or nut on a straight screw thread

Minor Diameter
The smallest diameter of the screw or nut on a straight screw thread

Neck
The reduced diameter, on some taps, between the threaded portion and the shank

Pitch
The distance from a point on one thread to a corresponding point on the next thread, measured parallel to the axis

Pitch Diameter
On a straight screw thread, the diameter of an imaginary cylinder where the width of the thread and the width of the space between the threads is equal

Point Diameter
The diameter at the leading end of the chamfered portion

Rake
The angle of the cutting face of the land in relation to an axial plane intercepting the cutting face of the major diameter

Relief
The condition created by removing metal from behind the cutting edge to produce clearance and reduce friction

Root
The valley of the thread profile where the two flanks converge

Screw Thread
A ridge of uniform section in the form of a helix on the external or internal surface of a cylinder, or in the form of a conical spiral on the external or internal surface of a cone or frustum of a cone. A thread formed on a cylinder is known as a straight or parallel thread, to distinguish it from a taper thread which is formed on a cone or frustum of a cone.

Side of Flank of Thread
The surface of the thread which connects the crest with the root

Shank
The portion of the tap by which it is held and driven

Gun or Spiral Point
A cutting edge ground into the lands to provide a shear cutting action on the first few threads

Square
The squared end of the tap shank used to drive the tap

Thread
The helical formed tooth of the tap which produces the thread in a tapped hole

An External Thread is a thread formed at the outside of a cylinder as on a bolt

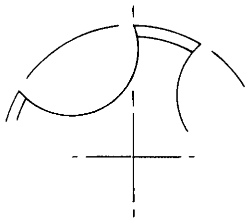
An Internal Thread is a thread formed in a round hole, as in a nut

Thread Helix Angle
On a straight thread, the helix angle is the angle made by the helix of the thread and its relation to a plane perpendicular to the thread axis. On a taper thread, the helix angle at a given position is the angle made by the conical spiral of the thread with the axis of the thread. The helix component of the lead angle

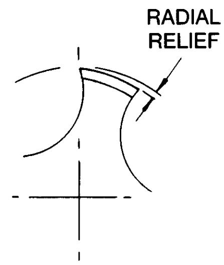
Threads per Inch
The number of threads counted over one inch

Thread-Single
A thread which lead is equal to pitch

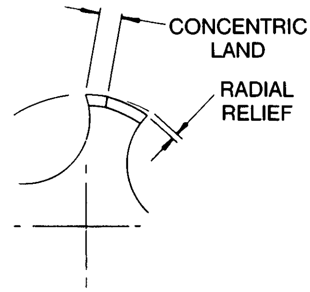
THREAD RELIEF TYPES



CONCENTRIC THREADS
(No radial relief)

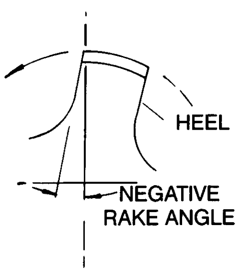


ECCENTRIC THREADS
(Relieved to cutting edge)

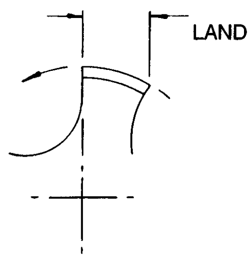


CON-ECCENTRIC THREADS
(Relieved to a land)

