Wide-cut

High-performance end mills for HSC / HPC of steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc.

Hochleistungs-Schaftfräser für die HSC / HPC von Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc.

47 - 76

								
Tool code		WE 235	WE 435	WE 345	WE 445	WE 645	WELS 235	WELS 435
Number of teeth		Z=2	Z=4	Z=3	Z=4	Z=6	Z=2	Z=4
Page		52	52	53	53	54	55	55
		VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30
		Al-X Coating	Al-X Coating	Al-X Coating	Al-X Coating	Al-X Coating	Al-X Coating	Al-X Coating
		HRc 60	HRc 60	HRc 60	HRc 60	HRc 60	HRc 60	HRc 60
		35°	35°	45°	45°	45°	35°	35°
		90°	90°	90°	90°	90°	90°	90°
		HSC	HSC	HSC	HSC	HSC	HSC	HSC
P	HRc < 24	◎	◎	◎	◎	◎	◎	◎
P	HRc 24 - 35	◎	◎	◎	◎	◎	◎	◎
P	HRc > 35	◎	◎	◎	◎	◎	◎	◎
H	HRc 45 - 55	◎	◎	◎	◎	◎	◎	◎
H	HRc 56 - 60	○	○	○	○	○	○	○
H	HRc > 60							
M	Stainless steel	◎	◎	◎	◎	◎	◎	◎
K	Cast iron	◎	◎	◎	◎	◎	◎	◎
N	Copper alloy	○	○	○	○	○	○	○
S	Titanium alloy	◎	◎	◎	◎	◎	◎	◎
S	High-temperature alloy	○	○	○	○	○	○	○

								
Tool code		WELN 235	WE 335 RC	WE 435 RC	WE 435 RF	WE 43X	WE 44X	WB 235
Number of teeth		Z=2	Z=3	Z=4	Z=4	Z=4	Z=4	Z=2
Page		56	57	57	58	59	60	61
		VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30
		New AlCrN Coating	Al-X Coating	Al-X Coating	Al-X Coating	New AlCrN Coating	New AlCrN Coating	Al-X Coating
		HRc 55	HRc 60	HRc 60	HRc 60	HRc 55	HRc 55	HRc 60
		35°	35°	35°	35°	35°/38°	42°/45°	35°
		90°	90°	90°	90°	90°	90°	
		HSC	HSC	HSC	HPC	HPC	HPC	HSC
P	HRc < 24	◎	◎	◎	◎	◎	◎	◎
P	HRc 24 - 35	◎	◎	◎	◎	◎	◎	◎
P	HRc > 35	◎	◎	◎	◎	◎	◎	◎
H	HRc 45 - 55	◎	◎	◎	◎	◎	◎	◎
H	HRc 56 - 60		○	○	○			○
H	HRc > 60							
M	Stainless steel	◎	◎	◎	◎	◎	◎	◎
K	Cast iron	◎	◎	◎	◎	◎	◎	◎
N	Copper alloy	○	○	○	○	○	○	○
S	Titanium alloy	◎	◎	◎	◎	◎	◎	◎
S	High-temperature alloy	○	○	○	○	○	○	○

								
Tool code		WB 435	WBLS 235	WBLS 435	WBLN 235	WBTN 2351	WBTN 2352	WR 230
Number of teeth		Z=4	Z=2	Z=4	Z=2	Z=2	Z=2	Z=2
Page		61	62	62	63	64	65	66
		VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30
		Al-X Coating	Al-X Coating	Al-X Coating	New AlCrN Coating	Al-X Coating	Al-X Coating	Al-X Coating
		HRc 60	HRc 60	HRc 60	HRc 55	HRc 60	HRc 60	HRc 60
		35°	35°	35°	35°	35°	35°	30°
								R
		HSC	HSC	HSC	HSC	HSC	HSC	HSC
P	HRc < 24	◎	◎	◎	◎	◎	◎	◎
P	HRc 24 - 35	◎	◎	◎	◎	◎	◎	◎
P	HRc > 35	◎	◎	◎	◎	◎	◎	◎
H	HRc 45 - 55	◎	◎	◎	◎	◎	◎	◎
H	HRc 56 - 60	○	○	○				○
H	HRc > 60							
M	Stainless steel	◎	◎	◎	◎	◎	◎	◎
K	Cast iron	◎	◎	◎	◎	◎	◎	◎
N	Copper alloy	○	○	○	○	○	○	○
S	Titanium alloy	◎	◎	◎	◎	◎	◎	◎
S	High-temperature alloy	○	○	○	○	○	○	○

								
Tool code		WR 430	WRLS 230	WRLS 430	WRLN 230			
Number of teeth		Z=4	Z=2	Z=4	Z=2			
Page		66	67	67	68			
		VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30			
		Al-X Coating	Al-X Coating	Al-X Coating	New AlCrN Coating			
		HRc 60	HRc 60	HRc 60	HRc 55			
		30°	30°	30°	30°			
		R	R	R	R			
		HSC	HSC	HSC	HSC			
P	HRc < 24	◎	◎	◎	◎			
P	HRc 24 - 35	◎	◎	◎	◎			
P	HRc > 35	◎	◎	◎	◎			
H	HRc 45 - 55	◎	◎	◎	◎			
H	HRc 56 - 60	○	○	○				
H	HRc > 60							
M	Stainless steel	◎	◎	◎	◎			
K	Cast iron	◎	◎	◎	◎			
N	Copper alloy	○	○	○	○			
S	Titanium alloy	◎	◎	◎	◎			
S	High-temperature alloy	○	○	○	○			

VHM K10-K30	35°	HSC
Al-X Coating	90°	
HRc 60		

End mills

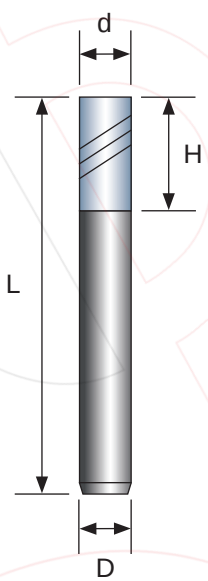
For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Schaftfräser

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P69 - P71



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

Example: Order code WE 235 002-00404

d-Code	d x H x D	L	WE 235 Z=2	WE 435 Z=4
002-00404	0.2 x 0.4 x C 4	50	◇	
003-00604	0.3 x 0.6 x C 4	50	◇	
004-00804	0.4 x 0.8 x C 4	50	◇	
005-01004	0.5 x 1.0 x C 4	50	●	
006-01204	0.6 x 1.2 x C 4	50	●	
007-01404	0.7 x 1.4 x C 4	50	◇	
008-01604	0.8 x 1.6 x C 4	50	●	
009-01804	0.9 x 1.8 x C 4	50	◇	
010-03003	1.0 x 3.0 x C 3	50	◇	◇
010-03004	1.0 x 3.0 x C 4	50	●	●
015-04003	1.5 x 4.0 x C 3	50	◇	◇
015-04004	1.5 x 4.0 x C 4	50	●	●
020-06003	2.0 x 6.0 x C 3	50	◇	◇
020-06004	2.0 x 6.0 x C 4	50	●	●
025-07003	2.5 x 7.0 x C 3	50	◇	◇
025-07004	2.5 x 7.0 x C 4	50	●	●
030-08003	3.0 x 8.0 x C 3	50	◇	◇
030-08004	3.0 x 8.0 x C 4	50	●	●
030-08006	3.0 x 8.0 x C 6	50	◇	◇
040-11004	4.0 x 11.0 x C 4	50	●	●
040-11006	4.0 x 11.0 x C 6	50	◇	◇
050-13006	5.0 x 13.0 x C 6	50	●	●
060-15006	6.0 x 15.0 x C 6	50	●	●
080-20008	8.0 x 20.0 x C 8	60	●	●
100-25010	10.0 x 25.0 x C10	75	●	●
120-30012	12.0 x 30.0 x C12	75	●	●
140-35016	14.0 x 35.0 x C16	100	◇	◇
160-40016	16.0 x 40.0 x C16	100	◇	●
200-40020	20.0 x 40.0 x C20	100	◇	◇

