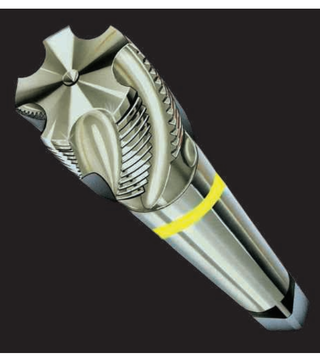
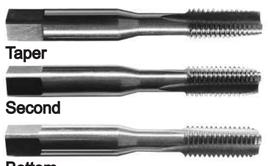
TAPPING & DRILLING GUIDE



FRENCH ENGINEERING WORKS
established 1918

YOUR LOCAL DISTRIBUTOR IS:

STANDARD SETS



Taper
Second
Bottom

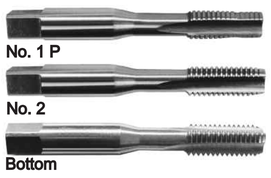
Hand Taps with full thread profile for general purpose use; Right and Left Hand threads in through and Blind holes.

SERIAL SETS
(Progressive thread form)

No. 1
No. 2
Bottom

Recommended for precision hand tapping in deep through or blind holes, and especially for tough materials.

PILOT SERIAL SETS



No. 1 P
No. 2
Bottom

Precision tapping in tough materials. The Pilot Serial Set has a pilot to help start the thread concentrically, thus allowing accurate hand tapping.

SPIRAL POINT TAPS
FOR THROUGH HOLES

Also known as Gun Type, Bull Nose or Chipdriver taps. FEW SP taps are designed for through hole tapping, as the chips are driven ahead of the tap. The greater strength and reduced torque loads allow for higher tapping speeds, thus making this an ideal production machine tap.

SPIRAL FLUTE TAPS
FOR BLIND HOLES

FEW Spiral Flute Taps are designed for machine tapping of blind holes in various materials and applications. They are available in slow, standard and fast flute helixes. The shortened thread length of the standard and fast helix DIN and ISO Spiral Flute taps allows for more efficient chip removal as well as lower torque loads.

SPECIAL APPLICATION TAPS
DIN COLOUR RING SERIES
SPIRAL POINT TAPS

Yellow Ring ST SP — 1221SO

The Yellow Ring ST Spiral Point Tap is designed to cut threads in soft steels with a tensile strength of less than 450 N/mm².

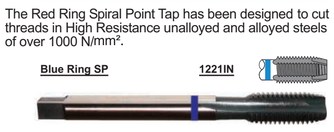
Orange Ring SP — 1221OR

The Orange Ring Spiral Point Tap is designed to tap general purpose steels with a tensile strength of 450 - 1000 N/mm².

Red Ring SP — 1224HR

The Red Ring Spiral Point Tap has been designed to cut threads in High Resistance unalloyed and alloyed steels of over 1000 N/mm².

Blue Ring SP — 1221IN



The Blue Ring Spiral Point Tap is designed to cut threads in tough stainless steels and high alloyed tool steels which have a tendancy to "close" after threading.

Yellow Ring BF SP — 1220AL

The Yellow Ring Spiral Point Tap is designed for tapping in soft, ductile alluminiums, and long chipping light metals and plastics.

Green Ring SP — 1220AS

The Green Ring Spiral Point Tap is designed to tap tough non-ferrous metals which have a tendancy to close after threading. e.g. Bronze (hard) or Alu with Si >10%.

SPIRAL FLUTE TAPS

Yellow Ring ST SF — 4221SO

The Yellow Ring Spiral Flute Tap is designed to cut threads in soft steels with a tensile strength of less than 450 N/mm².

Orange Ring SF — 4221OR

The Orange Ring Spiral Flute Tap is designed to tap general purpose steels with a tensile strength of 450 - 900 N/mm².

Orange Ring SF 15° — 3221OR

The Orange Ring Slow Spiral Flute Tap is designed to tap tougher general purpose steels with a tensile strength of 600 - 1100 N/mm².

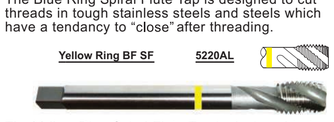
Red Ring SF — 5224HR

The Red Ring Spiral Flute Tap is designed to tap High Resistance unalloyed and alloyed steels over 1000 N/mm².

Blue Ring SF — 5221IN

The Blue Ring Spiral Flute Tap is designed to cut threads in tough stainless steels and steels which have a tendancy to "close" after threading.

