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RANGE	NORM	TYPE	MATERIAL / COATING	HELIX ANGLE	GEOMETRY	Z	ISO P	ISO M	ISO K	ISO N	ISO S	ISO H
1-30	DIN 327	N	HSS/Co BR	30°	SQUARE	2	★	☆	★	☆		
1-25	DIN 327	N	HSS/Co PV200	30°	SQUARE	2	★	☆	★	☆		
2-20	DIN 327	UM	HSSP PV200	30°	SQUARE	2	★	★	★			
3-30	DIN 844	N	HSS/Co BR	30°	SQUARE	2	★	☆	★	☆		
3-20	DIN 844	N	HSS/Co PV200	30°	SQUARE	2	★	☆	★	☆		
2-20	DIN 844	ALU	HSS/Co BR	42°	SQUARE	2				★		
1-32	DIN 844	N	HSS/Co BR	30°	SQUARE	3	★	☆	★	☆		
1-25	DIN 844	N	HSS/Co PV200	30°	SQUARE	3	★	☆	★	☆		
3-25	DIN 844	N	HSS/Co BR	30°	SQUARE	3	★	☆	★	☆		
3-20	DIN 844	N	HSS/Co PV200	30°	SQUARE	3	★	☆	★	☆		
6-20	DIN 844	N	HSS/Co PV200	45°	SQUARE	3	★	☆	★	☆		
2-30	DIN 844	N	HSS/Co BR	30°	SQUARE	4-6	★	☆	★	☆		
2-40	DIN 844	N	HSS/Co PV200	30°	SQUARE	4-6	★	☆	★	☆		
3-20	DIN 844	UM	HSSP PV200	30°	SQUARE	4	★	★	★			
3-25	DIN 844	N	HSS/Co BR	30°	SQUARE	4-6	★	☆	★	☆		
3-40	DIN 844	N	HSS/Co PV200	30°	SQUARE	4-6	★	☆	★	☆		
6-20	DIN 844	N - NR	HSS/Co PV200	30°	SQUARE	3-4	★	☆	★	☆		
6-20	DIN 844	N - HR	HSS/Co BR	30°	SQUARE	3-4	★	☆	★	☆		
6-40	DIN 844	N - HR	HSS/Co PV200	30°	SQUARE	3-6	★	☆	★	☆		
6-20	DIN 844	UM - HR	HSSP PV200	30°	SQUARE	3-4	★	★	★			
6-20	DIN 844	N - HR	HSS/Co BR	30°	SQUARE	3-4	★	☆	★	☆		
6-40	DIN 844	N - HR	HSS/Co PV200	30°	SQUARE	3-6	★	☆	★	☆		
2-30	DIN 327	N	HSS/Co BR	30°	BALL NOSE	2	★	☆	★	☆		
2-20	DIN 327	N	HSS/Co PV200	30°	BALL NOSE	2	★	☆	★	☆		
3-20	DIN 1889	N	HSS/Co BR	30°	BALL NOSE	2	★	☆	★	☆		
3-20	DIN 1889	N	HSS/Co PV200	30°	BALL NOSE	2	★	☆	★	☆		

★ 1st choice ☆ suitable

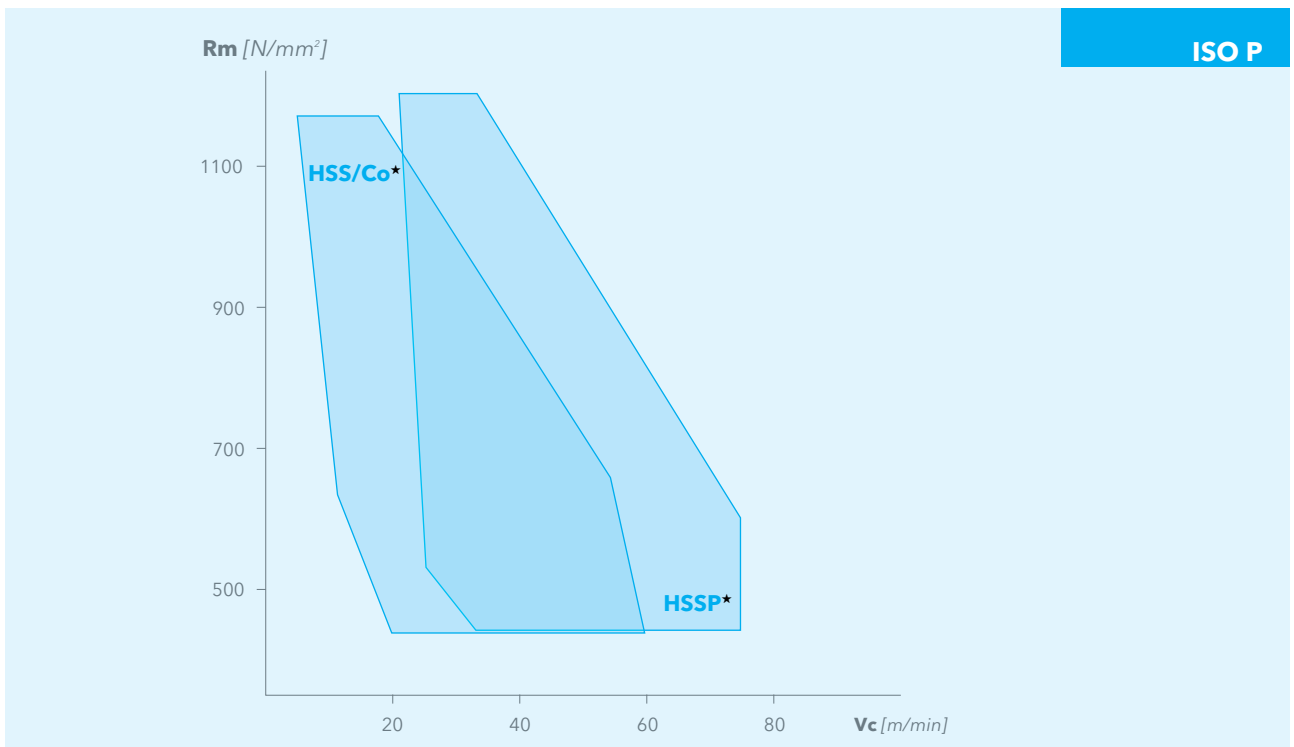


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RANGE	NORM	TYPE	MATERIAL / COATING	HELIX ANGLE	GEOMETRY	Z	ISO P	ISO M	ISO K	ISO N	ISO S	ISO H
40-100	DIN 1880	N	HSS/Co BR	30°	SQUARE	8-10	★	☆	★	☆		
40-100	DIN 1880	N	HSS/Co PV200	30°	SQUARE	8-10	★	☆	★	☆		
40-100	DIN 1880	N - HR	HSS/Co BR	30°	SQUARE	6-10	★	☆	★	☆		
40-100	DIN 1880	N - HR	HSS/Co PV200	30°	SQUARE	6-10	★	☆	★	☆		
R1-R11	DIN 6518	N	HSS/Co BR	0°	RADIUS	4	★	☆	★	☆		
16-38	DIN 1833	N	HSS/Co BR	45°-60°	SQUARE	6-12	★	☆	★	☆		
16-38	DIN 1833	N	HSS/Co BR	45°-60°	SQUARE	6-12	★	☆	★	☆		
12.5-36	DIN 851	N	HSS/Co BR	15°	SQUARE	6-8	★	☆	★	☆		
10.5-32.5	DIN850	N	HSS/Co BR	10°	SQUARE	8-12	★	☆	★	☆		

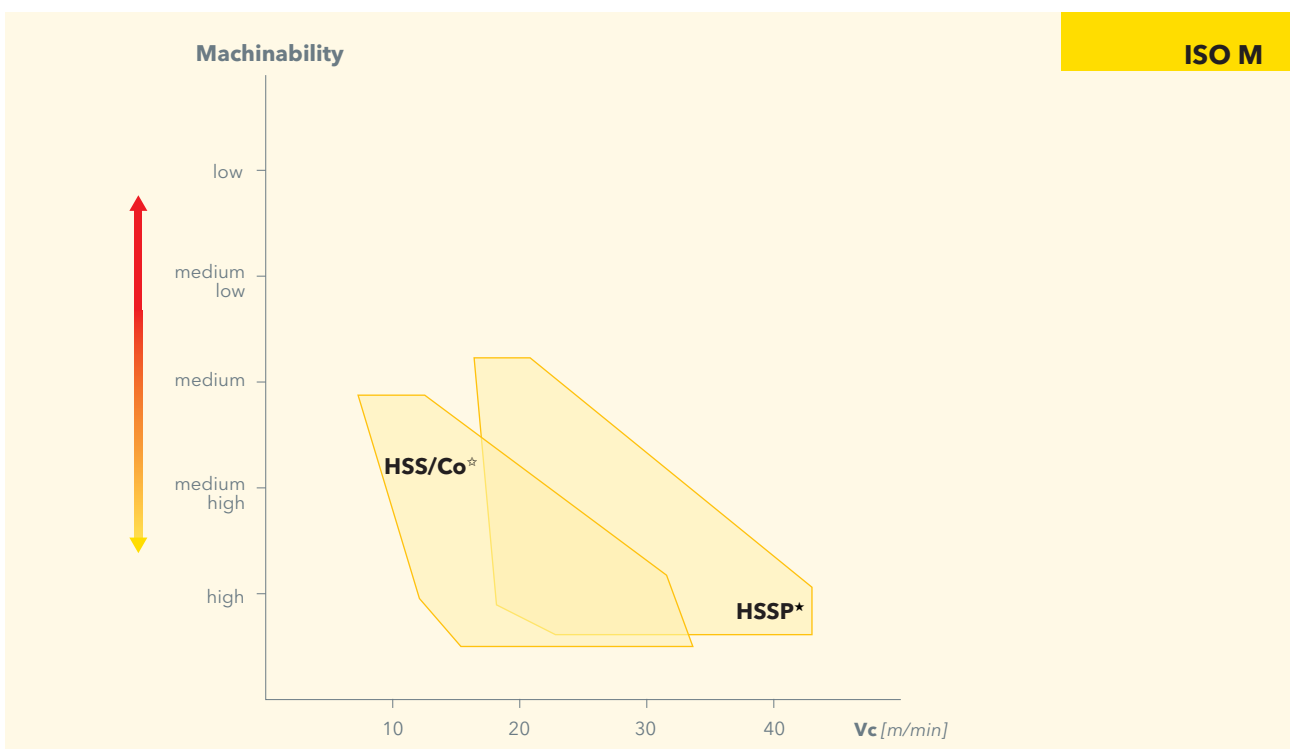
★ 1st choice ☆ suitable

STEEL APPLICATION



★ 1st choice ☆ suitable

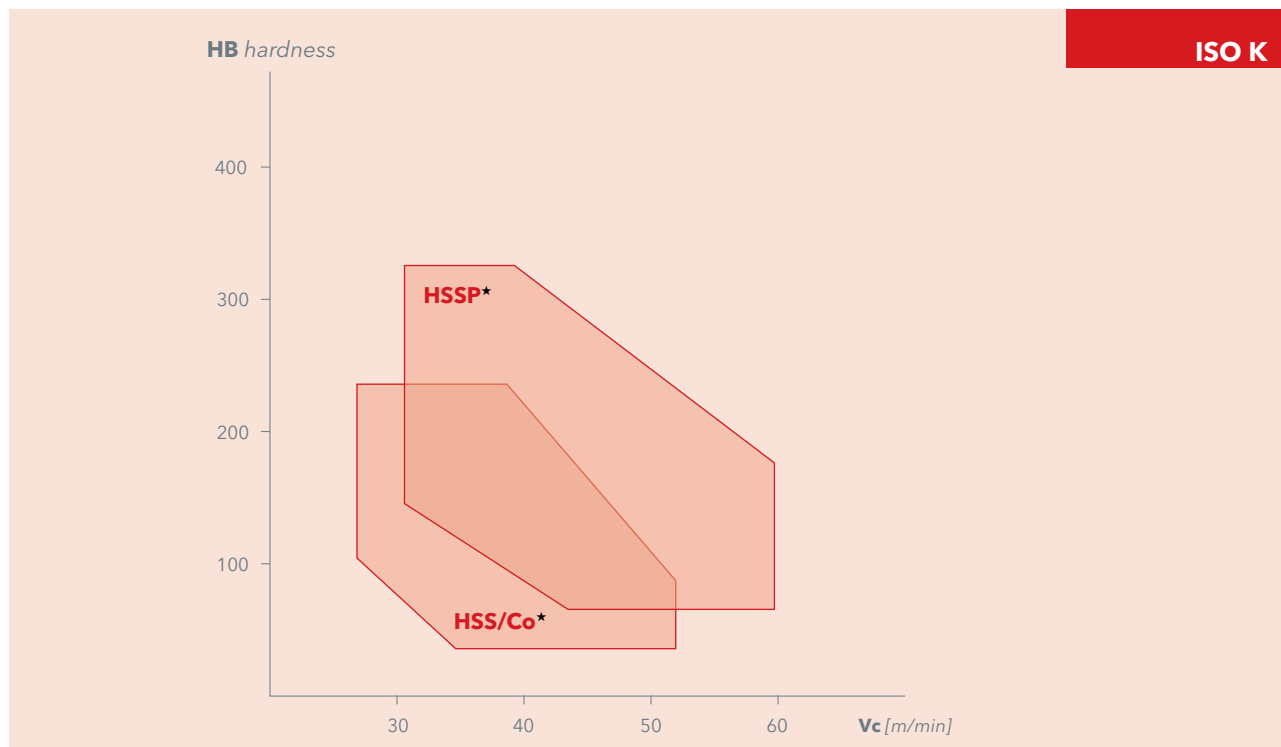
STAINLESS STEEL APPLICATION



HSS/Co : general purpose (page 658)  
 HSSP : high performance (page 658)