Long cut length / Lange schneidkantenlänge

030-15004	3.0 x 15.0 x C 4	75	◇	◇
040-20004	4.0 x 20.0 x C 4	75	◇	◇
060-25006	6.0 x 25.0 x C 6	75	◇	●
080-30008	8.0 x 30.0 x C 8	75	◇	●
100-40010	10.0 x 40.0 x C10	100	◇	●
120-45012	12.0 x 45.0 x C12	100	◇	●

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	45°	HSC
Al-X Coating	90°	
HRc 60		

End mills

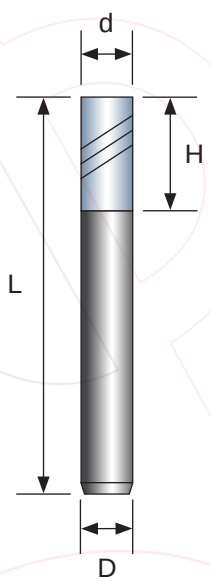
For steels, stainless steels, titanium alloy, tempered steels and hardened steels up to 60 HRc

Schaftfräser

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P69 - P71



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

Example: Order code WE 345 010-03004

d-Code	d x H x D	L	WE 345 Z=3	WE 445 Z=4
010-03004	1.0 x 3.0 x C 4	50	◇	●
015-04004	1.5 x 4.0 x C 4	50	◇	●
020-06004	2.0 x 6.0 x C 4	50	◇	●
025-07004	2.5 x 7.0 x C 4	50	◇	◇
030-08004	3.0 x 8.0 x C 4	50	◇	◇
030-08006	3.0 x 8.0 x C 6	50	●	●
040-11004	4.0 x 11.0 x C 4	50	◇	◇
040-11006	4.0 x 11.0 x C 6	50	●	●
050-13006	5.0 x 13.0 x C 6	50	●	●
060-15006	6.0 x 15.0 x C 6	50	●	●
070-17008	7.0 x 17.0 x C 8	60	◇	◇
080-20008	8.0 x 20.0 x C 8	60	●	●
090-23010	9.0 x 23.0 x C10	75	◇	◇
100-25010	10.0 x 25.0 x C10	75	●	●
120-30012	12.0 x 30.0 x C12	75	●	●
140-35016	14.0 x 35.0 x C16	100	◇	◇
160-40016	16.0 x 40.0 x C16	100	◇	●
180-40020	18.0 x 40.0 x C20	100	◇	◇
200-40020	20.0 x 40.0 x C20	100	◇	●

Long cut length / Lange schneidkantenlänge

030-12006	3.0 x 12.0 x C 6	60		◇
040-16006	4.0 x 16.0 x C 6	60		◇
050-20006	5.0 x 20.0 x C 6	60		◇
060-24006	6.0 x 24.0 x C 6	75		●
080-30008	8.0 x 30.0 x C 8	75		●
100-40010	10.0 x 40.0 x C10	100		●
120-45012	12.0 x 45.0 x C12	100		●
160-64016	16.0 x 64.0 x C16	150		◇
200-72020	20.0 x 72.0 x C20	150		◇

VHM K10-K30	45°	HSC
Al-X Coating	90°	
HRc 60		

Finishing end mills

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Schlichten Schaftfräser

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

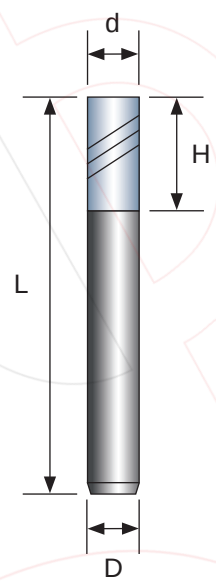
Example: Order code WE 645 060-15006

				WE 645	
d-Code	d x H x D		L	Z=6	
P	HRc < 24	◎	060-15006	6.0 x 15.0 x C 6	50	●	
	HRc 24 - 35	◎	080-20008	8.0 x 20.0 x C 8	75	●	
	HRc > 35	◎	100-25010	10.0 x 25.0 x C10	75	●	
H	HRc 45 - 55	◎	120-30012	12.0 x 30.0 x C12	75	●	
	HRc 56 - 60	○	160-40016	16.0 x 40.0 x C16	100	●	
	HRc > 60		200-40020	20.0 x 40.0 x C20	100	◇	
M	Stainless steel	◎					
K	Cast iron	◎					
N	Copper alloy	○					
S	Titanium alloy	◎					
	High-temperature alloy	○					

Long cut length / Lange schneidkantenlänge

060-24006	6.0 x 24.0 x C 6	75	◇	
080-30008	8.0 x 30.0 x C 8	75	◇	
100-40010	10.0 x 40.0 x C10	100	◇	
120-45012	12.0 x 45.0 x C12	100	◇	
160-64016	16.0 x 64.0 x C16	150	◇	
200-72020	20.0 x 72.0 x C20	150	◇	

Cutting data, P70 - P71



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	35°	HSC
Al-X Coating	90°	
HRc 60		

End mills, long shank

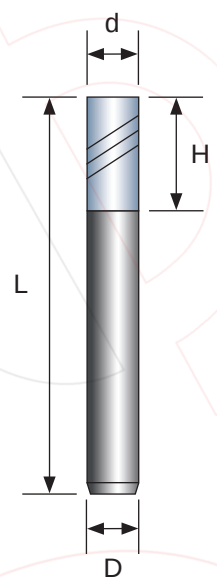
For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Schaftfräser, langer schaft

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P70 - P71



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Example: Order code WELS 235 020-05104

d-Code	d x L x D	H	WELS 235 Z=2	WELS 435 Z=4
020-05104	2.0 x L 75 x C 4	5.0	◇	◇
030-08104	3.0 x L 75 x C 4	8.0	◇	◇
030-08306	3.0 x L100 x C 6	8.0	◇	◇
040-11104	4.0 x L 75 x C 4	11.0	◇	●
040-11306	4.0 x L100 x C 6	11.0	◇	◇
050-13106	5.0 x L 75 x C 6	13.0	◇	◇
050-13306	5.0 x L100 x C 6	13.0	◇	◇
060-15106	6.0 x L 75 x C 6	15.0	◇	●
060-15306	6.0 x L100 x C 6	15.0	◇	●
080-20108	8.0 x L 75 x C 8	20.0	◇	●
080-20308	8.0 x L100 x C 8	20.0	◇	●
080-20508	8.0 x L150 x C 8	20.0	◇	●
100-25310	10.0 x L100 x C10	25.0	◇	●
100-25510	10.0 x L150 x C10	25.0	◇	●
120-30312	12.0 x L100 x C12	30.0	◇	●
120-30512	12.0 x L150 x C12	30.0	◇	●

VHM K10-K30 | 35° | HSC

New AlCrN Coating | 90°

HRc 55

End mills, long neck

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

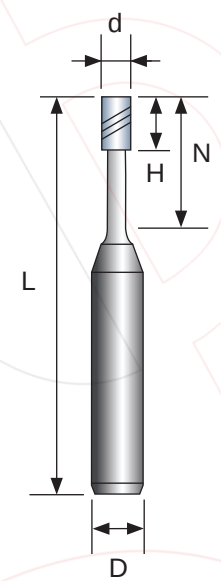
Schaftfräser, überlaufhals

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 55 HRc

Example: Order code WELN 235 005-02004

d-Code	d x N x D	H	L	WELN 235 Z=2	
005-02004	0.5 x N 2 x C 4	0.7	50	●	
005-04004	0.5 x N 4 x C 4	0.7	50	●	
005-06004	0.5 x N 6 x C 4	0.7	50	●	
006-04004	0.6 x N 4 x C 4	0.9	50	●	
006-06004	0.6 x N 6 x C 4	0.9	50	●	
008-04004	0.8 x N 4 x C 4	1.2	50	●	
008-06004	0.8 x N 6 x C 4	1.2	50	●	
008-08004	0.8 x N 8 x C 4	1.2	50	●	
010-06004	1.0 x N 6 x C 4	1.5	50	●	
010-08004	1.0 x N 8 x C 4	1.5	50	●	
010-10004	1.0 x N 10 x C 4	1.5	50	●	
010-12004	1.0 x N 12 x C 4	1.5	50	●	
015-06004	1.5 x N 6 x C 4	2.3	50	●	
015-08004	1.5 x N 8 x C 4	2.3	50	●	
015-12004	1.5 x N 12 x C 4	2.3	50	●	
015-16004	1.5 x N 16 x C 4	2.3	60	●	
020-08004	2.0 x N 8 x C 4	3.0	50	●	
020-12004	2.0 x N 12 x C 4	3.0	50	●	
020-16004	2.0 x N 16 x C 4	3.0	60	●	
020-20004	2.0 x N 20 x C 4	3.0	60	●	
030-16006	3.0 x N 16 x C 6	4.5	60	●	
030-20006	3.0 x N 20 x C 6	4.5	60	◇	
030-25006	3.0 x N 25 x C 6	4.5	60	◇	
040-16006	4.0 x N 16 x C 6	6.0	60	◇	
040-20006	4.0 x N 20 x C 6	6.0	60	●	
040-30006	4.0 x N 30 x C 6	6.0	75	◇	

