

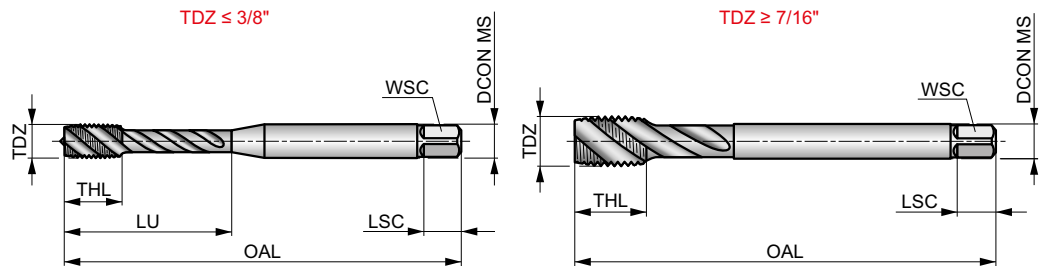
EX21

HSS-E-PM Spiral Flute Machine Tap, UNC, DIN Standard

Machine tap to produce normal fit threads within 2B tolerance. The spiral flute is suited for blind holes. Steam tempered surface acts to retain cutting fluid and prevent chip to tool welding.



	DIN 2184-1	2B
	2.5×D	HSS-E PM
C 2-3		λ 45°



Workpiece material group suitability and starting values for cutting speed (m/min).

P1.1 ▣21	P2.2 ▣15	P2.3 ▣13	P3.2 ▣9	P3.3 ▣8	P4.1 ▣7	P4.2 ▣5	M1.1 ▣8	M1.2 ▣6	M2.1 ▣7	M2.2 ▣5	M3.1 ▣5	M3.2 ▣4	M3.3 ▣3
M4.1 ▣3													

Product	TDZ	TPI	TD	OAL	THL	DCON MS	WSC	LSC	NOF	PHD	LU
			[mm]	[mm]	[mm]	[mm]	[mm]	[mm]		[mm]	[mm]
EX214-40	4	40	2.845	56.0	6	3.50	2.70	6	3	2.35	18.00
EX215-40	5	40	3.175	56.0	6	3.50	2.70	6	3	2.65	18.00
EX216-32	6	32	3.505	56.0	7	4.00	3.00	6	3	2.85	20.00
EX218-32	8	32	4.166	63.0	7	4.50	3.40	8	3	3.50	21.00
EX2110-24	10	24	4.826	70.0	8	6.00	4.90	8	3	3.90	25.00
EX2112-24	12	24	5.486	80.0	10	6.00	4.90	8	3	4.50	30.00
EX211/4	1/4	20	6.350	80.0	10	7.00	5.50	8	3	5.10	30.00
EX215/16	5/16	18	7.938	90.0	12	8.00	6.20	9	3	6.60	35.00
EX213/8	3/8	16	9.525	100.0	15	10.00	8.00	11	3	8.00	39.00
EX217/16	7/16	14	11.112	100.0	15	8.00	6.20	9	3	9.40	—
EX211/2	1/2	13	12.700	110.0	18	9.00	7.00	10	3	10.80	—
EX215/8	5/8	11	15.875	110.0	20	12.00	9.00	12	4	13.50	—
EX213/4	3/4	10	19.050	125.0	25	14.00	11.00	14	4	16.50	—
EX217/8	7/8	9	22.225	140.0	25	18.00	14.50	17	4	19.50	—
EX211	1"	8	25.400	160.0	30	18.00	14.50	17	4	22.25	—



WMG (WORK MATERIAL GROUP)