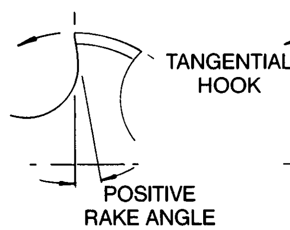
CUTTING FACES



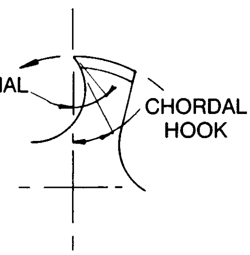
NEGATIVE RAKE



RADIAL RAKE

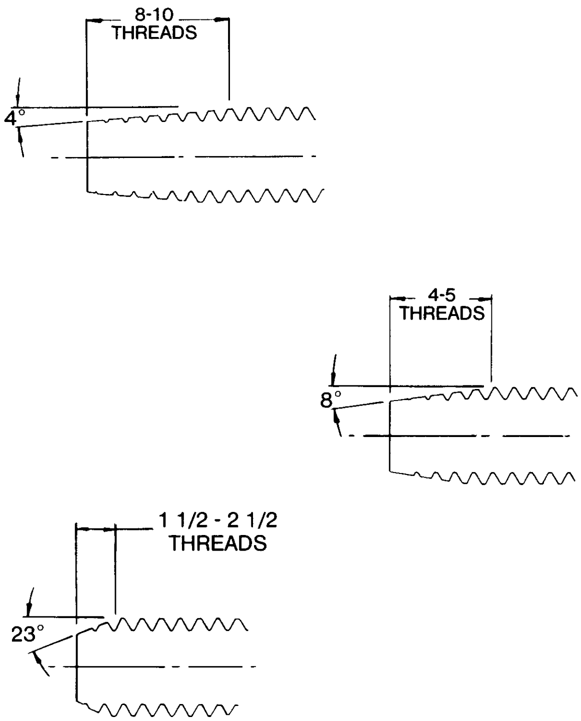


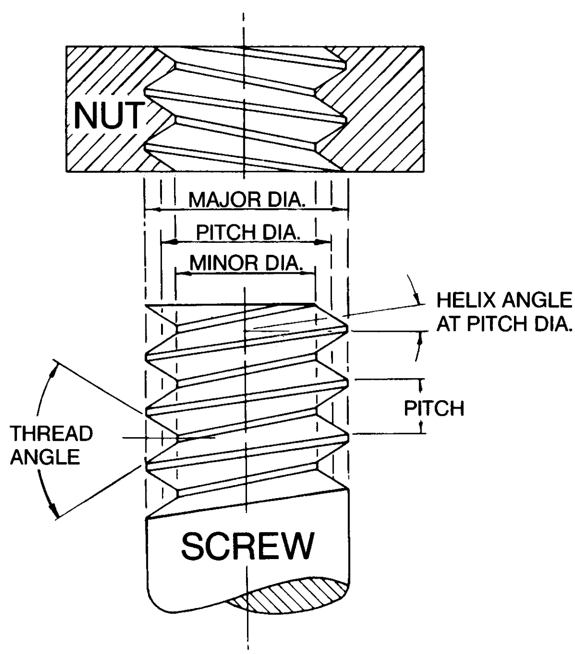
POSITIVE RAKE



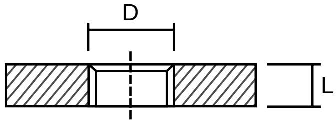
HOOK

CHAMFER

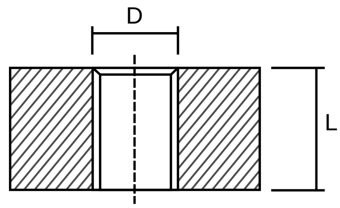




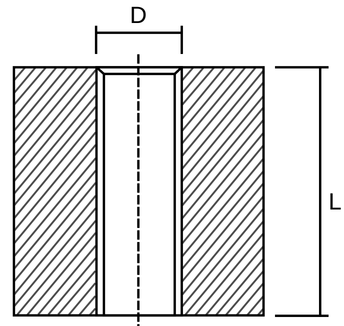
THROUGH HOLE



L< 1/2 D
Regular Straight Flute Tap

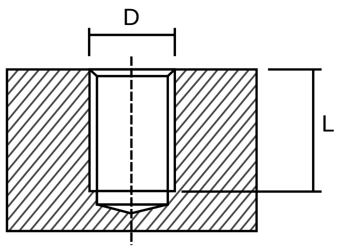


L < 1-1/2 D
Regular Straight Flute Tap
OR Gun Tap

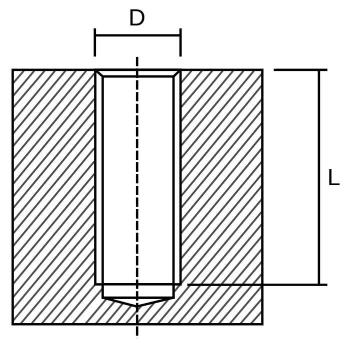


L < 3 D
Gun Nose Tap OR
Spiral Flute Tap

BLIND HOLE



L < 1-1/2 D
Regular Straight Flute Tap
OR Spiral Flute Tap



L < 3 D
Spiral Flute Tap

How to order your Recoil STI Tap

Steps in purchasing a Recoil STI Tap

1. Identify the thread size and type. For example this may be Metric, UNF, UNC, M3, #10-32, 1/4BSW etc

2. Identify the type of hole and method of tapping. e.g. blind hole, through hole, hand tap, machine tap

3. Consider the implications of material and number of holes to be tapped. e.g. tapping lubricants, tap design, chamfer load, tap coatings.

Note: Please check stock availability and lead time of unusual tap sizes

Note: Please check stock availability of taps when ordering

Note: A lead time will be incurred when ordering taps with special coatings

RECOIL®

QUALITY THREAD INSERT SYSTEMS

Complete Thread Fastener Systems

Recoil Wire Thread Inserts

Designed to be slightly oversized, these helically-coiled inserts compress as they are inserted into the prepared hole to achieve maximum surface contact with the parent material.

Keysert Inserts and Studs

Solid one piece Keysert insert and studs provide high resistance to torque-out and pull-out utilising keys that are driven into the parent material. Styles include miniature, blind-end, solid and floating types.

Strip Feed Inserts

To complete the range of Recoil Power Tools, Recoil have inserts available on strip (M2.5-M12, #2-5/16) to optimise production with increased installation cycles and reduce operator fatigue.