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02

Wide-cut

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	35°	HSC
Al-X Coating	90°	
HRc 60		

Roughing end mills

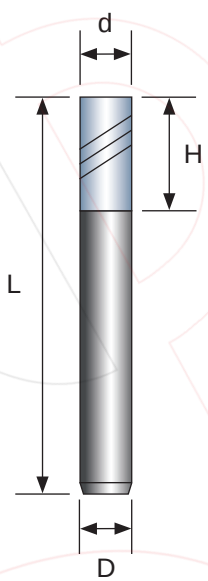
For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Schruppen Schaftfräser

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

Example: Order code WE 335 RC 060-15006

			d-Code	d x H x D	L	WE 335 RC Z=3	WE 435 RC Z=4
P	HRc < 24	◎	060-15006	6.0 x 15.0 x C 6	50	●	●
P	HRc 24 - 35	◎	080-20008	8.0 x 20.0 x C 8	60	●	●
P	HRc > 35	◎	100-25010	10.0 x 25.0 x C10	75	●	●
H	HRc 45 - 55	◎	120-30012	12.0 x 30.0 x C12	75	●	●
H	HRc 56 - 60	○	160-40016	16.0 x 40.0 x C16	100	◇	◇
H	HRc > 60		200-40020	20.0 x 40.0 x C20	100	◇	◇
M	Stainless steel	◎					
K	Cast iron	◎					
N	Copper alloy	○					
S	Titanium alloy	◎					
S	High-temperature alloy	○					



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

Wide-cut

VHM K10-K30	35°	HPC
Al-X Coating	90°	
HRc 60		

Roughing & Finishing end mills

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

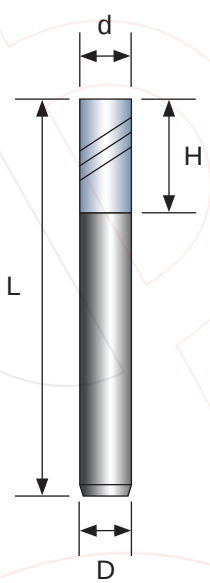
Schruppen & Schlichten Schaftfräser

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

Example: Order code WE 435 RF 060-15006

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

d-Code	d x H x D	L	WE 435 RF Z=4	
060-15006	6.0 x 15.0 x C 6	50	●	
070-17008	7.0 x 17.0 x C 8	60	◇	
080-20008	8.0 x 20.0 x C 8	60	●	
090-23010	9.0 x 23.0 x C10	75	◇	
100-25010	10.0 x 25.0 x C10	75	●	
110-28012	11.0 x 28.0 x C12	75	◇	
120-30012	12.0 x 30.0 x C12	75	●	
160-40016	16.0 x 40.0 x C16	100	◇	
200-40020	20.0 x 40.0 x C20	100	◇	



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

● Stock item, subject to confirmation ◇ On request

VHM
K10-K30

35°/ 38°

HPC

New
AlCrN
Coating

90°

HRc
55

End mills, unequial helix (35° - 38°) and division

For steels, stainless steels, titanium alloy, tempered steels and hardened steels up to 55 HRc

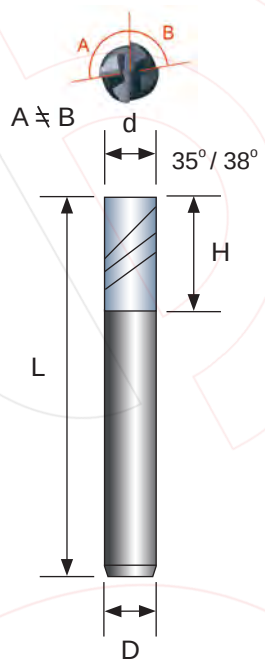
Schaftfräser, ungleicher Drallwinkel und ungleiche Teilung

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 55 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Example: Order code WE 43X 030-06006

d-Code	d x H x D	L	WE 43X Z=4	
030-06006	3.0 x 6.0 x C 6	50	◇	
040-08006	4.0 x 8.0 x C 6	50	◇	
050-10006	5.0 x 10.0 x C 6	50	◇	
060-12006	6.0 x 12.0 x C 6	50	●	
080-16008	8.0 x 16.0 x C 8	60	●	
100-20010	10.0 x 20.0 x C10	75	●	
120-24012	12.0 x 24.0 x C12	75	●	
160-32016	16.0 x 32.0 x C16	100	◇	
200-40020	20.0 x 40.0 x C20	100	◇	



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

Wide-cut

VHM
K10-K30

42°/ 45°

HPC

New
AlCrN
Coating

90°

HRc
55

End mills, unequial helix (42° - 45°) and division

For steels, stainless steels, titanium alloy, tempered steels and hardened steels up to 55 HRc

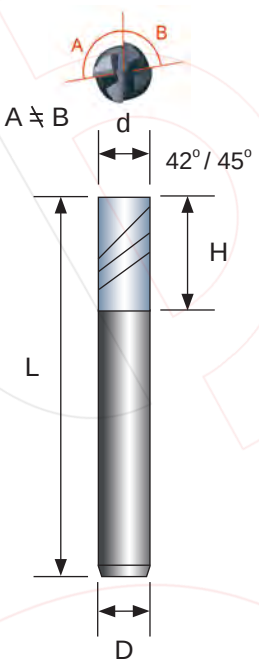
Schaftfräser, ungleicher Drallwinkel und ungleiche Teilung

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 55 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Example: Order code WE 44X 030-06006

d-Code	d x H x D	L	WE 44X Z=4	
030-06006	3.0 x 6.0 x C 6	50	◇	
040-08006	4.0 x 8.0 x C 6	50	◇	
050-10006	5.0 x 10.0 x C 6	50	◇	
060-12006	6.0 x 12.0 x C 6	50	●	
080-16008	8.0 x 16.0 x C 8	60	●	
100-20010	10.0 x 20.0 x C10	75	●	
120-24012	12.0 x 24.0 x C12	75	●	
160-32016	16.0 x 32.0 x C16	100	●	
200-40020	20.0 x 40.0 x C20	100	◇	



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	35°	HSC
Al-X Coating		
HRC 60		

Ball nose end mills

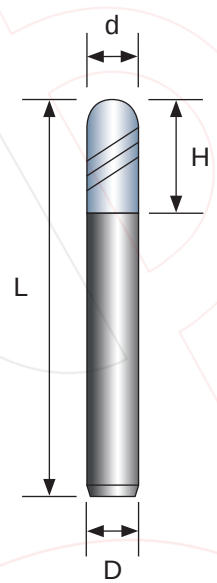
For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Kugelkopffräser