Yellow Ring BF SF — 5220AL



The Yellow Ring Spiral Flute Tap is designed to tap soft ductile aluminiums, light metals and plastics with long chips.

Green Ring SF — 5220AS

The Green Ring Spiral Flute Tap is designed to tap tough non-ferrous metals which have a tendancy to close after threading. e.g. Bronze (hard) or Alu with Si >10%.

STRAIGHT FLUTE NITRIDED MACHINE TAPS

White Ring STR FL NI — 0222GG

The White Ring Straight Flute Nitride tap is designed to tap blind and through holes in abrasive short chipping applications, such as cast iron.

The White Ring Straight Flute TIN/TICN tap is designed for higher speed tapping in abrasive short chipping materials, (blind or through holes).

NUT TAPS

H - Nib: For buttwelding onto bentshank.

R - Nib: For soldering onto bentshank.

POLYGON TAPS
(Roll or Form Taps)

Standard – Type 6220
With oil groove – Type 6220G

TAPPING DRILL SIZES FOR POLYGON TAPS

METRIC SIZE		
Nominal Size of tap	Pitch (mm)	Tap Drill Size (mm)
M 3	0.5	2.80
M 3.5	0.6	3.20
M 4	0.7	3.70
M 4.5	0.75	4.20
M 5	0.8	4.60
M 6	1	5.60
M 7	1	6.50
M 8	1.25	7.40
M 10	1.5	9.30
M 12	1.75	11.2

Note: The recommended tapping drill size has been calculated to give between 60% and 75% depth of thread. If not acceptable, the user may wish to experiment to achieve the desired thread depth for his particular application.

DRILL RANGE

HSS Jobber Drills - 277
Bright finish ground flute for general purpose drilling.

HSS Jobber Drills - 278
Steam tempered black finish for drilling in steel where cold welding is a problem.

Cobalt Heavy Duty Drills - 287
HSS - Co drill with Gold Oxide finish and135° Split Point for heavy duty applications in tough materials.

Parabolic Jobber Drills - 297
Bright Finish HSS-Co drill with parabolic ground flutes and a 130° Split Point for high production and precision applications.

Long Series Drills - 285
A general purpose bright finish HSS ground flute drill for long reach or deep hole applications.

Parabolic Long Series Drills - 298
Bright Finish HSS - Co LS drill with parabolic ground flutes and 130° Split Point for high production and precision long reach applications.

Extra Long Series Drills - 375/376/377/378/379
A Bright Finish HSS ground flute drill for general purpose long reach applications.

Single Ended Stub Drills - 282
A shorter rigid HSS drill with Bright Finish ground flutes for general purpose applications. (118°)

Parabolic Flute HSS Co Stub Drills - 296
A shorter rigid HSS - Co drill with Bright Finish parabolic ground flutes and 130° Split Point for high production and precision applications.

Double Ended Stub Drills - 283
135° Split Point for thin material applications.

HSS 60° Centre Drills - Type A
Centre Drill for general purpose centering applications.

HSS 60° Centre Drills - Type B
The double angle countersink produces a 60° protected center.

HSS 60° Centre Drills - Type R
The radius on the countersink produces a protected centre to accomodate a variety of male centre angles.

HSS - Co NC Spotting Drills - 289/290
An alternative to centre drills. (90°/ 120°)

Reduced Shank Drills - 295
For general purpose drilling.

Morse Taper Shank Drills - 280
For general purpose applications.

Extra Length Morse Taper Shank Drills - 281
Industrial quality Steam Tempered drill for general purpose applications.