ISO group	WMG (Work Material Group)			Hardness (HB or HRC)	Ultimate Tensile Strength (MPa)	
P	P1	P1.1	Free machining steel (carbon steels with increased machinability)	Sulfurized	< 240 HB	≤ 830
		P1.2		Sulfurized and phosphorized	< 180 HB	≤ 620
		P1.3		Sulfurized/phosphorized and leaded	< 180 HB	≤ 620
	P2	P2.1	Plain carbon steel (steels comprised of mainly iron and carbon)	Containing <0.25 % C	< 180 HB	≤ 620
		P2.2		Containing <0.55 % C	< 240 HB	≤ 830
		P2.3		Containing >0.55 % C	< 300 HB	≤ 1030
	P3	P3.1	Alloy steel (carbon steels with an alloying content ≤ 10%)	Annealed	< 180 HB	≤ 620
		P3.2		Hardened and tempered	180 – 260 HB	> 620 ≤ 900
		P3.3			260 – 360 HB	> 900 ≤ 1240
P4	P4.1	Tool steel (special alloy steel for tools, dies and molds)	Annealed	< 26 HRC	≤ 900	
	P4.2		Hardened and tempered	26 – 39 HRC	> 900 ≤ 1240	
	P4.3			39 – 45 HRC	> 1240 ≤ 1450	
M	M1	M1.1	Ferritic stainless steel (straight chromium non-hardenable alloys)		< 160 HB	≤ 520
		M1.2			160 – 220 HB	> 520 ≤ 700
	M2	M2.1	Martensitic stainless steel (straight chromium hardenable alloys)	Annealed	< 200 HB	≤ 670
		M2.2		Quenched and tempered	200 – 280 HB	> 670 ≤ 950
	M3	M2.3	Austenitic stainless steel (chromium-nickel and chromium-nickel-manganese alloys)	Precipitation-hardened	280 – 380 HB	> 950 ≤ 1300
		M3.1			< 200 HB	≤ 750
		M3.2			200 – 260 HB	> 750 ≤ 870
	M4	M3.3	Austenitic-ferritic (DUPLEX) or super-austenitic stainless steel		260 – 300 HB	> 870 ≤ 1040
		M4.1			< 300 HB	≤ 990
M4.2				300 – 380 HB	≤ 1320	
K	K1	K1.1	Gray iron or Automotive Gray iron (GG) (iron-carbon castings with a lamellar graphite microstructure)	Ferritic or ferritic-pearlitic	< 180 HB	≤ 190
		K1.2		Ferritic-pearlitic or pearlitic	180 – 240 HB	> 190 ≤ 310
		K1.3		Pearlitic	240 – 280 HB	> 310 ≤ 390
	K2	K2.1	Malleable iron (GTS/GTW) (iron-carbon castings with a graphite-free microstructure)	Ferritic	< 160 HB	≤ 400
		K2.2		Ferritic or pearlitic	160 – 200 HB	> 400 ≤ 550
		K2.3		Pearlitic	200 – 240 HB	> 550 ≤ 660
	K3	K3.1	Ductile iron (GGG) (iron-carbon castings with a nodular graphite microstructure)	Ferritic	< 180 HB	≤ 560
		K3.2		Ferritic or pearlitic	180 – 220 HB	> 560 ≤ 680
		K3.3		Pearlitic	220 – 260 HB	> 680 ≤ 800
K4	K4.1	Austenitic gray iron (ASTM A436) (iron-carbon alloy castings with an austenitic lamellar graphite microstructure)		< 180 HB	≤ 190	
	K4.2			< 240 HB	≤ 740	
	K4.3		Austempered ductile iron (ASTM A897) (iron-carbon alloy castings with an ausferrite microstructure)	< 280 HB	> 840 ≤ 980	
K4.4	280 – 320 HB	> 980 ≤ 1130				
K4.5	320 – 360 HB	> 1130 ≤ 1280				
K5	K5.1	Compacted graphite iron CGI (ASTM A842) (iron-carbon castings with a vermicular graphite structure)	Ferritic	< 180 HB	≤ 400	
	K5.2		Ferritic-pearlitic	180 – 220 HB	> 400 ≤ 450	
	K5.3		Pearlitic	220 – 260 HB	> 450 ≤ 500	
N	N1	N1.1	Commercially pure wrought aluminium		< 60 HB	≤ 240
		N1.2		Half hard tempered	60 – 100 HB	> 240 ≤ 400
		N1.3			Full hard tempered	100 – 150 HB
	N2	N2.1	Cast aluminium alloys		< 75 HB	≤ 240
		N2.2		75 – 90 HB	> 240 ≤ 270	
		N2.3		90 – 140 HB	> 270 ≤ 440	
	N3	N3.1	Free-cutting copper-alloys materials with excellent machining properties		–	–
		N3.2		Short-chip copper-alloys with good to moderate machining properties	–	–
		N3.3		Electrolytic copper and long-chip copper-alloys with moderate to poor machining properties	–	–
N4	N4.1	Thermoplastic polymers		–	–	
	N4.2		Thermosetting polymers	–	–	
	N4.3		Reinforced polymers or composites	–	–	
N5	N5.1	Graphite		–	–	
S	S1	S1.1	Titanium or titanium alloys		< 200 HB	≤ 660
		S1.2		200 – 280 HB	> 660 ≤ 950	
		S1.3		280 – 360 HB	> 950 ≤ 1200	
	S2	S2.1	Fe-based high-temperature alloys		< 200 HB	≤ 690
		S2.2		200 – 280 HB	> 690 ≤ 970	
		S2.3		< 280 HB	≤ 940	
	S3	S3.1	Ni-based high-temperature alloys		280 – 360 HB	> 940 ≤ 1200
		S3.2		< 240 HB	≤ 800	
		S3.3		240 – 320 HB	> 800 ≤ 1070	
S4	S4.1	Co-based high-temperature alloys				
	S4.2					
H	H1	H1.1	Chilled cast iron		< 440 HB	–
	H2	H2.1	Hardened cast iron		< 55 HRC	–
		H2.2		> 55 HRC	–	
	H3	H3.1	Hardened steel <55 HRC		< 51 HRC	–
		H3.2		51 – 55 HRC	–	
	H4	H4.1	Hardened steel >55 HRC		55 – 59 HRC	–
		H4.2		> 59 HRC	–	