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P72 - P73



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Example: Order code WB 235 004-00804

d-Code	d x H x D	L	WB 235 Z=2	WB 435 Z=4
004-00804	R0.2 x 0.8 x C 4	50	●	
005-01004	R0.25 x 1.0 x C 4	50	●	
006-01204	R0.3 x 1.2 x C 4	50	●	
007-01404	R0.35 x 1.4 x C 4	50	◇	
008-01604	R0.4 x 1.6 x C 4	50	●	
010-02003	R0.5 x 2.0 x C 3	50	◇	
010-02004	R0.5 x 2.0 x C 4	50	●	
012-02404	R0.6 x 2.4 x C 4	50	◇	
014-02804	R0.7 x 2.8 x C 4	50	◇	
015-03003	R0.75 x 3.0 x C 3	50	◇	
015-03004	R0.75 x 3.0 x C 4	50	●	
016-03204	R0.8 x 3.2 x C 4	50	◇	
020-04003	R1.0 x 4.0 x C 3	50	◇	
020-04004	R1.0 x 4.0 x C 4	50	●	◇
020-04006	R1.0 x 4.0 x C 6	50	●	
025-05004	R1.25 x 5.0 x C 4	50	◇	
030-06003	R1.5 x 6.0 x C 3	50	◇	
030-06004	R1.5 x 6.0 x C 4	50	●	◇
030-06006	R1.5 x 6.0 x C 6	50	●	◇
040-08004	R2.0 x 8.0 x C 4	50	●	◇
040-08006	R2.0 x 8.0 x C 6	50	●	◇
050-10006	R2.5 x 10.0 x C 6	50	●	◇
060-12006	R3.0 x 12.0 x C 6	50	●	●
070-14008	R3.5 x 14.0 x C 8	60	◇	
080-16008	R4.0 x 16.0 x C 8	60	●	●
100-20010	R5.0 x 20.0 x C10	75	●	●
120-24012	R6.0 x 24.0 x C12	75	●	●
160-30016	R8.0 x 30.0 x C16	100	◇	
200-30020	R10.0 x 30.0 x C20	100	◇	

VHM K10-K30	35°	HSC
Al-X Coating		
HRC 60		

Ball nose end mills, long shank

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Kugelkopffräser, langer schaft

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

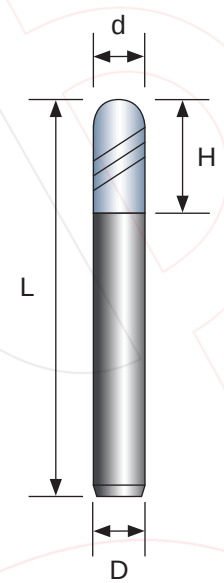
WBLS 235

WBLS 435

Example: Order code WBLS 235 010-02104

P	HRc < 24	◎	d-Code	d x L x D	H
	HRc 24 - 35	◎			
	HRc > 35	◎			
H	HRc 45 - 55	◎			
	HRc 56 - 60	○			
	HRc > 60				
M	Stainless steel	◎			
K	Cast iron	◎			
N	Copper alloy	○			
S	Titanium alloy	◎			
	High-temperature alloy	○			

Cutting data, P72 - P73



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

d-Code	d x L x D	H	WBLS 235 Z=2	WBLS 435 Z=4
010-02104	R0.5 x L 75 x C 4	2.0	◇	
015-03104	R0.75 x L 75 x C 4	3.0	◇	
020-04104	R1.0 x L 75 x C 4	4.0	●	
020-04106	R1.0 x L 75 x C 6	4.0	◇	◇
020-04306	R1.0 x L100 x C 6	4.0	◇	◇
030-06104	R1.5 x L 75 x C 4	6.0	◇	
030-06106	R1.5 x L 75 x C 6	6.0	◇	◇
030-06306	R1.5 x L100 x C 6	6.0	●	◇
040-08104	R2.0 x L 75 x C 4	8.0	●	
040-08106	R2.0 x L 75 x C 6	8.0	◇	◇
040-08306	R2.0 x L100 x C 6	8.0	●	◇
050-10106	R2.5 x L 75 x C 6	10.0	●	◇
050-10306	R2.5 x L100 x C 6	10.0	●	◇
060-12106	R3.0 x L 75 x C 6	12.0	●	●
060-12306	R3.0 x L100 x C 6	12.0	●	●
060-12506	R3.0 x L150 x C 6	12.0	●	
080-16108	R4.0 x L 75 x C 8	16.0	●	
080-16308	R4.0 x L100 x C 8	16.0	●	●
080-16508	R4.0 x L150 x C 8	16.0	●	
100-20310	R5.0 x L100 x C10	20.0	●	●
100-20510	R5.0 x L150 x C10	20.0	●	
100-20710	R5.0 x L200 x C10	20.0	◇	
120-24312	R6.0 x L100 x C12	24.0	●	●
120-24512	R6.0 x L150 x C12	24.0	●	
120-24712	R6.0 x L200 x C12	24.0	◇	
160-30516	R8.0 x L150 x C16	30.0	◇	
160-30716	R8.0 x L200 x C16	30.0	◇	
200-30520	R10.0 x L150 x C20	30.0	◇	
200-30720	R10.0 x L200 x C20	30.0	◇	

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	35°	HSC
New AlCrN Coating		
HRC 55		

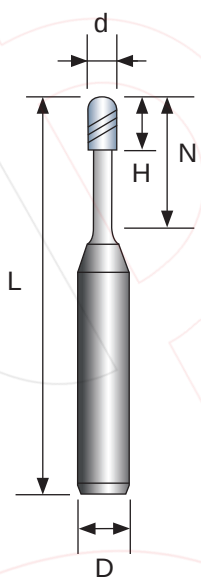
Ball nose end mills, long neck

For steels, stainless steels, titanium alloy, tempered steels and hardened steels up to 55 HRc

Kugelkopffräser, überlaufhals

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 55 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02

Example: Order code WBLN 235 004-02004

d-Code	d x N x D	H	L	WBLN 235 Z=2	
004-02004	R0.2 x N 2 x C 4	0.4	50	◇	
004-03004	R0.2 x N 3 x C 4	0.4	50	◇	
004-04004	R0.2 x N 4 x C 4	0.4	50	◇	
005-02004	R0.25 x N 2 x C 4	0.5	50	●	
005-04004	R0.25 x N 4 x C 4	0.5	50	●	
005-06004	R0.25 x N 6 x C 4	0.5	50	◇	
006-02004	R0.3 x N 2 x C 4	0.6	50	●	
006-04004	R0.3 x N 4 x C 4	0.6	50	●	
006-06004	R0.3 x N 6 x C 4	0.6	50	●	
008-04004	R0.4 x N 4 x C 4	0.8	50	●	
008-06004	R0.4 x N 6 x C 4	0.8	50	●	
008-08004	R0.4 x N 8 x C 4	0.8	50	●	
010-04004	R0.5 x N 4 x C 4	1.0	50	●	
010-06004	R0.5 x N 6 x C 4	1.0	50	●	
010-08004	R0.5 x N 8 x C 4	1.0	50	●	
010-10004	R0.5 x N 10 x C 4	1.0	50	●	
010-12004	R0.5 x N 12 x C 4	1.0	50	●	
015-06004	R0.75 x N 6 x C 4	1.5	50	●	
015-08004	R0.75 x N 8 x C 4	1.5	50	●	
015-12004	R0.75 x N 12 x C 4	1.5	50	●	
015-16004	R0.75 x N 16 x C 4	1.5	60	◇	
015-20004	R0.75 x N 20 x C 4	1.5	60	◇	
020-08004	R1.0 x N 8 x C 4	2.0	50	●	
020-10004	R1.0 x N 10 x C 4	2.0	50	●	
020-12004	R1.0 x N 12 x C 4	2.0	50	●	
020-16004	R1.0 x N 16 x C 4	2.0	60	●	
020-20004	R1.0 x N 20 x C 4	2.0	60	●	
020-25004	R1.0 x N 25 x C 4	2.0	60	●	
030-16006	R1.5 x N 16 x C 6	3.0	60	●	
030-20006	R1.5 x N 20 x C 6	3.0	60	●	
030-25006	R1.5 x N 25 x C 6	3.0	60	◇	
030-30006	R1.5 x N 30 x C 6	3.0	75	◇	
040-16006	R2.0 x N 16 x C 6	4.0	60	●	
040-20006	R2.0 x N 20 x C 6	4.0	60	●	
040-25006	R2.0 x N 25 x C 6	4.0	60	●	
040-30006	R2.0 x N 30 x C 6	4.0	75	●	

VHM K10-K30	35°	HSC
Al-X Coating		
HRc 60		

Ball nose end mills, pencil neck

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Kugelkopffräser, konischer schaft