TAPPING DRILL SIZES

METRIC COARSE		METRIC FINE				IMPERIAL SIZES		B.S.W.		B.S.F.		BRASS		U.N.C.		U.N.F.		U.N.E.F.		BSP SIZES	G (BSP)		Rc (BSPT)		NPS/T SIZES	N.P.S.		N.P.T.		BRITISH ASSOCIATION			
Nominal Diam. & Pitch	Drill Diam.	Nominal Diam. & Pitch	Drill Diam.	Nominal Diam. & Pitch	Drill Diam.	Diam. (INCH)	Metric Equiv.	TPI	Drill Diam.	TPI	Drill Diam.	TPI	Drill Diam.	TPI	Drill Diam.	TPI	Drill Diam.	TPI	Drill Diam.	Metric Equiv.	TPI	Drill Diam.	TPI	Drill Diam.	Metric Equiv.	TPI	Drill Diam.	TPI	Drill Diam.	No.	Major Diam.	TPI	Drill Diam.
M 1 0.25	0.75	M 2.5 0.35	2.15	M 24 1	23	1/16	1.587	60	1.15											7.723			28	6.2	7.894			27	6.1	16	0.0311	133.3	0.6
M 1.1 0.25	0.85	M 3 0.35	2.65	M 24 1.5	22.5	3/32	2.381	48	1.8																				15	0.0354	120.5	0.7
M 1.2 0.25	0.95	M 3.5 0.35	3.15	M 24 2	22	1/8	3.175	40	2.6											9.728	28	8.8	28	8.6	10.272	27	8.9	27	8.5	14	0.0394	109.9	0.75
M 1.4 0.3	1.1	M 4 0.5	3.5	M 25 1	24	5/32	3.968	32	3.1																				13	0.0472	102	0.95
M 1.6 0.35	1.25	M 4.5 0.5	4	M 25 1.5	23.5	3/16	4.762	24	3.6	32	4																		12	0.0512	90.9	1
M 1.8 0.35	1.45	M 5 0.5	4.5	M 25 2	23	7/32	5.556	24	4.4	28	4.7																		11	0.0591	81.9	1.2
M 2 0.4	1.6	M 5.5 0.5	5	M 27 1	26	1/4	6.350	20	5.1	26	5.4	26	5.4	20	5.1	28	5.5	32	5.5	13.157	19	11.8	19	11.5	13.571	18	11.5	18	11	10	0.0669	72.6	1.3
M 2.2 0.45	1.75	M 6 0.75	5.25	M 27 1.5	25.5	9/32	7.143	20	5.8	26	6.2																		9	0.0748	65.1	1.5
M 2.5 0.45	2.05	M 7 0.75	6.25	M 27 2	25	5/16	7.937	18	6.5	22	6.8	26	6.9	18	6.6	24	6.9	32	7.1										8	0.0866	59.1	1.8
M 3 0.5	2.5	M 8 0.75	7.25	M 28 1	27	3/8	9.525	16	7.9	20	8.3	26	8.4	16	8	24	8.5	32	8.6	16.662	19	15.25	19	15	17.053	18	15	18	14.5	7	0.0984	52.9	2
M 3.5 0.6	2.9	M 8 1	7	M 28 1.5	26.5	7/16	11.112	14	9.3	18	9.8	26	10	14	9.4	20	9.9	28	10.1										6	0.1102	47.9	2.3
M 4 0.7	3.3	M 9 0.75	8.25	M 28 2	26	1/2	12.700	12	10.5	16	11.2	26	11.5	13	10.8	20	11.5	28	11.7	20.955	14	19	14	18.5	21.224	14	18.5	14	18	5	0.1260	43	2.7
M 4.5 0.75	3.7	M 9 1	8	M 30 1	29	9/16	14.288	12	12	16	12.7	26	13	12	12.2	18	12.9	24	13										4	0.1417	38.5	3
M 5 0.8	4.2	M 10 0.75	9.25	M 30 1.5	28.5	5/8	15.875	11	13.5	14	14	26	14.7	11	13.5	18	14.5	24	14.75	22.911	14	21							3	0.1614	34.8	3.5
M 6 1	5	M 10 1	9	M 30 2	28	11/16	17.462	11	15	14	15.75							24	16.25										2	0.1850	31.4	4
M 7 1	6	M 10 1.25	8.75	M 30 3	27	3/4	19.050	10	16.5	12	17	26	17.8	10	16.5	16	17.5	20	17.5	26.441	14	24.5	14	24	26.568	14	24	14	23	1	0.2087	28.2	4.5
M 8 1.25	6.75	M 11 0.75	10.25	M 32 1.5	30.5	13/16	20.638	10	18	12	18.5							20	19.25										0	0.2362	25.4	5.1
M 9 1.25	7.75	M 11 1	10	M 32 2	30	7/8	22.225	9	19.25	11	20	26	21	9	19.5	14	20.4	20	20.75	30.201	14	28.25										
M 10 1.5	8.5	M 12 1	11	M 33 1.5	31.5	15/16	23.812	9	20.75	11	21.75							20	22.25													
M 11 1.5	9.5	M 12 1.25	10.75	M 33 2	31	1"	25.400	8	22	10	23	26	24.2	8	22.25	12	23.25	20	23.75	33.249	11	30.75	11	30.25	33.228	11.5	30	11.5	29				
M 12 1.75	10.2	M 12 1.5	10.5	M 33 3	30	1.1/8	28.575	7	24.75	9	26			7	25	12	26.5	18	26.75	37.897	11	35.5										
M 14 2	12	M 14 1	13	M 35 1.5	33.5	1.1/4	31.750	7	27.75	9	29			7	28	12	29.5	18	30	41.910	11	39.5	11	39	41.986	11.5	39	11.5	38				
M 16 2	14	M 14 1.25	12.75	M 36 1.5	34.5	1.3/8	34.925	6	30.5	8	32			6	30.75	12	32.75	18	33													
M 18 2.5	15.5	M 14 1.5	12.5	M 36 2	34	1.1/2	38.100	6	33.5	8	35			6	34	12	36	18	36	47.803	11	45	11	45	48.054	11.5	45	11.5	44				
M 20 2.5	17.5	M 15 1	14	M 36 3	33	1.5/8	41.275	5	35.5	8	37.5																					
M 22 2.5	19.5	M 15 1.5	13.5	M 38 1.5	36.5	1.3/4	44.450	5	39	7	40			5	39.5					53.746	11	51										
M 24 3	21	M 16 1	15	M 39 1.5	37.5	1.7/8	47.625	4.5	41.5	7	43																					
M 27 3	24	M 16 1.5	14.5	M 39 2	37	2"	50.800	4.5	44.5	7	46.5			4.5	45					59.614	11	57	11	56.5	60.091	11.5	57	11.5	56				
M 30 3.5	26.5	M 17 1	16	M 39 3	36	2.1/4	57.150	4	50	6	52			4.5	51.5					65.710	11	63.3										
M 33 3.5	29.5	M 17 1.5	15.5	M 40 1.5	38.5	2.1/2	63.500	4	56.5	6	58.5			4	57.25					75.184	11	72.8	11	71.4	73.025	8	68	8	67				
M 36 4	32	M 18 1	17	M 40 2	38	2.3/4	69.850	3.5	62	6	64.5			4	63.5																	
M 39 4	35	M 18 1.5	16.5	M 40 3	37	3"	76.200	3.5	68.5	5	69.75			4	70					87.884	11	85.5			88.900	8	84	8	83				
M 42 4.5	37.5	M 18 2	16	M 42 1.5	40.5																											
M 45 4.5	40.5	M 20 1	19	M 42 2	40																											
M 48 5	43	M 20 1.5	18.5	M 42 3	39																											
M 52 5	47	M 20 2	18	M 42 4	38																											
M 56 5.5	50.5	M 22 1	21	M 45 1.5	43.5																											
		M 22 1.5	20.5	M 45 2	43																											
		M 22 2	20	M 45 3	42																											
				M 45 4	41																											