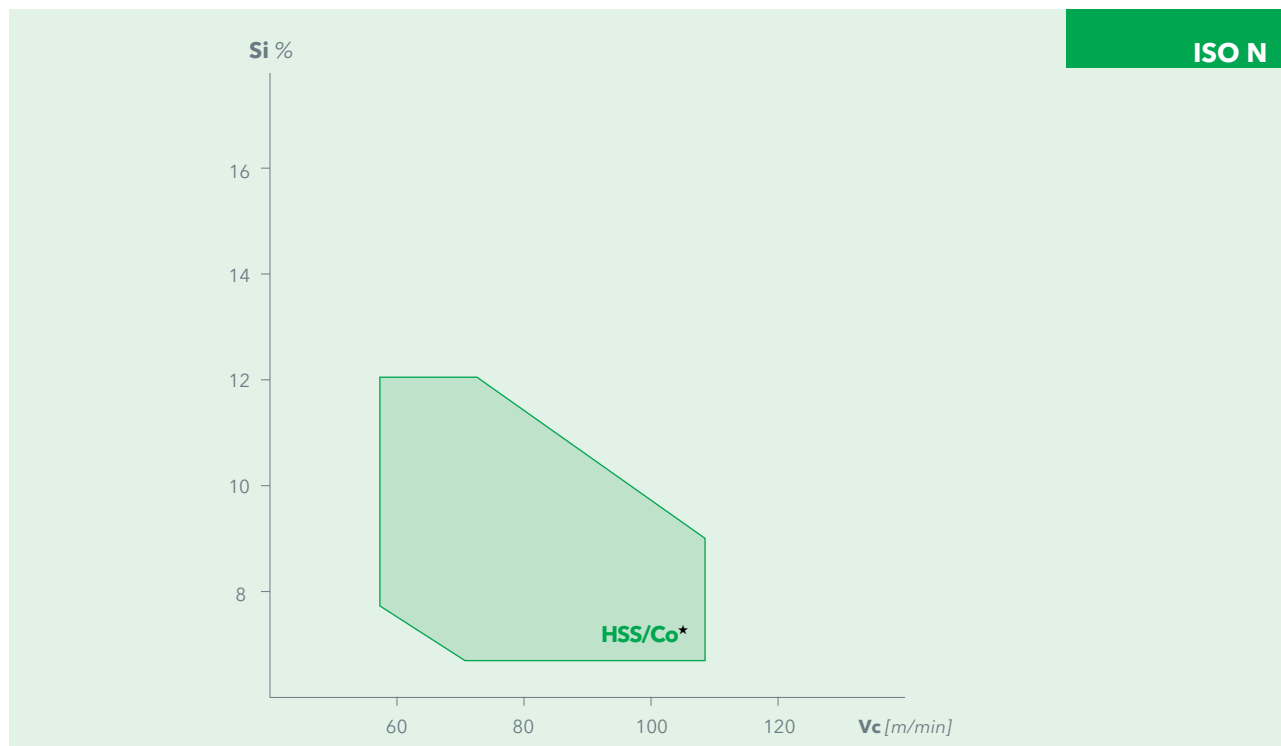
★ 1st choice ☆ suitable

CAST IRON APPLICATION



★ 1st choice ☆ suitable

NON-FERROUS MATERIALS APPLICATION



★ 1st choice ☆ suitable

HSS/Co : general purpose (page 658)  
 HSSP : high performance (page 658)





INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF-VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

## HSS/CO - HSSP

GENERAL PURPOSE

🇬🇧 The Osawa catalogue includes a wide range of HSS/Co - HSSP end mills, both coated and uncoated.

🇮🇹 Il catalogo Osawa include un'ampia scelta di frese in HSS/Co - HSSP nudo e rivestito.

🇩🇪 Der Osawa Katalog umfasst eine große Auswahl an beschichteten und unbeschichteten Fräsern aus HSS/Co - HSSP.

🇫🇷 Le catalogue Osawa inclut une large gamme de fraises en HSS/Co - HSSP, soit revêtues, soit non revêtues.

🇪🇸 El catálogo Osawa incluye una amplia variedad de fresas de HSS/Co - HSSP con o sin recubrimiento.

🇷🇺 В каталоге Osawa также представлена широкая гамма концевых фрез изготовленных из HSS/Co - HSSP с покрытием и без покрытия.



# WS2-TAWS2-UMWS2

weldon shank, 2 flutes

DIN 327
N
HSS/Co BR
HSS/Co PV200
30°
SQUARE
ZZ

WS2/TAWS2    WS2    TAWS2



WS2



TAWS2

UM
HSS-P PV200

UMWS2

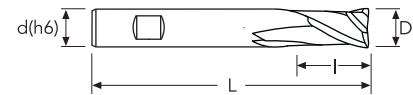


UMWS2

P	M	K	N	S	H
★	☆	★	☆		
★	★	★			

WS2-TAWS2  
UMWS2

★ 1st choice ☆ suitable



D(e8)	D Tol.	d(h6)	l	l1	L	z	WS2		TAWS2		UMWS2	
							EDP No.	Stock	EDP No.	Stock	EDP No.	Stock
1	-0.014/-0.028	6	2.5		47	2	WS2010	h	TAWS2010	h		
1.5	-0.014/-0.028	6	3		47	2	WS2015	h	TAWS2015	h		
2	-0.014/-0.028	6	4		48	2	WS2020	h	TAWS2020	h	UMWS2020	h
2.5	-0.014/-0.028	6	5		49	2	WS2025	h	TAWS2025	h		
3	-0.014/-0.028	6	5		49	2	WS2030	h	TAWS2030	h	UMWS2030	h
3.5	-0.020/-0.038	6	6		50	2	WS2035	h	TAWS2035	h		
4	-0.020/-0.038	6	7		51	2	WS2040	h	TAWS2040	h	UMWS2040	h
4.5	-0.020/-0.038	6	7		51	2	WS2045	h	TAWS2045	h		
5	-0.020/-0.038	6	8		52	2	WS2050	h	TAWS2050	h	UMWS2050	h
5.5	-0.020/-0.038	6	8		52	2	WS2055	h	TAWS2055	h		
6	-0.020/-0.038	6	8		52	2	WS2060	h	TAWS2060	h	UMWS2060	h
6.5	-0.025/-0.047	10	10		60	2	WS2065	h	TAWS2065	h		
7	-0.025/-0.047	10	10		60	2	WS2070	h	TAWS2070	h		
7.5	-0.025/-0.047	10	10		60	2	WS2075	h	TAWS2075	h		
8	-0.025/-0.047	10	11		61	2	WS2080	h	TAWS2080	h	UMWS2080	h
8.5	-0.025/-0.047	10	11		61	2	WS2085	h	TAWS2085	h		
9	-0.025/-0.047	10	11		61	2	WS2090	h	TAWS2090	h		
9.5	-0.025/-0.047	10	11		61	2	WS2095	h	TAWS2095	h		
10	-0.025/-0.047	10	13		63	2	WS2100	h	TAWS2100	h	UMWS2100	h
10.5	-0.032/-0.059	12	13		70	2	WS2105	h	TAWS2105	h		
11	-0.032/-0.059	12	13		70	2	WS2110	h	TAWS2110	h		
11.5	-0.032/-0.059	12	13		70	2	WS2115	h	TAWS2115	h		
12	-0.032/-0.059	12	16		73	2	WS2120	h	TAWS2120	h	UMWS2120	h
12.5	-0.032/-0.059	12	16		73	2	WS2125	h	TAWS2125	h		
13	-0.032/-0.059	12	16		73	2	WS2130	h	TAWS2130	h		
13.5	-0.032/-0.059	12	16		73	2	WS2135	h	TAWS2135	h		
14	-0.032/-0.059	12	16		73	2	WS2140	h	TAWS2140	h	UMWS2140	h
15	-0.032/-0.059	12	16		73	2	WS2150	h	TAWS2150	h		
16	-0.032/-0.059	16	19		79	2	WS2160	h	TAWS2160	h	UMWS2160	h
17	-0.032/-0.059	16	19		79	2	WS2170	h	TAWS2170	h		
18	-0.032/-0.059	16	19		79	2	WS2180	h	TAWS2180	h	UMWS2180	h
19	-0.040/-0.073	16	19		79	2	WS2190	h	TAWS2190	h		
20	-0.040/-0.073	20	22		88	2	WS2200	h	TAWS2200	h	UMWS2200	h
22	-0.040/-0.073	20	22		88	2	WS2220	h	TAWS2220	h		
24	-0.040/-0.073	25	26		102	2	WS2240	h				
25	-0.040/-0.073	25	26		102	2	WS2250	h	TAWS2250	h		
26	-0.040/-0.073	25	26		102	2	WS2260	h				
28	-0.040/-0.073	25	26		102	2	WS2280	h				
30	-0.040/-0.073	25	26		102	2	WS2300	h				

h stock standard    f non-standard stock    m stock exhaustion

# TAWS2

UMWS2 (n and Vf = +20%) - WS2 (n and Vf = -20% ÷ -30%)

	Material Group ISO 513	P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm	≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
	Vc (m/min)	40-60			30-50			25-35			15-25		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
1	15920	0.003	90	12740	0.003	60	9550	0.002	40	6370	0.002	20	
2	7960	0.006	95	6370	0.005	70	4780	0.005	45	3180	0.004	25	
3	5310	0.009	95	4250	0.008	70	3180	0.007	45	2120	0.006	25	
4	3980	0.013	105	3180	0.012	75	2390	0.010	45	1590	0.009	30	
5	3180	0.017	110	2550	0.015	80	1910	0.013	50	1270	0.012	30	
6	2650	0.022	115	2120	0.020	85	1590	0.017	50	1060	0.015	35	
8	1990	0.032	125	1590	0.029	90	1190	0.024	55	800	0.022	35	
10	1590	0.040	125	1270	0.036	90	960	0.030	60	640	0.028	35	
12	1330	0.048	130	1060	0.043	90	800	0.036	60	530	0.034	35	
14	1140	0.057	130	910	0.051	95	680	0.043	60	450	0.040	35	
16	1000	0.067	135	800	0.060	95	600	0.050	60	400	0.047	40	
18	880	0.077	135	710	0.069	100	530	0.058	60	350	0.054	40	
20	800	0.088	140	640	0.079	100	480	0.066	65	320	0.062	40	
22	720	0.098	140	580	0.088	100	430	0.074	65	290	0.069	40	
24	660	0.105	140	530	0.095	100	400	0.079	65	270	0.074	40	
25	640	0.110	140	510	0.099	100	380	0.083	65	250	0.077	40	
26	610	0.116	140	490	0.104	100	370	0.087	65	240	0.081	40	
28	570	0.122	140	450	0.110	100	340	0.092	60	230	0.085	40	
30	530	0.128	135	420	0.115	95	320	0.096	60	210	0.090	40	
ap x ae	≤ D3	0.25D x D											

	Material Group ISO 513	P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm	≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae	1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.3D			1.5D x 0.3D		
	Vc (m/min)	50-70			40-60			25-35			20-30		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
1	19110	0.003	130	15920	0.003	100	11150	0.003	60	7960	0.004	60	
2	9550	0.007	140	7960	0.006	100	5570	0.006	60	3980	0.008	60	
3	6370	0.007	90	5310	0.006	70	3720	0.006	45	2650	0.005	25	
4	4780	0.011	105	3980	0.010	75	2790	0.009	50	1990	0.008	30	
5	3820	0.016	120	3180	0.014	90	2230	0.012	55	1590	0.011	35	
6	3180	0.020	130	2650	0.018	95	1860	0.016	60	1330	0.014	40	
8	2390	0.026	125	1990	0.024	95	1390	0.021	60	1000	0.018	35	
10	1910	0.038	145	1590	0.035	110	1110	0.031	70	800	0.027	45	
12	1590	0.048	155	1330	0.043	115	930	0.038	70	660	0.034	45	
14	1360	0.058	155	1140	0.052	120	800	0.046	75	570	0.040	45	
16	1190	0.068	165	1000	0.062	125	700	0.055	75	500	0.048	50	
18	1060	0.080	170	880	0.072	125	620	0.064	80	440	0.056	50	
20	960	0.092	175	800	0.083	135	560	0.074	85	400	0.065	50	
22	870	0.106	185	720	0.095	135	510	0.084	85	360	0.074	55	
24	800	0.118	190	660	0.106	140	460	0.094	85	330	0.082	55	
25	760	0.126	190	640	0.113	145	450	0.101	90	320	0.088	55	
26	730	0.132	195	610	0.119	145	430	0.106	90	310	0.092	55	
28	680	0.139	190	570	0.125	145	400	0.111	90	280	0.097	55	
30	640	0.146	185	530	0.132	140	370	0.117	85	270	0.102	55	
ap x ae	≤ D3	1.5D x 0.25D		1.5D x 0.25D		1.2D x 0.1D			1.2D x 0.1D				

INFO  
 TYPHOON TA-HTA-4HTA  
 TYPHOON PU-HPU  
 TYPHOON SUH  
 TYPHOON ALH  
 TYPHOON HRC  
 TYPHOON SUH MINI  
 TYPHOON HL  
 C-SD-TA  
 LFTA  
 SUTA  
 HSS-HSS/CO DRILLS  
 G2  
 MDTA  
 HF-VH/UP  
 MEF  
 ALU  
 MEX  
 UH  
 HSS/CO-HSSP END MILLS  
 CARBIDE BURRS

# TAWS2

UMWS2 (n and Vf = +20%) - WS2 (n and Vf = -20% ÷ -30%)

Material Group ISO 513	P1 P2			P3 M1 K1			P4 M2 K2			P5 M3					
	Hardness/Rm			≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae			0.5D x D			0.5D x D			0.5D x D			0.5D x D		
	Vc (m/min)			30-50			25-35			20-30			12-18		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)			
3	4250	0.005	40	3180	0.003	15	2650	0.002	10	1590	0.002	5			
4	3180	0.007	40	2390	0.004	20	1990	0.003	15	1190	0.003	5			
5	2550	0.009	45	1910	0.006	20	1590	0.005	15	960	0.005	10			
6	2120	0.011	45	1590	0.008	25	1330	0.006	15	800	0.006	10			
8	1590	0.016	50	1190	0.010	25	1000	0.008	15	600	0.008	10			
10	1270	0.020	50	960	0.014	30	800	0.012	20	480	0.011	10			
12	1060	0.024	50	800	0.018	30	660	0.015	20	400	0.014	10			
14	910	0.029	50	680	0.022	30	570	0.018	20	340	0.017	10			
16	800	0.034	55	600	0.026	30	500	0.021	20	300	0.020	10			
18	710	0.039	55	530	0.030	30	440	0.025	20	270	0.023	15			
20	640	0.044	55	480	0.035	35	400	0.029	25	240	0.027	15			
22	580	0.049	55	430	0.040	35	360	0.033	25	220	0.031	15			
24	530	0.053	55	400	0.044	35	330	0.037	25	200	0.034	15			
25	510	0.055	55	380	0.047	35	320	0.039	25	190	0.037	15			
26	490	0.058	55	370	0.050	35	310	0.041	25	180	0.039	15			
28	450	0.061	55	340	0.052	35	280	0.044	25	170	0.041	15			
30	420	0.064	55	320	0.055	35	270	0.046	25	160	0.043	15			



- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
- HF VH/UP
- MEF
- ALU
- MEX
- UH
- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