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

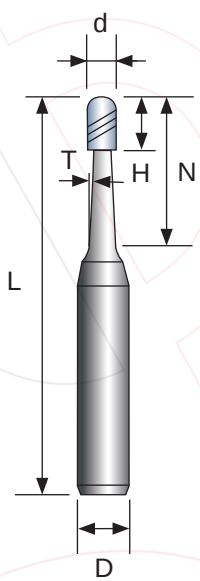
WBTN 2351

Z=2

Example: Order code WBTN 2351 020-10256

	HRc < 24	◎
P	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

d-Code	d x T x N x D	H	L	
020-10256	R1.0 x T1.0 x N 25 x C 6	3.0	75	◇
030-10306	R1.5 x T1.0 x N 30 x C 6	5.0	75	◇
040-10356	R2.0 x T1.0 x N 35 x C 6	7.0	75	◇



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

Wide-cut

● Stock item, subject to confirmation ◇ On request

NKO

VHM K10-K30	35°	HSC
Al-X Coating		
HRc 60		

Ball nose end mills, long pencil neck

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

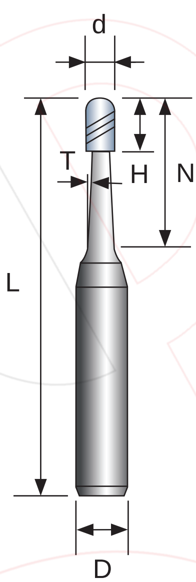
Kugelkopffräser, langer konischer schaft

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Example: Order code WBTN 2352 020-05606

d-Code	d x T x N x D	H	L	WBTN 2352 Z=2	
020-05606	R1.0 x T0.5 x N 60 x C 6	3.0	100	◇	
020-10606	R1.0 x T1.0 x N 60 x C 6	3.0	100	◇	
020-15606	R1.0 x T1.5 x N 60 x C 6	3.0	100	◇	
020-20576	R1.0 x T2.0 x N 57 x C 6	3.0	100	◇	
030-05606	R1.5 x T0.5 x N 60 x C 6	5.0	100	◇	
030-10606	R1.5 x T1.0 x N 60 x C 6	5.0	100	◇	
030-15576	R1.5 x T1.5 x N 57 x C 6	5.0	100	◇	
030-20436	R1.5 x T2.0 x N 43 x C 6	5.0	100	◇	
040-05606	R2.0 x T0.5 x N 60 x C 6	7.0	100	◇	
040-10576	R2.0 x T1.0 x N 57 x C 6	7.0	100	◇	
040-15386	R2.0 x T1.5 x N 38 x C 6	7.0	100	◇	
040-20296	R2.0 x T2.0 x N 29 x C 6	7.0	100	◇	



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

Wide-cut

VHM K10-K30	30°	HSC
Al-X Coating	R	
HRc 60		

Corner radius end mills

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Eckradiusfräser

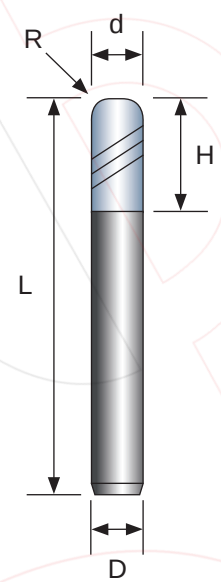
Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

Example: Order code WR 230 010-02004

d-Code	d x R x H x D	L	WR 230 Z=2	WR 430 Z=4
010-02004	1.0 x R0.2 x 2.0 x C 4	50	●	◇
015-02004	1.5 x R0.2 x 3.0 x C 4	50	●	◇
015-05004	1.5 x R0.5 x 3.0 x C 4	50	◇	◇
020-02004	2.0 x R0.2 x 4.0 x C 4	50	●	●
020-05004	2.0 x R0.5 x 4.0 x C 4	50	●	●
025-02004	2.5 x R0.2 x 5.0 x C 4	50	●	●
025-05004	2.5 x R0.5 x 5.0 x C 4	50	●	●
030-02004	3.0 x R0.2 x 6.0 x C 4	50	●	●
030-05004	3.0 x R0.5 x 6.0 x C 4	50	●	●
030-10004	3.0 x R1.0 x 6.0 x C 4	50	◇	◇
040-02004	4.0 x R0.2 x 8.0 x C 4	50	●	●
040-05004	4.0 x R0.5 x 8.0 x C 4	50	●	●
040-10004	4.0 x R1.0 x 8.0 x C 4	50	◇	◇
050-05006	5.0 x R0.5 x 10.0 x C 6	50	◇	●
050-10006	5.0 x R1.0 x 10.0 x C 6	50	◇	●
060-02006	6.0 x R0.2 x 12.0 x C 6	50	◇	◇
060-05006	6.0 x R0.5 x 12.0 x C 6	50	◇	●
060-10006	6.0 x R1.0 x 12.0 x C 6	50	◇	●
060-15006	6.0 x R1.5 x 12.0 x C 6	50	◇	◇
060-20006	6.0 x R2.0 x 12.0 x C 6	50	◇	◇
080-05008	8.0 x R0.5 x 16.0 x C 8	60	◇	●
080-10008	8.0 x R1.0 x 16.0 x C 8	60	◇	●
080-15008	8.0 x R1.5 x 16.0 x C 8	60	◇	◇
080-20008	8.0 x R2.0 x 16.0 x C 8	60	◇	◇
100-05010	10.0 x R0.5 x 20.0 x C10	75	◇	●
100-10010	10.0 x R1.0 x 20.0 x C10	75	◇	●
100-15010	10.0 x R1.5 x 20.0 x C10	75	◇	◇
100-20010	10.0 x R2.0 x 20.0 x C10	75	◇	◇
120-05012	12.0 x R0.5 x 24.0 x C12	75	◇	●
120-10012	12.0 x R1.0 x 24.0 x C12	75	◇	●
120-20012	12.0 x R2.0 x 24.0 x C12	75	◇	◇
120-30012	12.0 x R3.0 x 24.0 x C12	75	◇	◇

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P74 - P75



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	30°	HSC
Al-X Coating	R	
HRc 60		

Corner radius end mills, long shank

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

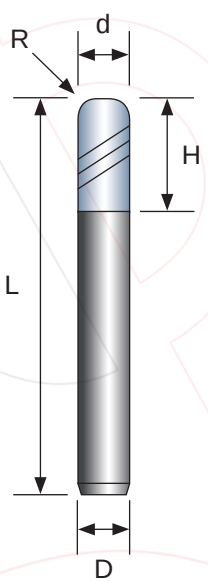
Eckradiusfräser, langer schaft

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

Example: Order code WRLS 230 040-02104

			d-Code	d x R x L x D	H	WRLS 230 Z=2	WRLS 430 Z=4
P	HRc < 24	◎	040-02104	4.0 x R0.2 x L 75 x C 4	8.0	◇	◇
P	HRc 24 - 35	◎	040-05104	4.0 x R0.5 x L 75 x C 4	8.0	◇	●
P	HRc > 35	◎	040-10104	4.0 x R1.0 x L 75 x C 4	8.0	◇	◇
H	HRc 45 - 55	◎	050-05106	5.0 x R0.5 x L 75 x C 6	10.0	◇	◇
H	HRc 56 - 60	○	050-05306	5.0 x R0.5 x L100 x C 6	10.0	◇	◇
H	HRc > 60		050-10106	5.0 x R1.0 x L 75 x C 6	10.0	◇	◇
			050-10306	5.0 x R1.0 x L100 x C 6	10.0	◇	◇
M	Stainless steel	◎	060-02106	6.0 x R0.2 x L 75 x C 6	12.0	◇	◇
K	Cast iron	◎	060-02306	6.0 x R0.2 x L100 x C 6	12.0	◇	◇
N	Copper alloy	○	060-05106	6.0 x R0.5 x L 75 x C 6	12.0	◇	●
S	Titanium alloy	◎	060-05306	6.0 x R0.5 x L100 x C 6	12.0	◇	●
S	High-temperature alloy	○	060-10106	6.0 x R1.0 x L 75 x C 6	12.0	◇	●
			060-10306	6.0 x R1.0 x L100 x C 6	12.0	◇	●
			080-05108	8.0 x R0.5 x L 75 x C 8	16.0	◇	◇
			080-05308	8.0 x R0.5 x L100 x C 8	16.0	◇	●
			080-10108	8.0 x R1.0 x L 75 x C 8	16.0	◇	◇
			080-10308	8.0 x R1.0 x L100 x C 8	16.0	◇	●
			080-10508	8.0 x R1.0 x L150 x C 8	16.0		●
			100-05310	10.0 x R0.5 x L100 x C10	20.0	◇	◇
			100-10310	10.0 x R1.0 x L100 x C10	20.0	◇	●
			100-10510	10.0 x R1.0 x L150 x C10	20.0		●
			100-20310	10.0 x R2.0 x L100 x C10	20.0		◇
			120-05312	12.0 x R0.5 x L100 x C12	24.0	◇	◇
			120-10312	12.0 x R1.0 x L100 x C12	24.0	◇	●
			120-10512	12.0 x R1.0 x L150 x C12	24.0		●
			120-20312	12.0 x R2.0 x L100 x C12	24.0		◇
			120-30312	12.0 x R3.0 x L100 x C12	24.0		◇