NOTES:

a. Please note all tapping drill sizes are in millimetres.
b. Tapping drill sizes of other thread forms are displayed in FEW Technical Catalogue.
c. Pipe thread nominal diameters do not represent actual size of tap.
d. When tapping with taper pipe taps use a taper reamer if available.
e. 1/4 Inch brass is identical to 1/4 inch BSF.
f. Blank sizes for external threads can be found in the FEW Technical Catalogue

NC – NATIONAL COARSE			
No.	Major Diam.	TPI	Drill Diam.
1	0.073	64	1.55
2	0.086	56	1.85
3	0.099	48	2.10
4	0.112	40	2.35
5	0.125	40	2.65
6	0.138	32	2.85
8	0.164	32	3.50
10	0.190	24	3.90
12	0.216	24	4.50

NF – NATIONAL FINE			
No.	Major Diam.	TPI	Drill Diam.
0	0.060	80	1.25
1	0.073	72	1.55
2	0.086	64	1.90
3	0.099	56	2.15
4	0.112	48	2.40
5	0.125	44	2.70
6	0.138	40	2.95
8	0.164	36	3.50
10	0.190	32	4.10
12	0.216	28	4.70

Tensile Strength

Comparison Table • Tensile Strength • Vickers-Brinell & Rockwell Hardness
PART OF DIN 50 150