# WL2-TAWL2

weldon shank, 2 flutes, long

DIN  
844

**N**

HSS/Co  
BR

HSS/Co  
**PV200**

30°

SQUARE

ZZ

WL2

TAWL2



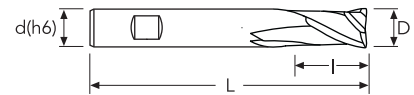
WL2



TAWL2

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D(e8)	D Tol.	d(h6)	l	l1	L	z	WL2		TAWL2	
							EDP No.	Stock	EDP No.	Stock
3	-0.014/-0.028	6	8		56	2	WL2030	h	TAWL2030	h
4	-0.020/-0.038	6	11		63	2	WL2040	h	TAWL2040	h
5	-0.020/-0.038	6	13		68	2	WL2050	h	TAWL2050	h
6	-0.020/-0.038	6	13		68	2	WL2060	h	TAWL2060	h
7	-0.025/-0.047	10	16		80	2	WL2070	h		
8	-0.025/-0.047	10	19		88	2	WL2080	h	TAWL2080	h
9	-0.025/-0.047	10	19		88	2	WL2090	h		
10	-0.025/-0.047	10	22		95	2	WL2100	h	TAWL2100	h
11	-0.032/-0.059	12	22		102	2	WL2110	h		
12	-0.032/-0.059	12	26		110	2	WL2120	h	TAWL2120	h
13	-0.032/-0.059	12	26		110	2	WL2130	h		
14	-0.032/-0.059	12	26		110	2	WL2140	h	TAWL2140	h
15	-0.032/-0.059	12	26		110	2	WL2150	h		
16	-0.032/-0.059	16	32		123	2	WL2160	h	TAWL2160	h
18	-0.032/-0.059	16	32		123	2	WL2180	h	TAWL2180	h
20	-0.040/-0.073	20	38		141	2	WL2200	h	TAWL2200	h
22	-0.040/-0.073	20	38		141	2	WL2220	h		
24	-0.040/-0.073	25	45		166	2	WL2240	f		
25	-0.040/-0.073	25	45		166	2	WL2250	h		
28	-0.040/-0.073	25	45		166	2	WL2280	h		
30	-0.040/-0.073	25	45		166	2	WL2300	h		

- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
- HF-VH/UP
- MEF
- ALU
- MEX
- UH
- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion

# TAWL2

WL2 (n and Vf = -20% ÷ -30%)

	<b>Material Group ISO 513</b>	P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	<b>Hardness/Rm</b>	≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	<b>ap x ae</b>	0.3D x D			0.3D x D			0.3D x D			0.2D x D		
	<b>Vc (m/min)</b>	30-50			25-35			20-30			12-18		
	<b>D (mm)</b>	<b>n (rpm)</b>	<b>fn (mm/rev)</b>	<b>Vf (mm/min)</b>	<b>n (rpm)</b>	<b>fn (mm/rev)</b>	<b>Vf (mm/min)</b>	<b>n (rpm)</b>	<b>fn (mm/rev)</b>	<b>Vf (mm/min)</b>	<b>n (rpm)</b>	<b>fn (mm/rev)</b>	<b>Vf (mm/min)</b>
	<b>3</b>	4250	0.006	50	3180	0.005	30	2650	0.005	25	1590	0.004	15
	<b>4</b>	3180	0.008	50	2390	0.007	35	1990	0.007	25	1190	0.006	15
	<b>5</b>	2550	0.011	55	1910	0.010	35	1590	0.009	25	960	0.008	15
	<b>6</b>	2120	0.014	60	1590	0.012	40	1330	0.011	30	800	0.010	15
	<b>8</b>	1590	0.020	65	1190	0.018	45	1000	0.016	30	600	0.015	20
	<b>10</b>	1270	0.025	65	960	0.023	45	800	0.020	30	480	0.019	20
	<b>12</b>	1060	0.030	65	800	0.027	45	660	0.024	30	400	0.023	20
	<b>14</b>	910	0.036	65	680	0.032	45	570	0.029	35	340	0.027	20
	<b>16</b>	800	0.042	70	600	0.038	45	500	0.034	35	300	0.032	20
	<b>18</b>	710	0.048	70	530	0.043	45	440	0.038	35	270	0.036	20
<b>20</b>	640	0.053	70	480	0.048	45	400	0.043	35	240	0.040	20	
<b>22</b>	580	0.060	70	430	0.054	45	360	0.048	35	220	0.045	20	
<b>25</b>	510	0.070	70	380	0.063	50	320	0.056	35	190	0.053	20	
<b>28</b>	450	0.077	70	340	0.069	45	280	0.062	35	170	0.058	20	
<b>30</b>	420	0.084	70	320	0.076	50	270	0.067	35	160	0.063	20	
<b>ap x ae</b>	≤ D5			0.25D x D									

	<b>Material Group ISO 513</b>	P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	<b>Hardness/Rm</b>	≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	<b>ap x ae</b>	2D x 0.1D			2D x 0.1D			2D x 0.1D			2D x 0.1D		
	<b>Vc (m/min)</b>	40-50			30-40			25-35			10-20		
	<b>D (mm)</b>	<b>n (rpm)</b>	<b>fn (mm/rev)</b>	<b>Vf (mm/min)</b>	<b>n (rpm)</b>	<b>fn (mm/rev)</b>	<b>Vf (mm/min)</b>	<b>n (rpm)</b>	<b>fn (mm/rev)</b>	<b>Vf (mm/min)</b>	<b>n (rpm)</b>	<b>fn (mm/rev)</b>	<b>Vf (mm/min)</b>
	<b>3</b>	4780	0.006	60	3720	0.006	40	3180	0.005	30	1590	0.005	10
	<b>4</b>	3580	0.009	65	2790	0.008	50	2390	0.007	30	1190	0.007	20
	<b>5</b>	2870	0.012	70	2230	0.011	50	1910	0.009	40	960	0.009	20
	<b>6</b>	2390	0.015	75	1860	0.014	50	1590	0.012	40	800	0.011	20
	<b>8</b>	1790	0.022	80	1390	0.020	60	1190	0.018	40	600	0.017	20
	<b>10</b>	1430	0.028	80	1110	0.025	60	960	0.022	40	480	0.021	20
	<b>12</b>	1190	0.033	80	930	0.030	60	800	0.027	40	400	0.025	20
	<b>14</b>	1020	0.040	80	800	0.036	60	680	0.032	40	340	0.030	20
	<b>16</b>	900	0.046	85	700	0.042	60	600	0.037	40	300	0.035	20
	<b>18</b>	800	0.052	85	620	0.047	60	530	0.042	40	270	0.039	20
<b>20</b>	720	0.059	85	560	0.053	60	480	0.047	40	240	0.044	20	
<b>22</b>	650	0.065	85	510	0.059	60	430	0.052	50	220	0.049	20	
<b>25</b>	570	0.077	90	450	0.069	60	380	0.062	50	190	0.058	20	
<b>28</b>	510	0.085	85	400	0.076	60	340	0.068	50	170	0.064	20	
<b>30</b>	480	0.092	90	370	0.083	60	320	0.074	50	160	0.069	20	
<b>ap x ae</b>	≤ D5			1.5D x 0.05D									

# WSA2

weldon shank, 2 flutes for aluminium



DIN 844

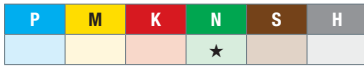
ALU

HSS/Co  
BR

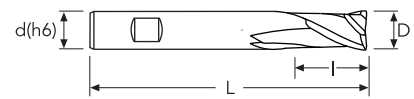
42°

SQUARE

ZZ



★ 1st choice ☆ suitable



D(e8)	D Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
2	-0.014/-0.028	6	7		51	2	WSA2020	h
2.5	-0.014/-0.028	6	8		52	2	WSA2025	h
3	-0.014/-0.028	6	8		52	2	WSA2030	h
4	-0.020/-0.038	6	11		55	2	WSA2040	h
5	-0.020/-0.038	6	13		57	2	WSA2050	h
6	-0.020/-0.038	6	13		57	2	WSA2060	h
8	-0.025/-0.047	10	19		69	2	WSA2080	h
10	-0.025/-0.047	10	22		72	2	WSA2100	h
12	-0.032/-0.059	12	26		83	2	WSA2120	h
14	-0.032/-0.059	12	26		83	2	WSA2140	h
16	-0.032/-0.059	16	32		92	2	WSA2160	h
18	-0.032/-0.059	16	32		92	2	WSA2180	h
20	-0.040/-0.073	20	38		104	2	WSA2200	h

- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
- HF-VH/UP
- MEF
- ALU
- MEX
- UH
- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion

CUTTING PARAMETERS

WSA2

	Material Group ISO 513	N1			N2			N3 N4			N5		
	Material	≤ 12% Si			> 12% Si			Non ferrous materials			Plastics		
	ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
	Vc (m/min)	90-110			70-90			60-80			100-140		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	15920	0.015	480	12740	0.014	345	11150	0.012	270	19110	0.018	690	
3	10620	0.020	425	8490	0.018	305	7430	0.016	240	12740	0.024	610	
4	7960	0.030	480	6370	0.027	345	5570	0.024	265	9550	0.036	690	
5	6370	0.035	445	5100	0.032	320	4460	0.028	250	7640	0.042	640	
6	5310	0.042	445	4250	0.038	320	3720	0.034	250	6370	0.050	640	
8	3980	0.056	445	3180	0.050	320	2790	0.045	250	4780	0.067	640	
10	3180	0.073	465	2550	0.066	335	2230	0.058	260	3820	0.088	670	
12	2650	0.090	475	2120	0.081	345	1860	0.072	270	3180	0.108	685	
14	2270	0.106	480	1820	0.095	345	1590	0.085	270	2730	0.127	695	
16	1990	0.120	480	1590	0.108	345	1390	0.096	265	2390	0.144	690	
18	1770	0.135	480	1420	0.122	345	1240	0.108	270	2120	0.162	685	
20	1590	0.150	475	1270	0.135	345	1110	0.120	265	1910	0.180	690	
ap x ae	≤ D3	0.2D x D											

	Material Group ISO 513	N1			N2			N3 N4			N5		
	Material	≤ 12% Si			> 12% Si			Non ferrous materials			Plastics		
	ap x ae	1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.5D		
	Vc (m/min)	100-140			90-110			70-90			130-150		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	19110	0.018	690	15920	0.016	520	12740	0.014	370	22290	0.020	880	
3	12740	0.018	460	10620	0.016	345	8490	0.014	245	14860	0.013	375	
4	9550	0.024	460	7960	0.022	345	6370	0.019	245	11150	0.017	375	
5	7640	0.036	550	6370	0.032	415	5100	0.029	295	8920	0.025	450	
6	6370	0.042	535	5310	0.038	400	4250	0.034	285	7430	0.029	435	
8	4780	0.050	480	3980	0.045	360	3180	0.040	255	5570	0.035	395	
10	3820	0.067	515	3180	0.060	385	2550	0.054	275	4460	0.047	420	
12	3180	0.088	555	2650	0.079	420	2120	0.070	295	3720	0.061	455	
14	2730	0.108	590	2270	0.097	440	1820	0.086	315	3180	0.076	480	
16	2390	0.127	610	1990	0.114	455	1590	0.102	325	2790	0.089	495	
18	2120	0.144	610	1770	0.130	460	1420	0.115	325	2480	0.101	500	
20	1910	0.162	620	1590	0.146	465	1270	0.130	330	2230	0.113	505	
ap x ae	≤ D3	1.2D x 0.1D											

	Material Group ISO 513	N1			N2			N3 N4			N5		
	Material	≤ 12% Si			> 12% Si			Non ferrous materials			Plastics		
	ap x ae	0.5D x D			0.5D x D			0.5D x D			0.5D x D		
	Vc (m/min)	70-90			55-75			50-60			90-110		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
3	8490	0.010	170	6900	0.007	95	5840	0.006	70	10620	0.009	192	
4	6370	0.015	190	5180	0.009	95	4380	0.008	70	7960	0.012	192	
5	5100	0.018	180	4140	0.014	110	3500	0.012	85	6370	0.018	230	
6	4250	0.021	180	3450	0.016	110	2920	0.014	80	5310	0.021	224	
8	3180	0.028	180	2590	0.019	100	2190	0.017	75	3980	0.025	200	
10	2550	0.037	185	2070	0.025	105	1750	0.022	80	3180	0.034	214	
12	2120	0.045	190	1730	0.033	115	1460	0.029	85	2650	0.044	232	
14	1820	0.053	195	1480	0.041	120	1250	0.036	90	2270	0.054	246	
16	1590	0.060	190	1290	0.048	125	1090	0.042	90	1990	0.064	254	
18	1420	0.068	190	1150	0.054	125	970	0.048	95	1770	0.072	254	
20	1270	0.075	190	1040	0.061	125	880	0.054	95	1590	0.081	258	

# WS3-TAWS3

weldon shank, 3 flutes

DIN 844	N	HSS/Co BR	HSS/Co PV200	30°	SQUARE	Z3
		WS3	TAWS3			



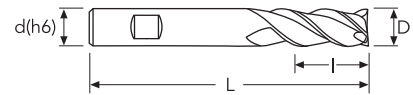
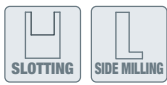
WS3



TAWS3

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D(e8)	D Tol.	d(h6)	l	l1	L	z	WS3		TAWS3	
							EDP No.	Stock	EDP No.	Stock
1	-0.014/-0.028	6	3		47	3	WS3010	h	TAWS3010	f
1.5	-0.014/-0.028	6	7		51	3	WS3015	h	TAWS3015	f
2	-0.014/-0.028	6	7		51	3	WS3020	h	TAWS3020	h
2.5	-0.014/-0.028	6	8		52	3	WS3025	h	TAWS3025	h
3	-0.014/-0.028	6	8		52	3	WS3030	h	TAWS3030	h
3.5	-0.020/-0.038	6	10		54	3	WS3035	h	TAWS3035	h
4	-0.020/-0.038	6	11		55	3	WS3040	h	TAWS3040	h
4.5	-0.020/-0.038	6	11		55	3	WS3045	h	TAWS3045	h
5	-0.020/-0.038	6	13		57	3	WS3050	h	TAWS3050	h
5.5	-0.020/-0.038	6	13		57	3	WS3055	h	TAWS3055	h
6	-0.020/-0.038	6	13		57	3	WS3060	h	TAWS3060	h
6.5	-0.025/-0.047	10	16		66	3	WS3065	h	TAWS3065	h
7	-0.025/-0.047	10	16		66	3	WS3070	h	TAWS3070	h
8	-0.025/-0.047	10	19		69	3	WS3080	h	TAWS3080	h
8.5	-0.025/-0.047	10	19		69	3	WS3085	h	TAWS3085	h
9	-0.025/-0.047	10	19		69	3	WS3090	h	TAWS3090	h
10	-0.025/-0.047	10	22		72	3	WS3100	h	TAWS3100	h
11	-0.032/-0.059	12	22		79	3	WS3110	h	TAWS3110	h
12	-0.032/-0.059	12	26		83	3	WS3120	h	TAWS3120	h
13	-0.032/-0.059	12	26		83	3	WS3130	h	TAWS3130	h
14	-0.032/-0.059	12	26		83	3	WS3140	h	TAWS3140	h
15	-0.032/-0.059	12	26		83	3	WS3150	h	TAWS3150	h
16	-0.032/-0.059	16	32		92	3	WS3160	h	TAWS3160	h
18	-0.032/-0.059	16	32		92	3	WS3180	h	TAWS3180	h
20	-0.040/-0.073	20	38		104	3	WS3200	h	TAWS3200	h
22	-0.040/-0.073	20	38		104	3	WS3220	h	TAWS3220	h
25	-0.040/-0.073	25	45		121	3	WS3250	h	TAWS3250	h
30	-0.040/-0.073	25	45		121	3	WS3300	h		
32	-0.050/-0.089	32	53		133	3	WS3320	h		