Cutting data, P74 - P75



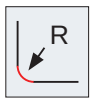
Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

VHM
K10-K30

HSC

New
AlCrN
Coating



HRc
55

Corner radius end mills, long neck

For steels, stainless steels, titanium alloy, tempered steels and hardened steels up to 55 HRc

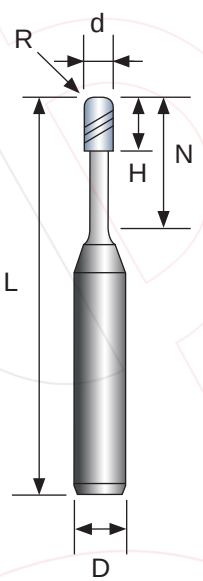
Eckradiusfräser, überlaufhals

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 55 HRc

Example: Order code WRLN 230 010-02064

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

d-Code	d x R x N x D	H	L	WRLN 230 Z=2	
010-02064	1.0 x R0.2 x N 6 x C 4	1.2	50	●	
010-02084	1.0 x R0.2 x N 8 x C 4	1.2	50	●	
010-02104	1.0 x R0.2 x N 10 x C 4	1.2	50	●	
010-02124	1.0 x R0.2 x N 12 x C 4	1.2	50	●	
015-02064	1.5 x R0.2 x N 6 x C 4	1.8	50	●	
015-02124	1.5 x R0.2 x N 12 x C 4	1.8	50	●	
020-02084	2.0 x R0.2 x N 8 x C 4	2.4	50	●	
020-02124	2.0 x R0.2 x N 12 x C 4	2.4	50	●	
020-02164	2.0 x R0.2 x N 16 x C 4	2.4	60	●	
020-05084	2.0 x R0.5 x N 8 x C 4	2.4	50	●	
020-05124	2.0 x R0.5 x N 12 x C 4	2.4	50	●	
020-05164	2.0 x R0.5 x N 16 x C 4	2.4	60	●	

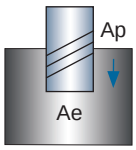


Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

● Stock item, subject to confirmation ◇ On request

Wide-cut — Slotting / Roughing

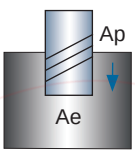


Ap = 0.25 x d [mm]
Ae = 1 x d [mm]

WE 235, WE 345

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc < 24	100 - 130	0.005	0.008	0.012	0.017	0.027	0.032	0.042	0.050	0.060
	HRc 24 - 35	85 - 110	0.004	0.007	0.011	0.016	0.025	0.029	0.039	0.046	0.055
	HRc > 35	75 - 100	0.003	0.006	0.010	0.014	0.022	0.027	0.035	0.042	0.050
H	HRc < 52	55 - 75	0.003	0.006	0.009	0.013	0.020	0.024	0.032	0.038	0.045
M	Stainless steels	50 - 70	0.003	0.006	0.009	0.013	0.021	0.025	0.033	0.040	0.047
K	Cast iron	90 - 120	0.004	0.008	0.012	0.017	0.027	0.032	0.042	0.050	0.060
N	Copper alloy	110 - 150	0.004	0.008	0.012	0.017	0.027	0.032	0.042	0.050	0.060
S	Titanium alloy	40 - 55	0.003	0.006	0.009	0.013	0.021	0.025	0.033	0.040	0.047
	High-temperature alloy	20 - 30	0.003	0.006	0.009	0.013	0.021	0.025	0.033	0.040	0.047

Wide-cut — Slotting / Pre-Finishing (HSC)



Ap = 0.1 x d [mm]
Ae = 1 x d [mm]

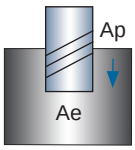
WE 235, WE 345

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc < 24	110 - 140	0.006	0.011	0.015	0.021	0.033	0.040	0.052	0.062	0.074
	HRc 24 - 35	95 - 125	0.005	0.010	0.014	0.019	0.031	0.037	0.048	0.057	0.068
	HRc > 35	80 - 105	0.004	0.009	0.012	0.017	0.028	0.033	0.043	0.051	0.062
H	HRc < 52	60 - 80	0.004	0.008	0.011	0.016	0.025	0.030	0.039	0.047	0.056
	HRc 52 - 55	50 - 65	0.003	0.007	0.010	0.014	0.022	0.026	0.034	0.040	0.048
M	Stainless steels	55 - 75	0.004	0.009	0.012	0.017	0.026	0.031	0.041	0.049	0.059
K	Cast iron	100 - 130	0.006	0.011	0.015	0.021	0.033	0.040	0.052	0.062	0.074
N	Copper alloy	125 - 165	0.006	0.011	0.015	0.021	0.033	0.040	0.052	0.062	0.074
S	Titanium alloy	45 - 60	0.004	0.009	0.012	0.017	0.026	0.031	0.041	0.049	0.059
	High-temperature alloy	20 - 30	0.004	0.009	0.012	0.017	0.026	0.031	0.041	0.049	0.059

Notes

- ▶ These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
- ▶ Recommend to use oil mist coolant for machining hardened steel.
- ▶ Recommend to apply herical or ramping for approaching into axial direction.
- ▶ Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

Wide-cut — Slotting / Pre-Finishing (HSC)

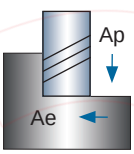


Ap = 0.02 x d [mm]
Ae = 1 x d [mm]

WE 235, WE 435, WE 345, WE 445, WE 645
WELS 235 (#1), WELS 435 (#2)

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc < 24	125 - 165	0.008	0.015	0.022	0.032	0.050	0.060	0.078	0.093	0.112
	HRc 24 - 35	110 - 150	0.007	0.014	0.021	0.029	0.046	0.055	0.072	0.086	0.103
	HRc > 35	95 - 125	0.007	0.013	0.019	0.026	0.042	0.049	0.065	0.077	0.093
H	HRc < 52	70 - 95	0.006	0.011	0.017	0.024	0.038	0.045	0.059	0.070	0.084
	HRc 52 - 55	60 - 80	0.005	0.010	0.015	0.021	0.033	0.039	0.051	0.060	0.073
	HRc 56 - 60	40 - 55	0.004	0.008	0.012	0.017	0.028	0.033	0.043	0.051	0.061
M	Stainless steels	55 - 75	0.006	0.012	0.018	0.025	0.040	0.047	0.062	0.073	0.088
K	Cast iron	100 - 130	0.008	0.015	0.022	0.032	0.050	0.060	0.078	0.093	0.112
N	Copper alloy	125 - 165	0.008	0.015	0.022	0.032	0.050	0.060	0.078	0.093	0.112
S	Titanium alloy	45 - 60	0.006	0.012	0.018	0.025	0.040	0.047	0.062	0.073	0.088
	High-temperature alloy	20 - 30	0.006	0.012	0.018	0.025	0.040	0.047	0.062	0.073	0.088

Wide-cut — Side milling / Roughing (HSC)



Ap = 1 x d [mm]
Ae = 0.2 x d [mm]