Tensile Strength N/mm2	Vicker Hardness (F ≥ 98 N)	Brinell Hardness (0.102 = F/D2 = 30 N/mm2)	HRC
255	80	76.0	
270	85	80.7	
285	90	85.5	
305	95	90.2	
320	100	95.0	
335	105	99.8	
350	110	105	
370	115	109	
385	120	114	
400	125	119	
415	130	124	
430	135	128	
450	140	133	
465	145	138	
480	150	143	
495	155	147	
510	160	152	
530	165	156	
545	170	162	
560	175	166	
575	180	171	
595	185	176	
610	190	181	
625	195	185	
640	200	190	
660	205	195	
675	210	199	
690	215	204	
705	220	209	
720	225	214	
740	230	219	
755	235	223	
770	240	228	20.3
785	245	233	21.3
800	250	238	22.2
820	255	242	23.1
835	260	247	24
850	265	252	24.8
865	270	257	25.6
880	275	261	26.4
900	280	266	27.1
915	285	271	27.8
930	290	276	28.5
950	295	280	29.2
965	300	285	29.8
995	310	295	31
1030	320	304	32.2
1060	330	314	33.3
1095	340	323	34.4
1125	350	333	35.5
1155	360	342	36.6
1190	370	352	37.7
1220	380	361	38.8
1255	390	371	39.8
1290	400	380	40.8
1320	410	390	41.8
1350	420	399	42.7
1385	430	409	43.6
1420	440	418	44.5
1455	450	428	45.3
1485	460	437	46.1
1520	470	447	46.9
1555	480	(456)	47.7
1595	490	(466)	48.4
1630	500	(475)	49.1
1665	510	(485)	49.8
1700	520	(494)	50.5
1740	530	(504)	51.1
1775	540	(513)	51.7
1810	550	(523)	52.3
1845	560	(532)	53
1880	570	(542)	53.6
1920	580	(551)	54.1
1955	590	(561)	54.7
1995	600	(570)	55.2
2030	610	(580)	55.7
2070	620	(589)	56.3
2105	630	(599)	56.8
2145	640	(608)	57.3
2180	650	(618)	57.8
	660		58.3
	670		58.8
	680		59.2
	690		59.7
	700		60.1
	720		61
	740		61.8
	760		62.5
	780		63.3
	800		64
	820		64.7
	840		65.3
	860		65.9
	880		66.4
	900		67
	920		67.5
	940		68