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion



# TAWS3

WS3 (n and Vf = -20% ÷ -30%)

	Material Group ISO 513	P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm	≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae	0.3D x D			0.3D x D			0.3D x D			0.3D x D		
	Vc (m/min)	40-60			30-50			25-35			15-25		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	1	15920	0.003	120	12740	0.002	90	9550	0.002	50	6370	0.002	30
	2	7960	0.005	130	6370	0.005	95	4780	0.004	60	3180	0.004	35
	3	5310	0.008	130	4250	0.007	95	3180	0.006	60	2120	0.006	35
	4	3980	0.012	140	3180	0.011	100	2390	0.009	65	1590	0.008	40
	5	3180	0.015	145	2550	0.014	105	1910	0.011	65	1270	0.011	40
	6	2650	0.020	155	2120	0.018	115	1590	0.015	70	1060	0.014	45
	8	1990	0.029	170	1590	0.026	125	1190	0.022	75	800	0.020	50
	10	1590	0.036	170	1270	0.032	125	960	0.027	80	640	0.025	50
	12	1330	0.043	170	1060	0.039	125	800	0.032	80	530	0.030	50
	14	1140	0.051	175	910	0.046	125	680	0.038	80	450	0.036	50
	16	1000	0.060	180	800	0.054	130	600	0.045	80	400	0.042	50
	18	880	0.069	185	710	0.062	135	530	0.052	85	350	0.049	50
20	800	0.079	190	640	0.071	135	480	0.059	85	320	0.055	55	
22	720	0.088	190	580	0.079	140	430	0.066	85	290	0.062	55	
25	640	0.099	190	510	0.089	135	380	0.074	85	250	0.069	50	
28	570	0.122	210	450	0.110	150	340	0.092	95	230	0.085	60	
30	530	0.128	205	420	0.115	145	320	0.096	90	210	0.090	55	
32	500	0.136	200	400	0.116	140	300	0.095	90	200	0.095	60	
ap x ae	≤ D3			0.2D x D									

	Material Group ISO 513	P1 P2			P3 M1 K1			P4 M2 K2			P5 M3				
	Hardness/Rm	≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>				
	ap x ae	1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.3D			1.5D x 0.3D				
	Vc (m/min)	50-70			40-60			25-35			20-30				
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)		
	1	19110	0.003	170	15920	0.003	130	11150	0.002	80	7960	0.003	80		
	2	9550	0.006	190	7960	0.006	140	5570	0.005	90	3980	0.007	90		
	3	6370	0.006	125	5310	0.006	95	3720	0.005	60	2650	0.005	35		
	4	4780	0.010	140	3980	0.009	105	2790	0.008	65	1990	0.007	40		
	5	3820	0.014	160	3180	0.013	120	2230	0.011	75	1590	0.010	45		
	6	3180	0.018	175	2650	0.017	130	1860	0.015	80	1330	0.013	50		
	8	2390	0.024	170	1990	0.021	130	1390	0.019	80	1000	0.017	50		
	10	1910	0.035	200	1590	0.031	150	1110	0.028	90	800	0.024	60		
	12	1590	0.043	205	1330	0.039	155	930	0.035	95	660	0.030	60		
	14	1360	0.052	210	1140	0.047	160	800	0.041	100	570	0.036	60		
	16	1190	0.062	220	1000	0.055	165	700	0.049	105	500	0.043	65		
	18	1060	0.072	230	880	0.065	170	620	0.058	110	440	0.051	65		
20	960	0.083	240	800	0.075	180	560	0.067	110	400	0.058	70			
22	870	0.095	250	720	0.086	185	510	0.076	115	360	0.067	70			
25	760	0.113	260	640	0.102	195	450	0.091	120	320	0.079	75			
28	680	0.139	285	570	0.125	215	400	0.111	135	280	0.097	80			
32	600	0.146	265	500	0.132	200	350	0.117	125	250	0.102	75			
ap x ae	≤ D3			1.5D x 0.25D			1.5D x 0.25D			1.2D x 0.1D			1.2D x 0.1D		

# WL3-TAWL3

weldon shank, 3 flutes, long

DIN 844	N	HSS/Co BR	HSS/Co PV200	30°	SQUARE	Z3
		WL3	TAWL3			



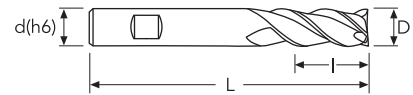
**WL3**



**TAWL3**

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D(e8)	D(e8) Tol.	d(h6)	I	I1	L	z	WL3		TAWL3	
							EDP No.	Stock	EDP No.	Stock
3	-0.014/-0.028	6	12		56	3	WL3030	h	TAWL3030	h
4	-0.020/-0.038	6	19		63	3	WL3040	h	TAWL3040	h
5	-0.020/-0.038	6	24		68	3	WL3050	h	TAWL3050	h
6	-0.020/-0.038	6	24		68	3	WL3060	h	TAWL3060	h
8	-0.025/-0.047	10	38		88	3	WL3080	h	TAWL3080	h
10	-0.025/-0.047	10	45		95	3	WL3100	h	TAWL3100	h
12	-0.032/-0.059	12	53		110	3	WL3120	h	TAWL3120	h
14	-0.032/-0.059	12	53		110	3	WL3140	h	TAWL3140	h
16	-0.032/-0.059	16	63		123	3	WL3160	h	TAWL3160	h
18	-0.032/-0.059	16	63		123	3	WL3180	h	TAWL3180	h
20	-0.040/-0.073	20	75		141	3	WL3200	h	TAWL3200	h
22	-0.040/-0.073	20	75		141	3	WL3220	h		
25	-0.040/-0.073	25	90		166	3	WL3250	h		

- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
- HF VH/UP
- MEF
- ALU
- MEX
- UH
- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion

# TAWL3

WL3 (n and Vf = -20% ÷ -30%)

	Material Group ISO 513	P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm	≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae	<b>0.3D x D</b>			<b>0.3D x D</b>			<b>0.3D x D</b>			<b>0.2D x D</b>		
	Vc (m/min)	<b>30-50</b>			<b>25-35</b>			<b>20-30</b>			<b>12-18</b>		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
3	4250	0.006	70	3180	0.005	50	2650	0.005	35	1590	0.004	20	
4	3180	0.008	80	2390	0.007	55	1990	0.007	40	1190	0.006	20	
5	2550	0.011	80	1910	0.010	55	1590	0.009	40	960	0.008	25	
6	2120	0.014	90	1590	0.012	60	1330	0.011	45	800	0.010	25	
8	1590	0.020	95	1190	0.018	65	1000	0.016	50	600	0.015	25	
10	1270	0.025	95	960	0.023	65	800	0.020	50	480	0.019	25	
12	1060	0.030	95	800	0.027	65	660	0.024	50	400	0.023	25	
14	910	0.036	100	680	0.032	65	570	0.029	50	340	0.027	25	
16	800	0.042	100	600	0.038	70	500	0.034	50	300	0.032	30	
18	710	0.048	100	530	0.043	70	440	0.038	50	270	0.036	30	
20	640	0.053	100	480	0.048	70	400	0.043	50	240	0.040	30	
22	580	0.060	105	430	0.054	70	360	0.048	50	220	0.045	30	
25	510	0.070	105	380	0.063	70	320	0.056	55	190	0.053	30	
ap x ae	≤ D5	0.25D x D											

	Material Group ISO 513	P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm	≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae	<b>2D x 0.1D</b>			<b>2D x 0.1D</b>			<b>2D x 0.1D</b>			<b>2D x 0.1D</b>		
	Vc (m/min)	<b>40-50</b>			<b>30-40</b>			<b>25-35</b>			<b>10-20</b>		
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
3	4780	0.006	90	3720	0.006	60	3180	0.005	50	1590	0.005	20	
4	3580	0.009	95	2790	0.008	70	2390	0.007	50	1190	0.007	20	
5	2870	0.012	100	2230	0.011	70	1910	0.009	50	960	0.009	30	
6	2390	0.015	110	1860	0.014	80	1590	0.012	60	800	0.011	30	
8	1790	0.022	120	1390	0.020	80	1190	0.018	60	600	0.017	30	
10	1430	0.028	120	1110	0.025	80	960	0.022	60	480	0.021	30	
12	1190	0.033	120	930	0.030	80	800	0.027	60	400	0.025	30	
14	1020	0.040	120	800	0.036	90	680	0.032	60	340	0.030	30	
16	900	0.046	125	700	0.042	90	600	0.037	70	300	0.035	30	
18	800	0.052	125	620	0.047	90	530	0.042	70	270	0.039	30	
20	720	0.059	125	560	0.053	90	480	0.047	70	240	0.044	30	
22	650	0.065	130	510	0.059	90	430	0.052	70	220	0.049	30	
25	570	0.077	130	450	0.069	90	380	0.062	70	190	0.058	30	
ap x ae	≤ D5	1.5D x 0.05D											

# TAWSH3

weldon shank 3 flutes



DIN  
844

N

HSS/Co  
PV200

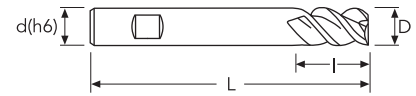
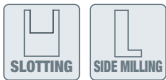
50°

SQUARE

Z3

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice    ☆ suitable



D	D Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	0/+0.048	6	13		57	3	TAWSH3060	h
8	0/+0.058	10	19		69	3	TAWSH3080	h
10	0/+0.058	10	22		72	3	TAWSH3100	h
12	0/+0.070	12	26		83	3	TAWSH3120	h
14	0/+0.070	12	26		83	3	TAWSH3140	h
16	0/+0.070	16	32		92	3	TAWSH3160	h
18	0/+0.070	16	32		92	3	TAWSH3180	h
20	0/+0.084	20	38		104	3	TAWSH3200	h

INFO

TYPHOON TA-HTA-4HTA

TYPHOON PU-HPU

TYPHOON SUH

TYPHOON ALH

TYPHOON HRC

TYPHOON SUH MINI

TYPHOON HL

C-SD-TA

LFTA

SUTA

HSS-HSS/CO DRILLS

G2

MDTA

HF-VH/UP

MEF

ALU

MEX

UH

HSS/CO-HSSP END MILLS

CARBIDE BURRS

h stock standard    f non-standard stock    m stock exhaustion

### TAWSH3

	Material Group ISO 513	P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm	≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae	0.3D x D			0.3D x D			0.3D x D			0.3D x D		
	Vc (m/min)	40-60			30-50			25-35			15-25		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	2650	0.020	155	2120	0.018	115	1590	0.015	70	1060	0.014	45
	8	1990	0.029	170	1590	0.026	125	1190	0.022	75	800	0.020	50
	10	1590	0.036	170	1270	0.032	125	960	0.027	80	640	0.025	50
	12	1330	0.043	170	1060	0.039	125	800	0.032	80	530	0.030	50
	14	1140	0.051	175	910	0.046	125	680	0.038	80	450	0.036	50
16	1000	0.060	180	800	0.054	130	600	0.045	80	400	0.042	50	
18	880	0.069	185	710	0.062	135	530	0.052	85	350	0.049	50	
20	800	0.079	190	640	0.071	135	480	0.059	85	320	0.055	55	

	Material Group ISO 513	P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm	≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae	1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.3D			1.5D x 0.3D		
	Vc (m/min)	50-70			40-60			25-35			20-30		
	D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
	6	3180	0.018	175	2650	0.017	130	1860	0.015	80	1330	0.013	50
	8	2390	0.024	170	1990	0.021	130	1390	0.019	80	1000	0.017	50
	10	1910	0.035	200	1590	0.031	150	1110	0.028	90	800	0.024	60
	12	1590	0.043	205	1330	0.039	155	930	0.035	95	660	0.030	60
	14	1360	0.052	210	1140	0.047	160	800	0.041	100	570	0.036	60
16	1190	0.062	220	1000	0.055	165	700	0.049	105	500	0.043	65	
18	1060	0.072	230	880	0.065	170	620	0.058	110	440	0.051	65	
20	960	0.083	240	800	0.075	180	560	0.067	110	400	0.058	70	

# WS4(6)-TAWS4(6)-UMWS4

weldon shank, 4 flutes-6 flutes

DIN 844	N	HSS/Co BR	HSS/Co PV200	30°	SQUARE	Z4-Z6
WS4(6) TAWS4(6)		WS4(6) TAWS4(6)				



WS4(6)



TAWS4(6)



UMWS4



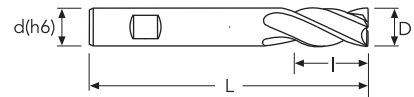
UMWS4

P	M	K	N	S	H
★	☆	★	☆		
★	★	★			

WS4(6)-TAWS4(6)