WE 235, WE 345, WE 445

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc < 24	120 - 155	0.006	0.011	0.014	0.020	0.032	0.038	0.050	0.060	0.072
	HRc 24 - 35	105 - 135	0.005	0.010	0.013	0.019	0.030	0.035	0.046	0.055	0.066
	HRc > 35	90 - 120	0.004	0.009	0.012	0.017	0.027	0.032	0.042	0.050	0.060
M	Stainless steels	75 - 100	0.004	0.008	0.011	0.016	0.026	0.030	0.040	0.047	0.057
K	Cast iron	130 - 170	0.006	0.011	0.014	0.020	0.032	0.038	0.050	0.060	0.072
N	Copper alloy	160 - 210	0.006	0.011	0.014	0.020	0.032	0.038	0.050	0.060	0.072
S	Titanium alloy	60 - 80	0.004	0.008	0.011	0.016	0.026	0.030	0.040	0.047	0.057
	High-temperature alloy	20 - 30	0.004	0.008	0.011	0.016	0.026	0.030	0.040	0.047	0.057

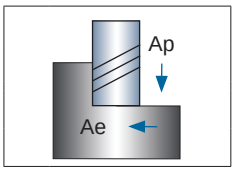
Notes

#1 For WELS 235, adjust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

#2 For WELS 435, adjust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

- ▶ For long cut length series, djust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
- ▶ These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
- ▶ Recommend to use oil mist coolant for machining hardened steel.
- ▶ Recommend to apply herical or ramping for approaching into axial direction.
- ▶ Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

Wide-cut — Side milling / Pre-Finishing (HSC)

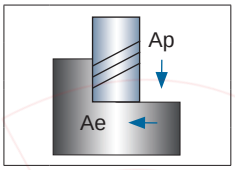


Ap = 1 x d [mm]
Ae = 0.1 x d [mm]

WE 235, WE 345, WE 445

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc < 24	135 - 175	0.007	0.013	0.018	0.025	0.040	0.048	0.062	0.074	0.089
	HRc 24 - 35	115 - 150	0.006	0.012	0.016	0.023	0.037	0.044	0.057	0.068	0.082
	HRc > 35	100 - 130	0.005	0.011	0.015	0.021	0.033	0.040	0.052	0.062	0.074
H	HRc < 52	75 - 100	0.005	0.009	0.013	0.019	0.030	0.036	0.047	0.056	0.067
	HRc 52 - 55	60 - 80	0.004	0.008	0.012	0.016	0.026	0.031	0.041	0.048	0.058
M	Stainless steels	85 - 110	0.005	0.010	0.014	0.020	0.032	0.038	0.049	0.059	0.071
K	Cast iron	150 - 195	0.007	0.013	0.018	0.025	0.040	0.048	0.062	0.074	0.089
N	Copper alloy	190 - 245	0.007	0.013	0.018	0.025	0.040	0.048	0.062	0.074	0.089
S	Titanium alloy	70 - 90	0.005	0.010	0.014	0.020	0.032	0.038	0.049	0.059	0.071
	High-temperature alloy	25 - 40	0.005	0.010	0.014	0.020	0.032	0.038	0.049	0.059	0.071

Wide-cut — Side milling / Finishing (HSC)



Ap = 1 x d [mm]
Ae = 0.02 x d [mm]

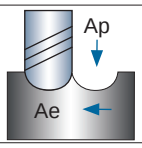
WE 235, WE 435, WE 345, WE 445, WE 645
WELS 235 (#1), WELS 435 (#2)

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc < 24	185 - 240	0.010	0.019	0.027	0.038	0.060	0.071	0.094	0.112	0.134
	HRc 24 - 35	160 - 210	0.009	0.018	0.025	0.035	0.055	0.066	0.086	0.103	0.123
	HRc > 35	140 - 180	0.008	0.016	0.022	0.031	0.050	0.059	0.078	0.093	0.111
H	HRc < 52	105 - 140	0.007	0.014	0.020	0.028	0.045	0.054	0.070	0.084	0.100
	HRc 52 - 55	85 - 115	0.006	0.012	0.017	0.025	0.039	0.046	0.061	0.073	0.087
	HRc 56 - 60	60 - 75	0.005	0.010	0.015	0.021	0.033	0.039	0.052	0.061	0.074
M	Stainless steels	85 - 110	0.008	0.015	0.021	0.030	0.048	0.056	0.074	0.088	0.106
K	Cast iron	150 - 195	0.010	0.019	0.027	0.038	0.060	0.071	0.094	0.112	0.134
N	Copper alloy	190 - 245	0.010	0.019	0.027	0.038	0.060	0.071	0.094	0.112	0.134
S	Titanium alloy	70 - 90	0.008	0.015	0.021	0.030	0.048	0.056	0.074	0.088	0.106
	High-temperature alloy	25 - 40	0.008	0.015	0.021	0.030	0.048	0.056	0.074	0.088	0.106

Notes

#1 For WELS 235, adjust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
#2 For WELS 435, adjust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
► For long cut length series, djust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
► Recommend to use oil mist coolant for machining hardened steel.
► Recommend to apply herical or ramping for approaching into axial direction.
► Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

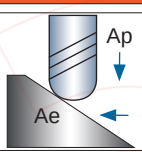
Wide-cut — Contour line / Roughing (HSC)



WB 235

	P						H					
	HRc < 24		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
Ap	0.10 x d		0.08 x d		0.08 x d		0.06 x d		0.05 x d		0.03 x d	
Ae	0.30 x d		0.24 x d		0.24 x d		0.18 x d		0.15 x d		0.09 x d	
Vc	94 - 252		94 - 200		85 - 170		75 - 125		58 - 95		43 - 70	
R [mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
R0.5	30000	1470	30000	1340	27000	1100	24600	940	18700	682	13800	430
R0.75	30000	1900	27500	1560	24500	1280	18600	950	14100	688	10400	440
R1.0	27200	2160	25000	1810	21500	1420	15600	970	11800	700	8700	450
R1.5	23500	2820	21300	2340	18000	1760	13300	1220	10100	870	7400	550
R2.0	17600	2820	16000	2360	13500	1750	10000	1220	7600	870	5600	560
R2.5	16000	3210	14500	2670	12300	2130	8000	1300	6100	930	4500	600
R3.0	13400	3340	12100	2790	10200	2130	6600	1300	5000	930	3700	600
R4.0	10000	3000	9000	2490	7700	2000	5000	1220	3800	870	2800	560
R5.0	8100	2740	7300	2270	6100	1810	4000	1120	3000	790	2200	500
R6.0	6700	2620	6000	2150	5100	1730	3300	1050	2500	750	1900	500

Wide-cut — Copy milling / Pre-Finishing (HSC)



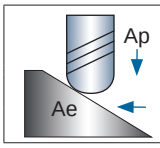
WB 235, WB 435 (#1) , WBLS 235 (#2), WBLS 435 (#3)

	P						H					
	HRc < 24		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
Ap	0.10 x d		0.10 x d		0.10 x d		0.08 x d		0.06 x d		0.05 x d	
Ae	0.10 x d		0.10 x d		0.10 x d		0.08 x d		0.06 x d		0.05 x d	
Vc	88 - 184		80 - 168		70 - 144		64 - 117		49 - 88		36 - 64	
R [mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
R0.5	28000	784	25400	660	22500	518	20600	474	15700	314	11600	209
R0.75	25200	1058	23100	901	20500	707	15600	538	12000	360	8700	235
R1.0	22800	1277	19400	1009	18000	828	14300	658	11000	440	7900	284
R1.5	19500	1680	17800	1430	15300	1070	12200	840	9400	580	6800	380
R2.0	14600	2080	13400	1740	11400	1330	9020	1050	7000	730	5100	470
R2.5	11700	1840	10700	1560	9200	1180	7300	940	5600	650	4100	420
R3.0	9800	1680	8900	1400	7700	1080	6100	840	4600	580	3400	380
R4.0	7400	1470	6700	1240	5800	930	4600	740	3500	510	2600	330
R5.0	5800	1280	5400	1080	4600	810	3600	650	2800	450	2000	290
R6.0	4900	1260	4500	1070	3800	800	3100	630	2300	440	1700	280

Notes

#1 For WB 435, adjust feed rate (Vf) 60% higher .
#2 For WBLS 235, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
#3 For WBLS 435, adjust feed rate (Vf) 60% higher then adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Wide-cut | **Copy milling / Finishing (HSC)**



WB 235, WB 435 (#1) , WBLS 235 (#2), WBLS 435 (#3)

	P			H		
	HRc < 24	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap	0.02 x d	0.02 x d	0.02 x d	0.02 x d	0.02 x d	0.02 x d
Ae	0.015 x d	0.015 x d	0.015 x d	0.015 x d	0.015 x d	0.015 x d
Vc	38 - 288	38 - 249	38 - 224	38 - 176	33 - 144	30 - 96