Power Tools

The Recoil range of Power Tooling ensures consistent high volume thread insert installation for a variety of applications. Recoil powered installation tools may be supplied for use with either a compressed air supply or via a stabilised low voltage power supply.

Work Arms

Recoil provide two different styles of work arms to suit production environments, the fully pneumatic professional tool and the mechanical work arm. Recoil work arms are light and easy to move from position to position offering the most efficient means of installing large numbers of inserts fast and accurately.

Recoil Inserts and Repair Kits

Recoil thread repair kits contain a quality HSS tap, installation tool, precision stainless steel inserts and instructions in a sturdy reusable container. Recoil has a full range of problem solving repair kits available in single or multiple size format.

Recoil is committed to the highest quality product and operating systems and employs a strict quality management system in accordance with:

- ISO9001 accreditation
- QS9000 accreditation
- Chrysler
- Civil Aviation Authority (Australia)
- Society of British Aerospace Companies (SBAC) TS 157 approval
- GM (General Motors)
- Ford

Australia
Recoil Pty (Head Office)
ACN 073 750 428
20 Stamford Road
Oakleigh Vic 3166
Telephone 613 9563 1500
Facsimile 613 9563 1980

Belgium
Recoil Marketing BVBA
Burgemeester De Cocklaan No. 4A
Erembodegem, Aalst, 9320
Belgium
Telephone 32 53 770 102
Facsimile 32 53 774 310

Singapore
Recoil Pte Ltd
Blk 194 Pandan Loop
#07-16, Pantech Industrial Complex
Singapore 128383
Telephone 65 778 9233
Facsimile 65 778 0151

Thailand
Recoil Ltd
33/260 Mooban Tor Ruam Chok 11
Chok Chai 4,Ladprao 53 Road
Ladprao, Bangkok 10230
Thailand
Telephone 662 539 0693
Facsimile 662 539 0638

United Kingdom
Recoil (Europe) Ltd
Unit C, Stafford Park 7,
Telford, TF3 3BQ
United Kingdom
Telephone 44 (0) 1952 290 011

USA
Recoil
1051 Third Avenue SW
Carmel IN 46032
USA
Telephone 317 846 8830
Facsimile 317 846 8858

a division of

Fairchild Fasteners

1097 11/99