UMWS4

★ 1st choice ☆ suitable



D	D Tol.	d(h6)	l	l1	L	z	WS4(6)		TAWS4(6)		UMWS4	
							EDP No.	Stock	EDP No.	Stock	EDP No.	Stock
2	0/+0.040	6	7		51	4	WS4020	h	TAWS4020	h		
3	0/+0.040	6	8		52	4	WS4030	h	TAWS4030	h	UMWS4030	h
4	0/+0.040	6	11		55	4	WS4040	h	TAWS4040	h	UMWS4040	h
5	0/+0.040	6	13		57	4	WS4050	h	TAWS4050	h	UMWS4050	h
6	0/+0.040	6	13		57	4	WS4060	h	TAWS4060	h	UMWS4060	h
7	0/+0.040	10	16		66	4	WS4070	h	TAWS4070	h		
8	0/+0.040	10	19		69	4	WS4080	h	TAWS4080	h	UMWS4080	h
9	0/+0.040	10	19		69	4	WS4090	h	TAWS4090	h		
10	0/+0.040	10	22		72	4	WS4100	h	TAWS4100	h	UMWS4100	h
11	0/+0.040	12	22		79	4	WS4110	h	TAWS4110	h		
12	0/+0.040	12	26		83	4	WS4120	h	TAWS4120	h	UMWS4120	h
13	0/+0.040	12	26		83	4	WS4130	h	TAWS4130	h		
14	0/+0.040	12	26		83	4	WS4140	h	TAWS4140	h	UMWS4140	h
15	0/+0.040	12	26		83	4	WS4150	h	TAWS4150	h		
16	0/+0.040	16	32		92	4	WS4160	h	TAWS4160	h	UMWS4160	h
17	0/+0.040	16	32		92	4			TAWS4170	h		
18	0/+0.040	16	32		92	4	WS4180	h	TAWS4180	h	UMWS4180	h
19	0/+0.040	16	32		92	4			TAWS4190	h		
20	0/+0.040	20	38		104	4	WS4200	h	TAWS4200	h	UMWS4200	h
22	0/+0.040	20	38		104	4	WS4220	h	TAWS4220	h		
24	0/+0.040	25	45		121	6	WS6240	h				
25	0/+0.040	25	45		121	4	WS4250	h	TAWS4250	h		
28	0/+0.040	25	45		121	6	WS6280	h	TAWS6280	h		
30	0/+0.040	25	45		121	6	WS6300	h	TAWS6300	h		
32	0/+0.040	32	53		133	6			TAWS6320	h		
36	0/+0.040	32	53		133	6			TAWS6360	h		
40	0/+0.040	32	63		143	6			TAWS6400	h		

- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
- HF VH/UP
- MEF
- ALU
- MEX
- UH
- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion

# TAWS4

UMWS4 (n and Vf = +20%) - WS4 (n and Vf = -20% ÷ -30%)

Material Group ISO 513			P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm		≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae		1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.3D			1.5D x 0.3D		
	Vc (m/min)		50-70			40-60			25-35			20-30		
D (mm)	Z (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
2	4	9550	0.006	220	7960	0.005	170	5570	0.005	100	3980	0.004	70	
3	4	6370	0.006	145	5310	0.005	110	3720	0.005	70	2650	0.004	45	
4	4	4780	0.009	165	3980	0.008	125	2790	0.007	75	1990	0.006	50	
5	4	3820	0.012	190	3180	0.011	145	2230	0.010	90	1590	0.009	60	
6	4	3180	0.016	210	2650	0.015	155	1860	0.013	95	1330	0.012	65	
8	4	2390	0.021	200	1990	0.019	150	1390	0.017	95	1000	0.016	65	
10	4	1910	0.031	235	1590	0.028	175	1110	0.025	110	800	0.023	75	
12	4	1590	0.038	245	1330	0.035	185	930	0.031	115	660	0.029	75	
14	4	1360	0.046	250	1140	0.041	190	800	0.037	120	570	0.035	80	
16	4	1190	0.055	260	1000	0.049	195	700	0.044	125	500	0.041	80	
18	4	1060	0.064	275	880	0.058	205	620	0.051	130	440	0.048	85	
20	4	960	0.074	285	800	0.067	215	560	0.059	130	400	0.055	90	
22	4	870	0.084	295	720	0.076	220	510	0.068	140	360	0.063	90	
24	6	800	0.088	425	660	0.079	315	460	0.071	195	330	0.066	130	
25	4	760	0.106	320	640	0.095	245	450	0.084	150	320	0.079	100	
28	6	680	0.102	420	570	0.092	315	400	0.082	195	280	0.077	130	
30	6	640	0.108	415	530	0.097	310	370	0.086	190	270	0.081	130	
32	6	600	0.113	410	500	0.102	305	350	0.091	190	250	0.085	130	
36	6	530	0.127	405	440	0.114	300	310	0.101	190	220	0.095	125	
40	6	480	0.139	400	400	0.125	300	280	0.111	185	200	0.104	125	
ap x ae		≤ D3	1.5D x 0.25D			1.5D x 0.25D			1.2D x 0.1D			1.2D x 0.1D		



- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
- HF VH/UP
- MEF
- ALU
- MEX
- UH
- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

# WL4(6)-TAWL4(6)

weldon shank, 4 flutes-6 flutes, long

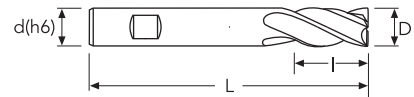
DIN 844	N	HSS/Co BR	HSS/Co PV200	30°	SQUARE	Z4-Z6
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WL4(6) TAWL4(6)



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D	D Tol.	d(h6)	l	l1	L	z	WL4(6)		TAWL4(6)	
							EDP No.	Stock	EDP No.	Stock
3	0/+0.040	6	12		56	4	WL4030	h	TAWL4030	h
4	0/+0.040	6	19		63	4	WL4040	h	TAWL4040	h
5	0/+0.040	6	24		68	4	WL4050	h	TAWL4050	h
6	0/+0.040	6	24		68	4	WL4060	h	TAWL4060	h
7	0/+0.050	10	30		80	4	WL4070	h	TAWL4070	h
8	0/+0.050	10	38		88	4	WL4080	h	TAWL4080	h
9	0/+0.050	10	38		88	4	WL4090	h	TAWL4090	h
10	0/+0.050	10	45		95	4	WL4100	h	TAWL4100	h
11	0/+0.050	12	45		102	4	WL4110	h	TAWL4110	h
12	0/+0.050	12	53		110	4	WL4120	h	TAWL4120	h
13	0/+0.050	12	53		110	4	WL4130	h	TAWL4130	h
14	0/+0.050	12	53		110	4	WL4140	h	TAWL4140	h
15	0/+0.050	12	53		110	4	WL4150	h	TAWL4150	h
16	0/+0.050	16	63		123	4	WL4160	h	TAWL4160	h
17	0/+0.050	16	63		123	4	WL4170	h	TAWL4170	h
18	0/+0.050	16	63		123	4	WL4180	h	TAWL4180	h
19	0/+0.050	16	63		123	4	WL4190	h	TAWL4190	h
20	0/+0.050	20	75		141	4	WL4200	h	TAWL4200	h
22	0/+0.050	20	75		141	6	WL6220	h	TAWL6220	h
25	0/+0.050	25	90		166	6	WL6250	h	TAWL6250	h
30	0/+0.050	25	90		166	6			TAWL6300	h
32	0/+0.050	32	106		186	6			TAWL6320	h
36	0/+0.050	32	106		186	6			TAWL6360	h
40	0/+0.050	40	125		217	6			TAWL6400	h

- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
- HF-VH/UP
- MEF
- ALU
- MEX
- UH
- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion



# TAWL4

WL4 (n and Vf = -20% ÷ -30%)

	Material Group ISO 513		P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm		≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae		2D x 0.1D			2D x 0.1D			2D x 0.1D			2D x 0.1D		
	Vc (m/min)		40-50			30-40			25-35			10-20		
D (mm)	Z (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
3	4	4780	0.004	75	3720	0.004	50	3180	0.003	40	1590	0.003	20	
4	4	3580	0.006	85	2790	0.005	60	2390	0.005	50	1190	0.004	20	
5	4	2870	0.009	100	2230	0.008	70	1910	0.007	50	960	0.006	20	
6	4	2390	0.012	115	1860	0.011	80	1590	0.010	60	800	0.009	30	
8	4	1790	0.015	105	1390	0.013	70	1190	0.012	60	600	0.011	30	
10	4	1430	0.021	120	1110	0.019	90	960	0.017	70	480	0.016	30	
12	4	1190	0.027	125	930	0.024	90	800	0.021	70	400	0.020	30	
14	4	1020	0.032	130	800	0.029	90	680	0.026	70	340	0.024	30	
16	4	900	0.038	135	700	0.034	100	600	0.030	70	300	0.028	30	
18	4	800	0.045	145	620	0.040	100	530	0.036	80	270	0.033	40	
20	4	720	0.050	145	560	0.045	100	480	0.040	80	240	0.038	40	
22	6	650	0.056	220	510	0.051	155	430	0.045	115	220	0.042	55	
25	6	570	0.068	230	450	0.061	165	380	0.054	125	190	0.051	60	
32	6	450	0.077	210	350	0.069	145	300	0.062	110	150	0.054	50	
36	6	400	0.085	205	310	0.077	140	270	0.068	110	130	0.060	45	
40	6	360	0.095	205	280	0.086	145	240	0.076	110	120	0.067	50	

ap x ae	≤ D5	1.5D x 0.05D	1.5D x 0.05D	1.2D x 0.05D	1.2D x 0.05D
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- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
- HF VH/UP
- MEF
- ALU
- MEX
- UH
- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

# TAWSR

weldon shank, roughing NR



DIN  
844

N

HSS/Co  
PV200

30°

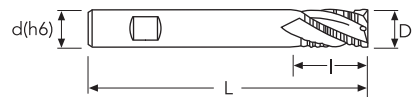
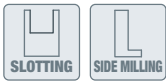
SQUARE

NR  
COARSE

Z3-Z4

<b>P</b>	<b>M</b>	<b>K</b>	<b>N</b>	<b>S</b>	<b>H</b>
★	☆	★	☆		

★ 1st choice ☆ suitable



D(js12)	D Tol.	d(h6)	l	l1	L	z	EDP No.	Stock
6	+/-0.060	6	13		57	3	TAWSR060	h
7	+/-0.075	10	16		66	3	TAWSR070	h
8	+/-0.075	10	19		69	3	TAWSR080	h
9	+/-0.075	10	19		69	3	TAWSR090	h
10	+/-0.075	10	22		72	4	TAWSR100	h
11	+/-0.090	12	22		79	4	TAWSR110	h
12	+/-0.090	12	26		83	4	TAWSR120	h
13	+/-0.090	12	26		83	4	TAWSR130	h
14	+/-0.090	12	26		83	4	TAWSR140	h
15	+/-0.090	12	26		83	4	TAWSR150	h
16	+/-0.090	16	32		92	4	TAWSR160	h
17	+/-0.090	16	32		92	4	TAWSR170	h
18	+/-0.090	16	32		92	4	TAWSR180	h
20	+/-0.105	20	38		104	4	TAWSR200	h

INFO

TYPHOON TA-HTA-4HTA

TYPHOON PU-HPU

TYPHOON SUH

TYPHOON ALH

TYPHOON HRC

TYPHOON SUH MINI

TYPHOON HL

C-SD-TA

LFTA

SUTA

HSS-HSS/CO DRILLS

G2

MDTA

HF-VH/UP

MEF

ALU

MEX

UH

HSS/CO-HSSP END MILLS

CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion

### TAWSR

	Material Group ISO 513		P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm		≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae		<b>D x D</b>			<b>D x D</b>			<b>D x D</b>			<b>0.5D x D</b>		
	Vc (m/min)		<b>40-60</b>			<b>30-50</b>			<b>25-35</b>			<b>15-25</b>		
D (mm)	Z (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
6	3	2650	0.022	175	2120	0.020	125	1590	0.018	85	1060	0.017	50	
8	3	1990	0.028	165	1590	0.025	120	1190	0.022	80	800	0.019	45	
10	4	1590	0.035	225	1270	0.032	160	960	0.028	110	640	0.025	65	
12	4	1330	0.045	240	1060	0.041	170	800	0.036	115	530	0.032	65	
14	4	1140	0.055	250	910	0.050	180	680	0.044	120	450	0.039	70	
16	4	1000	0.065	260	800	0.059	185	600	0.052	125	400	0.046	75	
18	4	880	0.075	265	710	0.068	190	530	0.060	125	350	0.053	75	
20	4	800	0.085	270	640	0.077	195	480	0.068	130	320	0.060	75	

	Material Group ISO 513		P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm		≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae		<b>1.5D x 0.5D</b>			<b>1.5D x 0.5D</b>			<b>1.5D x 0.3D</b>			<b>1.5D x 0.3D</b>		
	Vc (m/min)		<b>50-70</b>			<b>40-60</b>			<b>30-40</b>			<b>20-30</b>		
D (mm)	Z (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
6	3	3180	0.026	250	2650	0.024	190	1860	0.021	120	1330	0.018	75	
8	3	2390	0.033	235	1990	0.030	175	1390	0.026	110	1000	0.023	70	
10	4	1910	0.042	320	1590	0.038	180	1110	0.034	110	800	0.029	70	
12	4	1590	0.054	345	1330	0.049	195	930	0.043	120	660	0.038	75	
14	4	1360	0.066	360	1140	0.059	205	800	0.053	125	570	0.046	80	
16	4	1190	0.078	370	1000	0.070	210	700	0.062	130	500	0.055	80	
18	4	1060	0.090	380	880	0.081	215	620	0.072	135	440	0.063	85	
20	4	960	0.102	390	800	0.092	220	560	0.082	135	400	0.071	85	

# WSFR-TAWSFR-UMWSFR

weldon shank, roughing HR

DIN 844	N	HSS/Co BR	HSS/Co PV200	HR FINE	Z3-Z6
WSFR TAWSFR		WSFR	TAWSFR		
			UM	HSS-P PV200	
			UMWSFR		



WSFR



TAWSFR



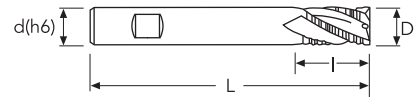
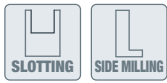
UMWSFR

P	M	K	N	S	H
★	☆	★	☆		
★	★	★			

WSFR-TAWSFR

UMWSFR

★ 1st choice ☆ suitable



D(js12)	D Tol.	d(h6)	l	l1	L	z	WSFR		TAWSFR		UMWSFR	
							EDP No.	Stock	EDP No.	Stock	EDP No.	Stock
6	+/-0.060	6	13		57	3	WSFR060	h	TAWSFR060	h	UMWSFR060	h
7	+/-0.075	10	16		66	3			TAWSFR070	h	UMWSFR070	h
8	+/-0.075	10	19		69	3	WSFR080	h	TAWSFR080	h	UMWSFR080	h
9	+/-0.075	10	19		69	3			TAWSFR090	h	UMWSFR090	h
10	+/-0.075	10	22		72	4	WSFR100	h	TAWSFR100	h	UMWSFR100	h
11	+/-0.090	12	22		79	4			TAWSFR110	h		
12	+/-0.090	12	26		83	4	WSFR120	h	TAWSFR120	h	UMWSFR120	h
13	+/-0.090	12	26		83	4			TAWSFR130	h		
14	+/-0.090	12	26		83	4	WSFR140	h	TAWSFR140	h	UMWSFR140	h
15	+/-0.090	12	26		83	4			TAWSFR150	h		
16	+/-0.090	16	32		92	4	WSFR160	h	TAWSFR160	h	UMWSFR160	h
17	+/-0.090	16	32		92	4			TAWSFR170	h		
18	+/-0.090	16	32		92	4	WSFR180	h	TAWSFR180	h	UMWSFR180	h
20	+/-0.105	20	38		104	4	WSFR200	h	TAWSFR200	h	UMWSFR200	h
22	+/-0.105	20	38		104	5			TAWSFR220	h		
25	+/-0.105	25	45		121	5			TAWSFR250	h		
28	+/-0.105	25	45		121	6 CH			TAWSFR280	h		
30	+/-0.105	25	45		121	6			TAWSFR300	h		
32	+/-0.125	32	53		133	6			TAWSFR320	h		
36	+/-0.125	32	53		133	6			TAWSFR360	h		
40	+/-0.125	32	63		155	6			TAWSFR400	h		

- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
- HF VH/UP
- MEF
- ALU
- MEX
- UH
- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

# TAWSFR

UMWSFR (n and Vf = +20%) - WSFR (n and Vf = -20% ÷ -30%)

Material Group ISO 513	P1 P2		P3 M1 K1			P4 M2 K2			P5 M3					
	Hardness/Rm		≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae		D x D			D x D			D x D			0.5D x D		
	Vc (m/min)		40-60			30-50			25-35			15-25		
D (mm)	Z (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
6	3	2650	0.022	175	2120	0.020	125	1590	0.018	85	1060	0.017	50	
8	3	1990	0.028	165	1590	0.025	120	1190	0.022	80	800	0.019	45	
10	4	1590	0.035	225	1270	0.032	160	960	0.028	110	640	0.025	65	
12	4	1330	0.045	240	1060	0.041	170	800	0.036	115	530	0.032	65	
14	4	1140	0.055	250	910	0.050	180	680	0.044	120	450	0.039	70	
16	4	1000	0.065	260	800	0.059	185	600	0.052	125	400	0.046	75	
18	4	880	0.075	265	710	0.068	190	530	0.060	125	350	0.053	75	
20	4	800	0.085	270	640	0.077	195	480	0.068	130	320	0.060	75	
22	5	720	0.086	310	580	0.077	225	430	0.068	145	290	0.060	85	
25	5	640	0.099	315	510	0.089	225	380	0.079	150	250	0.069	85	
28	6	570	0.100	340	450	0.090	245	340	0.080	165	230	0.070	95	
30	6	530	0.108	345	420	0.097	245	320	0.086	165	210	0.076	95	
32	6	500	0.116	350	400	0.104	250	300	0.093	165	200	0.081	95	
36	6	440	0.130	345	350	0.111	230	270	0.104	170	180	0.091	100	
40	6	400	0.145	350	320	0.123	235	240	0.116	165	160	0.102	95	



Material Group ISO 513	P1 P2		P3 M1 K1			P4 M2 K2			P5 M3					
	Hardness/Rm		≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae		1.5D x 0.5D			1.5D x 0.5D			1.5D x 0.3D			1.5D x 0.3D		
	Vc (m/min)		50-70			40-60			30-40			20-30		
D (mm)	Z (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
6	3	3180	0.026	250	2650	0.024	190	1860	0.021	120	1330	0.018	75	
8	3	2390	0.033	235	1990	0.030	175	1390	0.026	110	1000	0.023	70	
10	4	1910	0.042	320	1590	0.038	180	1110	0.034	110	800	0.029	70	
12	4	1590	0.054	345	1330	0.049	195	930	0.043	120	660	0.038	75	
14	4	1360	0.066	360	1140	0.059	205	800	0.053	125	570	0.046	80	
16	4	1190	0.078	370	1000	0.070	210	700	0.062	130	500	0.055	80	
18	4	1060	0.090	380	880	0.081	215	620	0.072	135	440	0.063	85	
20	4	960	0.102	390	800	0.092	220	560	0.082	135	400	0.071	85	
22	5	870	0.103	445	720	0.092	200	510	0.082	125	360	0.072	80	
25	5	760	0.119	450	640	0.107	205	450	0.095	130	320	0.083	80	
28	6	680	0.120	490	570	0.108	245	400	0.096	155	280	0.084	95	
30	6	640	0.130	500	530	0.117	245	370	0.104	155	270	0.091	100	
32	6	600	0.139	500	500	0.125	250	350	0.111	155	250	0.097	95	
36	6	530	0.156	495	440	0.140	245	310	0.125	155	220	0.109	95	
40	6	480	0.174	500	400	0.157	250	280	0.139	155	200	0.122	95	



# WLFR-TAWLFR

weldon shank, roughing HR, long

DIN 844	N	HSS/Co BR	HSS/Co PV200	30°	HR FINE	Z3-Z6
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WLFR TAWLFR



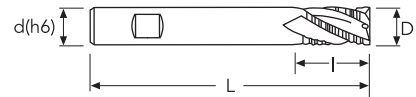
WLFR



TAWLFR

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D(js12)	D Tol.	d(h6)	l	l1	L	z	WLFR		TAWLFR	
							EDP No.	Stock	EDP No.	Stock
6	+/-0.060	6	24		68	3	WLFR060	h	TAWLFR060	h
8	+/-0.075	10	38		88	3	WLFR080	h	TAWLFR080	h
10	+/-0.075	10	45		95	4	WLFR100	h	TAWLFR100	h
12	+/-0.090	12	53		110	4	WLFR120	h	TAWLFR120	h
14	+/-0.090	12	53		110	4	WLFR140	h	TAWLFR140	h
16	+/-0.090	16	63		123	4	WLFR160	h	TAWLFR160	h
18	+/-0.090	16	63		123	4	WLFR180	h	TAWLFR180	h
20	+/-0.105	20	75		141	4	WLFR200	h	TAWLFR200	h
22	+/-0.105	20	75		141	5			TAWLFR220	h
25	+/-0.105	25	90		166	5			TAWLFR250	h
30	+/-0.105	25	90		166	6			TAWLFR300	h
32	+/-0.105	32	106		186	6			TAWLFR320	h
36	+/-0.125	32	106		186	6			TAWLFR360	h
40	+/-0.125	32	125		217	6			TAWLFR400	h

INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF-VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion

# TAWLFR

WLFR (n and Vf = -20% ÷ -30%)

Material Group ISO 513		P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
Hardness/Rm		≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
ap x ae		0.5D x D			0.5D x D			0.5D x D			0.3D x D		
Vc (m/min)		35-45			25-35			20-30			10-20		
D (mm)	Z (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	3	2120	0.014	90	1590	0.013	60	1330	0.011	45	800	0.011	25
8	3	1590	0.020	95	1190	0.018	65	1000	0.016	50	600	0.014	25
10	4	1270	0.025	125	960	0.022	85	800	0.020	65	480	0.017	35
12	4	1060	0.032	135	800	0.028	90	660	0.025	65	400	0.022	35
14	4	910	0.039	140	680	0.035	95	570	0.031	70	340	0.027	35
16	4	800	0.046	145	600	0.041	100	500	0.036	75	300	0.032	40
18	4	710	0.053	150	530	0.047	100	440	0.042	75	270	0.037	40
20	4	640	0.060	150	480	0.054	105	400	0.048	75	240	0.042	40
22	5	580	0.060	175	430	0.054	115	360	0.048	85	220	0.042	45
25	5	510	0.069	175	380	0.062	120	320	0.055	90	190	0.049	45
28	6	450	0.070	190	340	0.063	130	280	0.056	95	170	0.049	50
30	6	420	0.076	190	320	0.068	130	270	0.060	100	160	0.053	50
32	6	400	0.081	195	300	0.073	130	250	0.065	95	150	0.057	50
36	6	350	0.091	190	270	0.077	125	220	0.073	95	130	0.064	50
40	6	320	0.102	195	240	0.086	125	200	0.081	95	120	0.071	50



Material Group ISO 513		P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
Hardness/Rm		≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
ap x ae		1.5D x 0.3D			1.5D x 0.3D			1.5D x 0.3D			1.5D x 0.2D		
Vc (m/min)		40-50			30-40			25-35			10-20		
D (mm)	Z (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
6	3	2390	0.017	120	1860	0.015	85	1590	0.013	65	800	0.012	30
8	3	1790	0.024	130	1390	0.022	90	1190	0.019	70	600	0.017	30
10	4	1430	0.029	170	1110	0.026	90	960	0.024	70	480	0.021	30
12	4	1190	0.038	180	930	0.034	95	800	0.030	75	400	0.026	30
14	4	1020	0.046	190	800	0.042	100	680	0.037	75	340	0.032	35
16	4	900	0.055	195	700	0.049	105	600	0.044	80	300	0.038	35
18	4	800	0.063	200	620	0.057	105	530	0.050	80	270	0.044	35
20	4	720	0.071	205	560	0.064	110	480	0.057	80	240	0.050	35
22	5	650	0.072	235	510	0.065	100	430	0.057	75	220	0.050	35
25	5	570	0.083	235	450	0.075	100	380	0.067	75	190	0.058	35
28	6	510	0.084	255	400	0.076	120	340	0.067	90	170	0.059	40
30	6	480	0.091	260	370	0.082	120	320	0.073	95	160	0.064	40
32	6	450	0.097	265	350	0.088	125	300	0.078	95	150	0.068	40
36	6	400	0.109	260	310	0.098	120	270	0.087	95	130	0.076	40
40	6	360	0.122	265	280	0.110	125	240	0.097	95	120	0.085	40



# WSB2-TAWSB2

weldon shank, 2 flutes ball nose

DIN 327	N	HSS/Co BR	HSS/Co PV200	30°	BALL NOSE	ZZ BALL
		WSB2 TAWSB2				



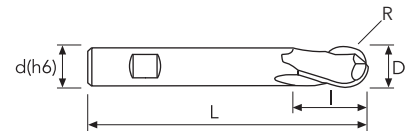
WSB2



TAWSB2

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D(e8)	D(e8) Tol.	R	R Tol.	d(h6)	l	l1	L	z	WSB2		TAWSB2	
									EDP No.	Stock	EDP No.	Stock
2	-0.014/-0.028	1.00	+0.020/-0.020	6	4		48	2	WSB2020	h	TAWSB2020	f
3	-0.014/-0.028	1.50	+0.020/-0.020	6	5		49	2	WSB2030	h	TAWSB2030	h
4	-0.020/-0.038	2.00	+0.020/-0.020	6	7		51	2	WSB2040	h	TAWSB2040	h
5	-0.020/-0.038	2.50	+0.020/-0.020	6	8		52	2	WSB2050	h	TAWSB2050	h
6	-0.020/-0.038	3.00	+0.020/-0.020	6	8		52	2	WSB2060	h	TAWSB2060	h
8	-0.025/-0.047	4.00	+0.020/-0.020	10	11		61	2	WSB2080	h	TAWSB2080	h
10	-0.025/-0.047	5.00	+0.020/-0.020	10	13		63	2	WSB2100	h	TAWSB2100	h
12	-0.032/-0.059	6.00	+0.020/-0.020	12	16		73	2	WSB2120	h	TAWSB2120	h
14	-0.032/-0.059	7.00	+0.020/-0.020	12	16		73	2	WSB2140	h	TAWSB2140	h
16	-0.032/-0.059	8.00	+0.020/-0.020	16	19		79	2	WSB2160	h	TAWSB2160	h
18	-0.032/-0.059	9.00	+0.020/-0.020	16	19		79	2	WSB2180	h	TAWSB2180	h
20	-0.040/-0.073	10.00	+0.020/-0.020	20	22		88	2	WSB2200	h	TAWSB2200	h
25	-0.040/-0.073	12.50	+0.020/-0.020	25	26		102	2	WSB2250	h		
28	-0.040/-0.073	14.00	+0.020/-0.020	25	26		102	2	WSB2280	f		
30	-0.040/-0.073	15.00	+0.020/-0.020	25	26		102	2	WSB2300	f		

- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
- HF-VH/UP
- MEF
- ALU
- MEX
- UH
- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion



# TAWSB2

WSB2 (n and Vf = -20% ÷ -30%)

Material Group ISO 513		P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
Hardness/Rm		≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
ap x ae		<b>0.1 D x 0.2 D</b>			<b>0.1 D x 0.2 D</b>			<b>0.1 D x 0.2 D</b>			<b>0.1 D x 0.2 D</b>		
Vc (m/min)		<b>40-60</b>			<b>30-50</b>			<b>25-35</b>			<b>15-25</b>		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)
2	1.20	7960	0.020	320	6370	0.018	230	4780	0.016	150	3180	0.015	100
3	1.80	5310	0.040	420	4250	0.036	310	3180	0.032	200	2120	0.030	130
4	2.40	3980	0.060	480	3180	0.054	340	2390	0.048	230	1590	0.045	140
5	3.00	3180	0.070	450	2550	0.063	320	1910	0.056	210	1270	0.053	130
6	3.60	2650	0.082	430	2120	0.074	310	1590	0.066	210	1060	0.062	130
8	4.80	1990	0.094	370	1590	0.085	270	1190	0.075	180	800	0.071	110
10	6.00	1590	0.110	350	1270	0.099	250	960	0.088	170	640	0.083	110
12	7.20	1330	0.130	350	1060	0.117	250	800	0.104	170	530	0.098	100
14	8.40	1140	0.150	340	910	0.135	250	680	0.120	160	450	0.113	100
16	9.60	1000	0.170	340	800	0.153	240	600	0.136	160	400	0.128	100
18	10.80	880	0.190	330	710	0.171	240	530	0.152	160	350	0.143	100
20	12.00	800	0.210	340	640	0.189	240	480	0.168	160	320	0.158	100
22	13.20	720	0.232	330	580	0.209	240	430	0.186	160	290	0.174	100
25	15.00	640	0.262	340	510	0.236	240	380	0.210	160	250	0.197	100
28	16.80	570	0.285	320	450	0.257	230	340	0.228	160	230	0.214	100
30	18.00	530	0.292	310	420	0.263	220	320	0.233	150	210	0.219	90



α	n (rpm)	Vf (mm/min)
15°	x 1.1	x 1.1

INFO  
TYPHOON TA-HTA-4HTA  
TYPHOON PU-HPU  
TYPHOON SUH  
TYPHOON ALH  
TYPHOON HRC  
TYPHOON SUH MINI  
TYPHOON HL  
C-SD-TA  
LFTA  
SUTA  
HSS-HSS/CO DRILLS  
G2  
MDTA  
HF VH/UP  
MEF  
ALU  
MEX  
UH  
HSS/CO-HSSP END MILLS  
CARBIDE BURRS