R	P						H					
	HRc < 24		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
[mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
R0.2	30000	360	30000	360	30000	360	30000	360	26800	320	23800	290
R0.25	30000	450	30000	450	30000	450	30000	450	26800	400	23800	360
R0.3	30000	540	30000	540	30000	540	30000	540	26800	480	23800	430
R0.4	30000	720	30000	720	30000	720	30000	720	26800	640	18100	430
R0.5	30000	900	26400	790	24000	720	24000	720	21400	640	14300	430
R0.75	30000	1350	26400	1190	24000	1080	24000	1080	20500	920	13600	610
R1.0	30000	1800	26400	1580	24000	1440	21900	1310	17900	1070	12000	720
R1.5	30000	2700	26300	2370	23800	2140	18700	1680	15300	1380	10200	920
R2.0	23000	2760	19800	2380	17800	2140	14000	1680	11400	1370	7700	920
R2.5	18300	2750	15800	2370	14200	2130	11200	1680	9200	1380	6100	920
R3.0	15300	2750	13200	2380	11900	2140	9400	1690	7700	1390	5100	920
R4.0	11400	2740	9800	2350	8900	2140	7000	1680	5800	1390	3800	910
R5.0	9200	2760	7900	2370	7100	2130	5600	1680	4600	1380	3000	900
R6.0	7700	2770	6600	2380	5900	2120	4600	1660	3800	1370	2600	940

Notes

#1 For WB 435, adjust feed rate (Vf) 60% higher .

#2 For WBLS 235, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

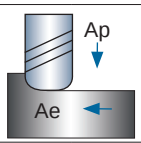
#3 For WBLS 435, adjust feed rate (Vf) 60% higher then adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

► These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.

► Recommend to use oil mist coolant for machining hardened steel.

► Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

Wide-cut | **Contour line / Roughing (HSC)**



WR 230, WRLS 230 (#1)

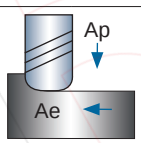
	P			H		
	HRc < 24	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]	0.05 x d	0.05 x d	0.04 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]	0.20 x d	0.20 x d	0.20 x d	0.20 x d	0.20 x d	0.20 x d
Vc [m / min]	86 - 154	74 - 133	58 - 105	47 - 84	40 - 71	32 - 55

d	R	P						H					
		HRc < 24		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
[mm]	[mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
1	0.2	27500	930	23600	690	18600	540	14900	340	12700	270	10200	180
1.5	0.2	20500	1160	17600	870	13900	610	11100	370	9500	310	7600	210
2	0.2,0.5	17500	1260	15000	980	11800	690	9400	430	8000	340	6400	230
3	0.2,0.5	16400	1740	14100	1390	11100	980	8900	600	7600	480	5800	310
4	0.2,0.5	12300	1470	10600	1160	8300	830	6700	520	5700	410	4300	260
5	0.5,1.0	9800	1290	8500	1030	6700	740	5300	460	4600	360	3500	230
6	0.5,1.0	8200	1330	7100	1060	5600	750	4500	470	3800	370	2900	240
8	0.5,1.0	6200	1180	5300	940	4200	670	3400	420	2900	330	2200	210
10	0.5,1.0	4900	1170	4300	930	3400	670	2700	410	2200	320	1800	210
12	0.5,1.0	4100	1070	3500	850	2800	620	2200	390	1900	300	1500	190

Notes

#1 For WRLS 230, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Wide-cut | **Contour line / Roughing (HSC)**



WR 430, WRLS 430 (#1)

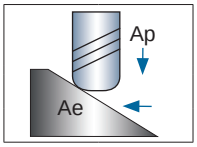
	P			H		
	HRc < 24	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]	0.05 x d	0.05 x d	0.04 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]	0.20 x d	0.20 x d	0.20 x d	0.20 x d	0.20 x d	0.20 x d
Vc [m / min]	86 - 154	74 - 133	58 - 105	47 - 84	40 - 71	32 - 55

d	R	P						H					
		HRc < 24		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
[mm]	[mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
1	0.2	27500	1490	23600	1100	18600	860	14900	540	12700	430	10200	290
1.5	0.2	20500	1860	17600	1390	13900	980	11100	590	9500	500	7600	340
2	0.2,0.5	17500	2020	15000	1570	11800	1100	9400	690	8000	540	6400	370
3	0.2,0.5	16400	2780	14100	2220	11100	1570	8900	960	7600	770	5800	500
4	0.2,0.5	12300	2350	10600	1860	8300	1330	6700	830	5700	660	4300	420
5	0.5,1.0	9800	2060	8500	1650	6700	1180	5300	740	4600	580	3500	370
6	0.5,1.0	8200	2130	7100	1700	5600	1200	4500	750	3800	590	2900	380
8	0.5,1.0	6200	1890	5300	1500	4200	1070	3400	670	2900	530	2200	340
10	0.5,1.0	4900	1870	4300	1490	3400	1070	2700	660	2200	510	1800	340
12	0.5,1.0	4100	1710	3500	1360	2800	990	2200	620	1900	480	1500	300

Notes

#1 For WRLS 430, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Wide-cut | **Inclined surface milling / Finishing (HSC)**



WR 230, WRLS 230 (#1)

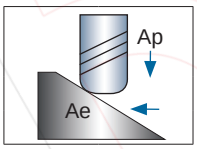
	P			H		
	HRc < 24	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.03 x d
Vc [m / min]	94 - 240	85 - 210	80 - 190	62 - 150	55 - 120	36 - 81

d	R	P						H					
		HRc < 24		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
[mm]	[mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
1	0.2	30000	910	27300	750	25500	640	20000	450	17500	370	11500	210
1.5	0.2	30000	1360	27300	1120	25500	960	20000	670	17500	550	11500	310
2	0.2,0.5	30000	1810	25200	1380	25500	1280	20000	900	17500	740	10600	380
3	0.2,0.5	25400	2300	19900	1640	20100	1490	15900	1090	12800	820	8600	470
4	0.2,0.5	19100	2300	15400	1680	15100	1510	11900	1070	9600	810	6500	470
5	0.5,1.0	15200	2200	12300	1620	12200	1450	9600	1040	7700	770	5100	430
6	0.5,1.0	12700	2280	10200	1670	10100	1480	8000	1050	6500	800	4300	450
8	0.5,1.0	9500	2260	7600	1660	7600	1470	6000	1060	4800	800	3200	450
10	0.5,1.0	7600	2220	6100	1620	6000	1450	4800	1040	3900	810	2600	450
12	0.5,1.0	6300	2220	5100	1630	5000	1460	3900	1030	3200	800	2100	450

Notes

#1: For WRLS 230, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Wide-cut | **Inclined surface milling / Finishing (HSC)**



WR 430, WRLS 430 (#1)

	P			H		
	HRc < 24	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.03 x d
Vc [m / min]	94 - 240	85 - 210	80 - 190	62 - 150	55 - 120	36 - 81

d	R	P						H					
		HRc < 24		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
[mm]	[mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
1	0.2	30000	1460	27300	1200	25500	1020	20000	720	17500	590	11500	340
1.5	0.2	30000	2180	27300	1790	25500	1540	20000	1070	17500	880	11500	500
2	0.2,0.5	30000	2900	25200	2210	25500	2050	20000	1440	17500	1180	10600	610
3	0.2,0.5	25400	3680	19900	2620	20100	2380	15900	1740	12800	1310	8600	750
4	0.2,0.5	19100	3680	15400	2690	15100	2420	11900	1710	9600	1300	6500	750
5	0.5,1.0	15200	3520	12300	2590	12200	2320	9600	1660	7700	1230	5100	690
6	0.5,1.0	12700	3650	10200	2670	10100	2370	8000	1680	6500	1280	4300	720
8	0.5,1.0	9500	3620	7600	2660	7600	2350	6000	1700	4800	1280	3200	720
10	0.5,1.0	7600	3550	6100	2590	6000	2320	4800	1660	3900	1300	2600	720
12	0.5,1.0	6300	3550	5100	2610	5000	2340	3900	1650	3200	1280	2100	720

Notes

#1: For WRLS 430, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

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