TAP SELECTION CHART by materials

TYPE OF HOLE	SUITABILITY OF TAP		HAND TAPS ISO 529 ISO 2284 JIS B4430	GENERAL PURPOSE MACHINE TAPS ISO 529 / 2283 / 2284 / JIS B4430 DIN 371 / 376 / 374 / 5156										SPECIAL APPLICATION MACHINE TAPS ISO 529 / 2283 / 2284 / JIS B4430 DIN 371 / 376 / 374 / 5156																				
1		(●) MOST SUITABLE	STD SET	(PILOT) SER SET	STR. FL TPR (FORM D)	STR. FL SEC (FORM C)	STR. FL BOT (FORM E)	BF SF	BF SF	BF SF	TIN SP	TIN SF	TIN SF	ST SP	ST SF	ST SP	ST SF	ST SF15	RED RING SP	RED RING SF	BLUE RING SP	BLUE RING SF	YELLOW RING BF SP	YELLOW RING BF SF	GREEN RING SP	GREEN RING SF	INT. THRD SP	STR. FL NITR	STR. FL TIN	POLY-GON	POLY-GON + OG	See Table of Cutting Speed for conver-sion from m/min to rpm (pg A5)	RECOMMENDED LUBRICATION
2		(○)SUITABLE	TYPE NO. (1)	0420	0720 (P)	0120	0220	0320	1220	4220	3220	1223	4223	3223	1221 SO SP	4221 SO SF	1221 (OR)	4221 (OR)	3221 OR	1224 HR	5224 HR	1221 IN	5221 IN	1220 AL	5220 AL	1220 AS	5220 AS	1220 IT	0222 GG	0223 GG	6220	6220 G		
3			INDEX PG NO	B3	B3	B4	B4	B4	B6	B7	B7	B6	B7	B7	B6	B7	B6	B7	B7	B5	B8	B5	B8	B5	B8	B5	B8	B6	B5	B5	B8	B8		
4			CATALOGUE SYMBOL	TPR + (SEC) + BOT	(NO. 1(P) + (NO. 2) + BOT																													
			DIN CHAMFER	–	–	D	C	E	B	C	C	B	C	C	B	C	B	C	C	B	C	B	C	B	C	B	C	B	C	C	C	C		
			LEAD (NO. OF THREADS)	–	–	6 - 8 (3,5 - 5)	3 - 4,5 (2 - 3)	1,5 - 2	3 - 5	2 - 3	2 - 3	3 - 5	2 - 3	2 - 3	3 - 5	2 - 3	3 - 5	2 - 3	2 - 3	3,5 - 5	2 - 3	3,5 - 5	2 - 3	3,5 - 5	2 - 3	3 - 5	2 - 3	3 - 5	2 - 3	2 - 3	2 - 3	2 - 3		
			SHORT CHIPPING	1 - 4	1 - 4	1 - 2	1 - 4	1 - 4	1 - 2	3 - 4	3 - 4	1 - 2	3 - 4	3 - 4	1 - 2	3 - 4	1 - 2	3 - 4	3 - 4	1 - 2	3 - 4	1 - 2	3 - 4	–	–	1 - 2	3 - 4	1 - 2	1 - 4	1 - 4	–	–		
			LONG CHIPPING	1 - 4	1 - 4	1 - 2	1 - 3	–	1 - 2	3 - 4	3 - 4	1 - 2	3 - 4	3 - 4	1 - 2	3 - 4	1 - 2	3 - 4	3 - 4	1 - 2	3 - 4	1 - 2	3 - 4	1 - 2	3 - 4	1 - 2	3 - 4	1 - 2	–	–	1 - 2	1 - 4	(3) Cutting Speed m/min	
TYPE OF MATERIAL	NOTE: STR. FL: Taps with larger diameter or fine pitch may be used to tap deeper in long chipping materials due to a greater Flute Volume: Metal Removal ratio.																															
STEELS UNDER 450 N/mm²			●	○	○	○								●	●	○	○													●	●	10 - 16	OIL/ EMULSION
STEELS UP TO 750 N/mm²			●	●	●	●		○	○	○	○	○	○	○	○	●	●	○									●			●	●	10 - 16	OIL/ EMULSION
STEELS UP TO 1000 N/mm²			●	●				○	○	○	●	○	●			○	○	●									●					5 - 10	OIL/ EMULSION
STEELS OVER 1000 N/mm²			○	●							○	○	○					○	●	●												2 - 6	OIL/ EMULSION
STAINLESS STEELS			○	●		○					○	○				○	○				●	●			○	○	○			○	●	4 - 8	SPECIAL CUTTING OIL
CAST IRON (SHORT CHIPPING)			●	●		○	○						○														●	●			6 - 12	DRY/ EMULSION
MALLEABLE CAST IRON (LONG CHIPPING)			●	●		○		○	○							●	●	●														6 - 12	OIL/ EMULSION
BRASS (SHORT CHIPPING)			●	○		●	●			○			○															○				20 - 25	DRY
BRASS (LONG CHIPPING)			●	○		○		●	●	●																				○	○	15 - 20	LIGHT OIL/ EMULSION
SOFT ALUMINIUM, COPPER, ZINC, ETC			●	○		○		○	○		○	○											●	●			○			●	○	15 - 25	LIGHT OIL/ EMULSION
ALUMINIUM ALLOYS, MALLEABLE BRONZE, ETC			●	●		○		●	●	○																	○			○	●	12 - 20	LIGHT OIL/ EMULSION
TOUGH ALUMINIUM (Si > 10%) HARD BRONZE, ETC			○	●		○		○	○	○	○	○	○														○				○	12 - 18	LIGHT OIL/ EMULSION
SOFT PLASTICS, THERMO PLASTICS, PVC, ETC			○			○		○	○	○													●	●								12 - 20	DRY
HARD PLASTICS, GRP, BAKELITE, ETC			○			○	○						○															○	○			5 - 10	DRY
SPECIAL ALLOYS, TITANIUM, INCONEL, ETC			TAPS WITH SPECIAL GEOMETRY CAN BE SUPPLIED AGAINST SPECIAL REQUEST.																															

Note (1) The full Type No, is preceded by the Norm letter. eg A0220 = ISO 529 STR. FL. SEC. D0220 = DIN 371 STR. FL. FORM C.
Note (2) Colour coded rings are available only on DIN Taps.

Note (3) Cutting speeds can be increased by 50 – 100% when using TIN coated or Polygon taps. Experimenting is advisable.
Note (4) Additional surface treatments can be added to increase performance in certain applications.

Recommended Speeds

DRILL SERIES Helix angle	STANDARD DRILLS STANDARD (20°-30°)					
Flute width	STANDARD					
Web thickness	STANDARD					
Choice standard	It is most suitable for drilling of steel, cast iron, alloy steel, and malleable cast iron and possible to drill stainless drill, brass, shallow hole of aluminium alloy, nickel and almost all kinds of material.					
Work material / Cutting condition / Dia.(mm)	Steel		Cast iron		Alloy steel	
	rpm	mm/rev	rpm	mm/rev	rpm	mm/rev
2	3550	0.03