# WLB2-TAWLB2

weldon shank, 2 flutes ball nose, long



WLB2

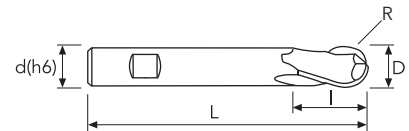


TAWLB2

DIN 1889	N	HSS/Co BR	HSS/Co PV200	30°	BALL NOSE	ZZ BALL
		WLB2 TAWLB2				

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable




D(e8)	D(e8) Tol.	R	R Tol.	d(h6)	l	l1	L	z	WLB2		TAWLB2	
									EDP No.	Stock	EDP No.	Stock
3	-0.014/-0.028	1.50	+0.020/-0.020	6	8		56	2	WLB2030	h	TAWLB2030	f
4	-0.020/-0.038	2.00	+0.020/-0.020	6	11		63	2	WLB2040	h	TAWLB2040	f
5	-0.020/-0.038	2.50	+0.020/-0.020	6	13		68	2	WLB2050	h	TAWLB2050	f
6	-0.020/-0.038	3.00	+0.020/-0.020	6	13		68	2	WLB2060	h	TAWLB2060	f
8	-0.025/-0.047	4.00	+0.020/-0.020	10	19		88	2	WLB2080	h	TAWLB2080	f
10	-0.025/-0.047	5.00	+0.020/-0.020	10	22		95	2	WLB2100	h	TAWLB2100	f
12	-0.032/-0.059	6.00	+0.020/-0.020	12	26		110	2	WLB2120	h	TAWLB2120	f
14	-0.032/-0.059	7.00	+0.020/-0.020	12	26		110	2	WLB2140	h	TAWLB2140	f
16	-0.032/-0.059	8.00	+0.020/-0.020	16	32		123	2	WLB2160	h	TAWLB2160	f
18	-0.032/-0.059	9.00	+0.020/-0.020	16	32		123	2	WLB2180	h	TAWLB2180	f
20	-0.040/-0.073	10.00	+0.020/-0.020	20	38		141	2	WLB2200	h	TAWLB2200	f


INFO
TYPHOON TA-HTA-4HTA
TYPHOON PU-HPU
TYPHOON SUH
TYPHOON ALH
TYPHOON HRC
TYPHOON SUH MINI
TYPHOON HL
C-SD-TA
LFTA
SUTA
HSS-HSS/CO DRILLS
G2
MDTA
HF-VH/UP
MEF
ALU
MEX
UH
HSS/CO-HSSP END MILLS
CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion

# TAWLB2

WLB2 (n and Vf = -20% ÷ -30%)

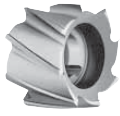
	Material Group ISO 513		P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm		≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae		<b>0.1 D x 0.2 D</b>			<b>0.1 D x 0.2 D</b>			<b>0.1 D x 0.2 D</b>			<b>0.1 D x 0.2 D</b>		
	Vc (m/min)		<b>30-50</b>			<b>25-35</b>			<b>20-30</b>			<b>12-18</b>		
D (mm)	D (eff.) (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
<b>3</b>	<b>1.80</b>	4250	0.034	290	3180	0.031	190	2650	0.027	140	1590	0.026	80	
<b>4</b>	<b>2.40</b>	3180	0.051	320	2390	0.046	220	1990	0.041	160	1190	0.038	90	
<b>5</b>	<b>3.00</b>	2550	0.060	300	1910	0.054	200	1590	0.048	150	960	0.045	90	
<b>6</b>	<b>3.60</b>	2120	0.070	300	1590	0.063	200	1330	0.056	150	800	0.052	80	
<b>8</b>	<b>4.80</b>	1590	0.080	250	1190	0.072	170	1000	0.064	130	600	0.060	70	
<b>10</b>	<b>6.00</b>	1270	0.094	240	960	0.084	160	800	0.075	120	480	0.070	70	
<b>12</b>	<b>7.20</b>	1060	0.111	230	800	0.099	160	660	0.088	120	400	0.083	70	
<b>14</b>	<b>8.40</b>	910	0.128	230	680	0.115	160	570	0.102	120	340	0.096	70	
<b>16</b>	<b>9.60</b>	800	0.145	230	600	0.130	160	500	0.116	120	300	0.108	70	
<b>18</b>	<b>10.80</b>	710	0.162	230	530	0.145	150	440	0.129	110	270	0.121	70	
<b>20</b>	<b>12.00</b>	640	0.179	230	480	0.161	150	400	0.143	110	240	0.134	60	

	α	n (rpm)	Vf (mm/min)
	15°	x 1.1	x 1.1

INFO  
TYPHOON TA-HTA-4HTA  
TYPHOON PU-HPU  
TYPHOON SUH  
TYPHOON ALH  
TYPHOON HRC  
TYPHOON SUH MINI  
TYPHOON HL  
C-SD-TA  
LFTA  
SUTA  
HSS-HSS/CO DRILLS  
G2  
MDTA  
HF VH/UP  
MEF  
ALU  
MEX  
UH  
HSS/CO-HSSP END MILLS  
CARBIDE BURRS

# FM-TAFM

shell mill, multi flute



FM



TAFM

<b>P</b>	<b>M</b>	<b>K</b>	<b>N</b>	<b>S</b>	<b>H</b>
★	☆	★	☆		

★ 1st choice ☆ suitable



**DIN**  
**1880**

**N**

HSS/Co  
BR

HSS/Co  
PV200

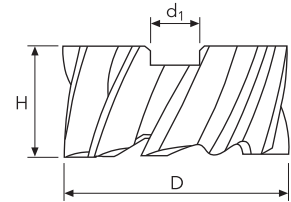
30°

SQUARE

Z8-Z14

FM

TAFM



D	D Tol.	d1	d1 Tol.	H	H Tol.	z	FM		TAFM	
							EDP No.	Stock	EDP No.	Stock
40	+0.250/-0.150	16	+0.020/0	32	+0.50/0	8	FM40	h	TAFM40	h
50	+0.250/-0.150	22	+0.020/0	36	+0.50/0	8	FM50	h	TAFM50	h
63	+0.250/-0.150	27	+0.020/0	40	+0.50/0	8	FM63	h	TAFM63	h
80	+0.250/-0.150	27	+0.020/0	45	+0.50/0	10	FM80	f	TAFM80	f
100	+0.250/-0.150	32	+0.020/0	50	+0.50/0	10	FM100	f	TAFM100	f

INFO

TYPHOON TA-HTA-4HTA

TYPHOON PU-HPU

TYPHOON SUH

TYPHOON ALH

TYPHOON HRC

TYPHOON SUH MINI

TYPHOON HL

C-SD-TA

LFTA

SUTA

HSS-HSS/CO DRILLS

G2

MDTA

HF-VH/UP

MEF

ALU

MEX

UH

HSS/CO-HSSP END MILLS

CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion

# TAFM

FM (n and Vf = -20% ÷ -30%)

	Material Group ISO 513		P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm		≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae		<b>0.25D x 0.75D</b>			<b>0.25D x 0.75D</b>			<b>0.25D x 0.75D</b>			<b>0.25D x 0.75D</b>		
	Vc (m/min)		<b>40-60</b>			<b>30-50</b>			<b>25-35</b>			<b>15-25</b>		
D (mm)	Z (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
<b>40</b>	<b>8</b>	400	0.060	190	320	0.054	140	240	0.048	90	160	0.045	60	
<b>50</b>	<b>8</b>	320	0.070	180	250	0.063	125	190	0.056	85	130	0.053	55	
<b>63</b>	<b>8</b>	250	0.080	200	200	0.072	145	150	0.064	95	100	0.060	60	
<b>80</b>	<b>10</b>	200	0.100	200	160	0.090	145	120	0.080	95	80	0.075	60	
<b>100</b>	<b>10</b>	160	0.120	190	130	0.108	140	100	0.096	95	60	0.090	55	

- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
- HF VH/UP
- MEF
- ALU
- MEX
- UH
- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

# FFR-TAFFR

shell mill, multi flute, roughing HR

DIN 1880
N
HSS/Co BR
HSS/Co PV200
30°
SQUARE
HR FINE
Z6-Z10

**FFR TAFFR**



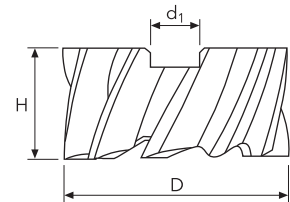
FFR



TAFFR

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D	D Tol.	d1	d1 Tol.	H	H Tol.	z	FFR		TAFFR	
							EDP No.	Stock	EDP No.	Stock
40	+0.250/-0.150	16	+0.020/0	32	+0.50/0	6	FFR40	h	TAFFR40	h
50	+0.250/-0.150	22	+0.020/0	36	+0.50/0	8	FFR50	h	TAFFR50	h
63	+0.250/-0.150	27	+0.020/0	40	+0.50/0	8	FFR63	h	TAFFR50	h
80	+0.250/-0.150	27	+0.020/0	45	+0.50/0	10	FFR80	f	TAFFR63	f
100	+0.250/-0.150	32	+0.020/0	50	+0.50/0	10	FFR100	f	TAFFR100	f

- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
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- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

# TAFFR

FFR (n and Vf = -20% ÷ -30%)

	Material Group ISO 513		P1 P2			P3 M1 K1			P4 M2 K2			P5 M3		
	Hardness/Rm		≤ 700 N/mm <sup>2</sup>			600-800 N/mm <sup>2</sup>			800-1000 N/mm <sup>2</sup>			900-1200 N/mm <sup>2</sup>		
	ap x ae		<b>0.25D x 0.75D</b>			<b>0.25D x 0.75D</b>			<b>0.25D x 0.75D</b>			<b>0.25D x 0.75D</b>		
	Vc (m/min)		<b>40-60</b>			<b>30-50</b>			<b>25-35</b>			<b>15-25</b>		
D (mm)	Z (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
<b>40</b>	<b>8</b>	400	0.080	255	320	0.072	185	240	0.064	125	160	0.060	75	
<b>50</b>	<b>8</b>	320	0.100	255	250	0.090	180	190	0.080	120	130	0.075	80	
<b>63</b>	<b>8</b>	250	0.120	300	200	0.108	215	150	0.096	145	100	0.090	90	
<b>80</b>	<b>10</b>	200	0.120	240	160	0.108	175	120	0.096	115	80	0.090	70	
<b>100</b>	<b>10</b>	160	0.140	225	130	0.126	165	100	0.112	110	60	0.105	65	

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WCR

Material Group ISO 513	P1 P2 P3 P4				M1 M2			K1 K2			N1 N2 N3 N4			
	< 800 N/mm <sup>2</sup>				< 750 N/mm <sup>2</sup>			< 350 HB						
	0.2D x 0.2D				0.2D x 0.2D			0.2D x 0.2D			0.2D x 0.2D			
Hardness/Rm														
ap x ae	0.2D x 0.2D				0.2D x 0.2D			0.2D x 0.2D			0.2D x 0.2D			
Vc (m/min)	30-50				15-25			30-40			60-80			
D (mm)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)		
8	1590	0.006	40	800	0.004	10	1390	0.005	30	2790	0.007	70		
9	1420	0.008	45	710	0.006	15	1240	0.007	35	2480	0.009	85		
10	1270	0.010	50	640	0.007	20	1110	0.009	40	2230	0.011	100		
11	1160	0.012	55	580	0.008	20	1010	0.010	40	2030	0.013	105		
12	1060	0.015	60	530	0.010	20	930	0.012	45	1860	0.016	120		
13	980	0.017	65	490	0.012	25	860	0.014	50	1710	0.019	130		
14	910	0.020	70	450	0.014	25	800	0.017	55	1590	0.021	135		
15	850	0.023	75	420	0.016	25	740	0.019	55	1490	0.025	150		
16	800	0.025	80	400	0.018	30	700	0.021	60	1390	0.028	155		
17	750	0.026	80	370	0.018	25	660	0.022	60	1310	0.029	150		
18	710	0.027	75	350	0.019	25	620	0.023	55	1240	0.030	145		
19	670	0.029	75	340	0.020	25	590	0.024	55	1170	0.031	145		
20	640	0.030	75	320	0.021	25	560	0.026	55	1110	0.033	145		
21	610	0.033	80	300	0.023	25	530	0.028	60	1060	0.036	150		
22	580	0.035	80	290	0.025	30	510	0.030	60	1010	0.039	155		
23	550	0.038	85	280	0.026	30	480	0.032	60	970	0.041	160		
24	530	0.040	85	270	0.028	30	460	0.034	65	930	0.044	165		
25	510	0.042	85	250	0.029	30	450	0.035	65	890	0.046	165		
26	490	0.043	85	240	0.030	30	430	0.037	65	860	0.047	165		
27	470	0.045	85	240	0.031	30	410	0.038	60	830	0.049	165		
28	450	0.046	85	230	0.032	30	400	0.039	65	800	0.051	160		
32	400	0.050	80	200	0.035	30	350	0.043	60	700	0.055	155		



- INFO
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- CARBIDE BURRS

# WDC

Dovetail cutter

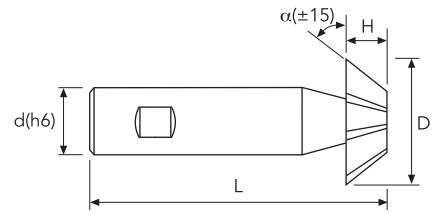


DIN 1833	N	HSS/Co BR	α 45°	α 60°	Z6-Z12
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WDC 45 WDC 60

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D	D Tol.	d(h6)	H	L	alfa	z	EDP No.	Stock
16	+/-0.065	12	4	60	45°	6	WDC45160	h
20	+/-0.065	12	5	63	45°	6	WDC45200	h
22	+/-0.065	12	6	67	45°	6	WDC45220	h
25	+/-0.065	16	6.3	67	45°	8	WDC45250	h
28	+/-0.065	16	7.5	67	45°	8	WDC45280	h
32	+/-0.080	16	8	71	45°	10	WDC45320	h
38	+/-0.080	16	10	80	45°	12	WDC45380	f
16	+/-0.065	12	6.3	60	60°	6	WDC60160	h
20	+/-0.065	12	8	63	60°	6	WDC60200	h
22	+/-0.065	12	9	67	60°	6	WDC60220	h
25	+/-0.065	16	10	67	60°	8	WDC60250	h
28	+/-0.065	16	11	67	60°	8	WDC60280	h
32	+/-0.080	16	12.5	71	60°	10	WDC60320	h
38	+/-0.080	16	16	80	60°	12	WDC60380	f

- INFO
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- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

### WDC 45° - 60°

	Material Group ISO 513		<span style="background-color: #0070C0; color: white; padding: 2px;">P1</span> <span style="background-color: #0070C0; color: white; padding: 2px;">P2</span> <span style="background-color: #0070C0; color: white; padding: 2px;">P3</span> <span style="background-color: #0070C0; color: white; padding: 2px;">P4</span>			<span style="background-color: #FFD700; color: black; padding: 2px;">M1</span> <span style="background-color: #FFD700; color: black; padding: 2px;">M2</span>			<span style="background-color: #DC143C; color: white; padding: 2px;">K1</span> <span style="background-color: #DC143C; color: white; padding: 2px;">K2</span>			<span style="background-color: #008000; color: white; padding: 2px;">N1</span> <span style="background-color: #008000; color: white; padding: 2px;">N2</span> <span style="background-color: #008000; color: white; padding: 2px;">N3</span> <span style="background-color: #008000; color: white; padding: 2px;">N4</span>			
	Hardness/Rm		< 800 N/mm <sup>2</sup>			< 750 N/mm <sup>2</sup>			< 350 HB						
	ap x ae		<b>0.2D x 0.15D</b>			<b>0.2D x 0.15D</b>			<b>0.2D x 0.15D</b>			<b>0.2D x 0.15D</b>			
Vc (m/min)		<b>30-50</b>			<b>15-25</b>			<b>30-40</b>			<b>50-70</b>				
D (mm)	z	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)		
<b>16</b>	<b>6</b>	800	0.015	70	400	0.011	25	700	0.013	55	1190	0.017	120		
<b>20</b>	<b>6</b>	640	0.017	65	320	0.012	20	560	0.014	45	960	0.018	105		
<b>22</b>	<b>6</b>	580	0.018	65	290	0.013	20	510	0.015	45	870	0.020	105		
<b>25</b>	<b>8</b>	510	0.020	80	250	0.014	20	450	0.017	45	760	0.022	100		
<b>28</b>	<b>8</b>	450	0.023	80	230	0.016	20	400	0.019	45	680	0.025	100		
<b>32</b>	<b>10</b>	400	0.025	100	200	0.018	20	350	0.021	45	600	0.028	100		
<b>38</b>	<b>12</b>	340	0.028	115	170	0.020	20	290	0.024	40	500	0.031	90		

- INFO
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- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

# WDD

Dovetail cutter

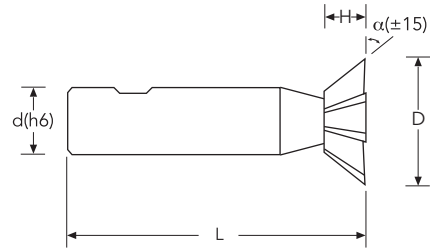


DIN 1833	<b>N</b>	HSS/Co BR	α 45°	α 60°	Z6-Z12
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WDD 45 WDD 60

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D	D Tol.	d(h6)	H	L	alfa	z	EDP No.	Stock
16	+/-0.065	12	4	60	45°	6	WDD45160	h
20	+/-0.065	12	5	63	45°	6	WDD45200	h
22	+/-0.065	12	6	67	45°	6	WDD45220	h
25	+/-0.065	16	6.3	67	45°	8	WDD45250	h
28	+/-0.065	16	7.5	67	45°	8	WDD45280	h
32	+/-0.080	16	8	71	45°	10	WDD45320	h
38	+/-0.080	16	10	80	45°	12	WDD45380	f
16	+/-0.065	12	6.3	60	60°	6	WDD60160	h
20	+/-0.065	12	8	63	60°	6	WDD60200	h
22	+/-0.065	12	9	67	60°	6	WDD60220	h
25	+/-0.065	16	10	67	60°	8	WDD60250	h
28	+/-0.065	16	11	67	60°	8	WDD60280	h
32	+/-0.080	16	12.5	71	60°	10	WDD60320	h
38	+/-0.080	16	16	80	60°	12	WDD60380	f

- INFO
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h stock standard    f non-standard stock    m stock exhaustion

### WDD 45° - 60°

	Material Group ISO 513		<span style="background-color: #007bff; color: white; padding: 2px;">P1</span> <span style="background-color: #007bff; color: white; padding: 2px;">P2</span> <span style="background-color: #007bff; color: white; padding: 2px;">P3</span> <span style="background-color: #007bff; color: white; padding: 2px;">P4</span>			<span style="background-color: #ffc107; color: black; padding: 2px;">M1</span> <span style="background-color: #ffc107; color: black; padding: 2px;">M2</span>			<span style="background-color: #dc3545; color: white; padding: 2px;">K1</span> <span style="background-color: #dc3545; color: white; padding: 2px;">K2</span>			<span style="background-color: #28a745; color: white; padding: 2px;">N1</span> <span style="background-color: #28a745; color: white; padding: 2px;">N2</span> <span style="background-color: #28a745; color: white; padding: 2px;">N3</span> <span style="background-color: #28a745; color: white; padding: 2px;">N4</span>			
	Hardness/Rm		< 800 N/mm <sup>2</sup>			< 750 N/mm <sup>2</sup>			< 350 HB						
	ap x ae		<b>0.2D x 0.15D</b>			<b>0.2D x 0.15D</b>			<b>0.2D x 0.15D</b>			<b>0.2D x 0.15D</b>			
Vc (m/min)		<b>30-50</b>			<b>15-25</b>			<b>30-40</b>			<b>50-70</b>				
D (mm)	z	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)		
<b>16</b>	<b>6</b>	800	0.015	70	400	0.011	25	700	0.013	55	1190	0.017	120		
<b>20</b>	<b>6</b>	640	0.017	65	320	0.012	20	560	0.014	45	960	0.018	105		
<b>22</b>	<b>6</b>	580	0.018	65	290	0.013	20	510	0.015	45	870	0.020	105		
<b>25</b>	<b>8</b>	510	0.020	80	250	0.014	20	450	0.017	45	760	0.022	100		
<b>28</b>	<b>8</b>	450	0.023	80	230	0.016	20	400	0.019	45	680	0.025	100		
<b>32</b>	<b>10</b>	400	0.025	100	200	0.018	20	350	0.021	45	600	0.028	100		
<b>38</b>	<b>12</b>	340	0.028	115	170	0.020	20	290	0.024	40	500	0.031	90		

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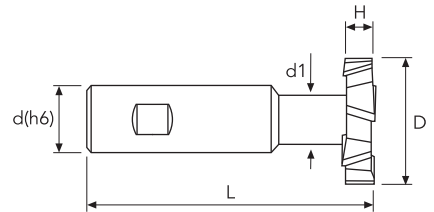
# WTM

T-slot



P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D(d11)	D(d11) Tol.	d(h6)	d1(h12)	d1 Tol.	H(d11)	H Tol.	L	z	EDP No.	Stock
12.5	-0.050/-0.160	10	5	0/-0.012	6	-0.030/-0.105	57	6	WTM125	h
16	-0.050/-0.160	10	6.5	0/-0.015	8	-0.040/-0.130	62	6	WTM160	h
18	-0.050/-0.160	12	8	0/-0.015	8	-0.040/-0.130	70	6	WTM180	h
19	-0.065/-0.195	12	8	0/-0.015	9	-0.040/-0.130	71	6	WTM190	h
21	-0.065/-0.195	12	10	0/-0.015	9	-0.040/-0.130	74	6	WTM210	h
22	-0.065/-0.195	12	10	0/-0.015	10	-0.040/-0.130	75	6	WTM220	h
25	-0.065/-0.195	16	12	0/-0.018	11	-0.050/-0.160	82	6	WTM250	h
28	-0.065/-0.195	16	13	0/-0.018	12	-0.050/-0.160	83	6	WTM280	h
32	-0.080/-0.240	16	15	0/-0.018	14	-0.050/-0.160	90	8	WTM320	h
36	-0.080/-0.240	25	17	0/-0.018	16	-0.050/-0.160	103	8	WTM360	h

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- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion

**WTM**

	Material Group ISO 513		P1 P2 P3 P4			M1 M2			K1 K2			N1 N2 N3 N4		
	Hardness/Rm		< 800 N/mm <sup>2</sup>			< 750 N/mm <sup>2</sup>			< 350 HB					
	ap x ae		DIN Norm 650			DIN Norm 650			DIN Norm 650			DIN Norm 650		
	Vc (m/min)		25-35			12-18			20-30			40-60		
D (mm)	z	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
12.5	6	760	0.010	45	380	0.007	15	640	0.009	35	1270	0.011	85	
16	6	600	0.025	90	300	0.018	30	500	0.021	65	1000	0.028	165	
18	6	530	0.030	95	270	0.021	35	440	0.026	65	880	0.033	175	
19	6	500	0.035	105	250	0.025	35	420	0.030	75	840	0.039	195	
21	6	450	0.040	110	230	0.028	40	380	0.034	80	760	0.044	200	
22	6	430	0.043	110	220	0.030	40	360	0.036	80	720	0.047	200	
25	6	380	0.045	105	190	0.032	35	320	0.038	75	640	0.050	190	
28	6	340	0.050	100	170	0.035	35	280	0.043	70	570	0.055	190	
32	8	300	0.057	135	150	0.040	50	250	0.048	95	500	0.063	250	
36	8	270	0.065	140	130	0.046	45	220	0.055	95	440	0.072	250	

- INFO
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- CARBIDE BURRS

# WWK

Woodruff



DIN  
850

N

HSS/Co  
BR

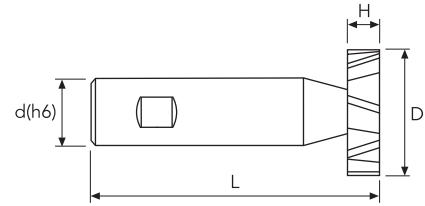
10°

SQUARE

Z8-Z14

P	M	K	N	S	H
★	☆	★	☆		

★ 1st choice ☆ suitable



D(h11)	D Tol.	d(h6)	H(e8)	H Tol.	L	z	EDP No.	Stock
10.5	0/-0.110	6	2	-0.032/-0.059	50	8	WWK105A	h
10.5	0/-0.110	6	2.5	-0.032/-0.059	50	8	WWK105B	h
10.5	0/-0.110	6	3	-0.032/-0.059	50	8	WWK105C	h
13.5	0/-0.110	10	2	-0.032/-0.059	56	8	WWK135A	h
13.5	0/-0.110	10	2.5	-0.032/-0.059	56	8	WWK135B	h
13.5	0/-0.110	10	3	-0.032/-0.059	56	8	WWK135C	h
13.5	0/-0.110	10	4	-0.032/-0.059	56	8	WWK135D	h
16.5	0/-0.110	10	2.5	-0.032/-0.059	56	8	WWK165B	h
16.5	0/-0.110	10	3	-0.032/-0.059	56	8	WWK165C	h
16.5	0/-0.110	10	4	-0.032/-0.059	56	8	WWK165D	h
16.5	0/-0.110	10	5	-0.032/-0.059	56	8	WWK165E	h
19.5	0/-0.130	10	3	-0.040/-0.073	63	8	WWK195C	h
19.5	0/-0.130	10	4	-0.040/-0.073	63	8	WWK195D	h
19.5	0/-0.130	10	5	-0.040/-0.073	63	8	WWK195E	h
19.5	0/-0.130	10	6	-0.040/-0.073	63	8	WWK195F	h
22.5	0/-0.130	10	4	-0.040/-0.073	63	10	WWK225D	h
22.5	0/-0.130	10	5	-0.040/-0.073	63	10	WWK225E	h
22.5	0/-0.130	10	6	-0.040/-0.073	63	10	WWK225F	h
22.5	0/-0.130	10	8	-0.040/-0.073	63	10	WWK225H	h
25.5	0/-0.130	10	5	-0.040/-0.073	63	10	WWK255E	h
25.5	0/-0.130	10	6	-0.040/-0.073	63	10	WWK255F	h
25.5	0/-0.130	10	7	-0.040/-0.073	63	10	WWK255G	h
25.5	0/-0.130	10	8	-0.040/-0.073	63	10	WWK255H	h
28.5	0/-0.130	10	5	-0.040/-0.073	63	10	WWK285E	h
28.5	0/-0.130	10	6	-0.040/-0.073	63	10	WWK285F	h
28.5	0/-0.130	10	7	-0.040/-0.073	63	10	WWK285G	h
28.5	0/-0.130	10	8	-0.040/-0.073	63	10	WWK285H	h
32.5	0/-0.160	12	5	-0.050/-0.089	71	12	WWK325E	h
32.5	0/-0.160	12	6	-0.050/-0.089	71	12	WWK325F	h
32.5	0/-0.160	12	7	-0.050/-0.089	71	12	WWK325G	h
32.5	0/-0.160	12	8	-0.050/-0.089	71	12	WWK325H	h
32.5	0/-0.160	12	10	-0.050/-0.089	71	12	WWK325L	h

- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
- TYPHOON SUH
- TYPHOON ALH
- TYPHOON HRC
- TYPHOON SUH MINI
- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
- G2
- MDTA
- HF VH/UP
- MEF
- ALU
- MEX
- UH
- HSS/CO-HSSP END MILLS
- CARBIDE BURRS

h stock standard f non-standard stock m stock exhaustion



WWK

	Material Group ISO 513		P1 P2 P3 P4			M1 M2			K1 K2			N1 N2 N3 N4		
	Hardness/Rm		< 800 N/mm <sup>2</sup>			< 750 N/mm <sup>2</sup>			< 350 HB					
	ap x ae		DIN Norm 6888			DIN Norm 6888			DIN Norm 6888			DIN Norm 6888		
	Vc (m/min)		25-35			12-18			20-30			40-60		
D (mm)	z	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	n (rpm)	fn (mm/rev)	Vf (mm/min)	
10.5	8	910	0.010	75	450	0.007	25	760	0.009	50	1520	0.011	135	
13.5	8	710	0.018	100	350	0.012	35	590	0.015	70	1180	0.019	180	
16.5	8	580	0.025	115	290	0.018	40	480	0.021	80	970	0.028	215	
19.5	8	490	0.033	125	240	0.023	45	410	0.028	90	820	0.036	235	
22.5	10	420	0.040	170	210	0.028	60	350	0.034	120	710	0.044	310	
25.5	10	370	0.045	165	190	0.032	60	310	0.038	120	620	0.050	305	
28.5	10	340	0.050	170	170	0.035	60	280	0.043	120	560	0.055	310	
32.5	12	290	0.055	190	150	0.039	70	240	0.047	135	490	0.061	355	

- INFO
- TYPHOON TA-HTA-4HTA
- TYPHOON PU-HPU
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- TYPHOON HL
- C-SD-TA
- LFTA
- SUTA
- HSS-HSS/CO DRILLS
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