



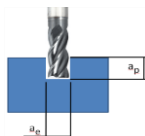
 <p>P Steel</p>	<p>Steel unalloyed (Group 1 - 5) Steel low alloyed (Group 6 - 9) Steel high alloyed (Group 10 und 11) Ferritic (Group 12) Martensitic (Group 13)</p>
 <p>M Stainless</p>	<p>Austenitic (Group 14.1) PH (Group 14.2) Duplex (Group 14.3) heat res. cast steel Ni>20% (Group 14.4)</p>
 <p>K Cast iron</p>	<p>Grey cast iron (Group 15 und 16) Spheroidal graphite (Group 17 und 18)</p>
 <p>N Non ferrous materials</p>	<p>Aluminum alloys (Group 21 – 22) Cast Aluminum (Group 23 – 25) Copper alloys (Group 26 – 28) Non ferrous(Group 29 – 30)</p>
 <p>S Heat resistant alloys and Titanium alloys</p>	<p>Group(33 – 35) Group(36 – 37)</p>
 <p>H Hardened materials</p>	<p>44 – 48 HRC Up to 57 HRC Up to 62 HRC</p>

P Steel

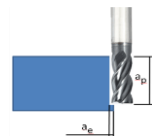
Tool Type	roughing	semi-finishing	finishing	trochoidal HSC	Characteristics	Benefits
EC-E4L	①	①	③	③	unequal pitch, Z=4, stable cutting edge, with honing	Smooth running, large flute space, Full slot, up to 2xD
EC-E5L	②	①	②	②	unequal pitch, Z=5, stable cutting edge, with honing	Smooth running, Trimming with full cutting length
ECR-B	①	/	/	④	Roughing profile, Z=4-7, Cutting length 1-2xD	Reduce cutting forces, full slot up to 2xD, use on weak workpiece,
ECR-B-MF	①	/	/	④	Roughing profile, Z=4 und Z=6, stabilere Schneidkante als ECR-B	Perfect on difficult to cut Steel- and cast materials, reduce cutting forces
EFS-E44-CF	①	①	②	④	unequal pitch, bigger flute space, Cutting edge similar Finishred EFS-B44	Troubleshooter on weak workpiece fixture, or thin walls
EC-E/H7-CF ECL-H7-CF	/	④	①	①	Z=7, Submicron IC902 unequal pitch, unequal helix	perfect also for hard machining up to 62 HRC, 1. choice for HSC-operations
EFS-B44	②	①	②	④	2 roughing and 2 finishing cutting edges Smooth cut	Roughing and finishing in one cut, perfect for Semi-Finishing
EFS-B44-C	①	①	②	④	Similar to EFS-B44 but with coolant holes into flutes	Better cooling in cutting zone while full slot Better chip evacuation
EC-H4M-E	②	①	②	③	unequal pitch, unequal helix, Z=4,	For general use, both stainless and steel materials
EC-H4S-E	①	①	②	③	Similar as EC-H4M-E, but cutting length 1xD	short, very stable type,
ECP-H7-CF	①	①	②	③	Chatterfree, z=7 for general use, for rough and semi-finish operations	Chip-splitters cut the chips to small segments, Prevents chipp jamming in the machine conveyor

① = first choice, ② = second choice

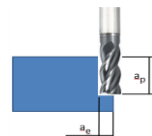
„ / “ = not to be used



Roughing



Trochoidal / dyn. Milling



general machining

ae	40% up to full slot	10% up to 20%	20% up to 35%
ap	1 x D	max. cutting length	2 x D

ISO	Group	IC900			IC608			IC300			
		IC900	IC608	IC300	IC900/IC902	IC608	IC300	IC900	IC608	IC300	
cutting speed Vc in m/min											
P	unalloyed	1 - 4	200	200	180	360	360	325	260	260	235
		5	180	180	160	325	325	290	235	235	210
P	low alloyed	6 - 7	140	140	140	260	260	240	190	190	175
		8 - 9	130	130	130	235	235	215	170	170	155
P	high alloyed, toolsteel	10	110	110	110	200	200	180	150	150	130
		11	100	100	100	180	180	180	130	130	110
P	ferritic martensitic	12	110	110	100	200	200	180	145	145	130
		13	70	70	60	125	125	110	105	105	80

ISO	Group	feed per tooth fz in mm																		
		Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20							
P	unalloyed	1 - 4	0,030	0,040	0,050	0,060	0,080	0,100	0,048	0,064	0,080	0,096	0,128	0,160	0,038	0,050	0,063	0,076	0,101	0,126
		5	0,030	0,040	0,050	0,060	0,080	0,100	0,048	0,064	0,080	0,096	0,128	0,160	0,038	0,050	0,063	0,076	0,101	0,126
P	low alloyed	6 - 7	0,028	0,037	0,047	0,056	0,074	0,093	0,044	0,058	0,073	0,087	0,116	0,145	0,035	0,046	0,058	0,069	0,092	0,115
		8 - 9	0,028	0,037	0,047	0,056	0,074	0,093	0,044	0,058	0,073	0,087	0,116	0,145	0,035	0,046	0,058	0,069	0,092	0,115
P	high alloyed, toolsteel	10	0,025	0,033	0,041	0,049	0,066	0,082	0,040	0,054	0,067	0,080	0,107	0,134	0,031	0,042	0,052	0,062	0,083	0,104
		11	0,025	0,033	0,041	0,049	0,066	0,082	0,040	0,054	0,067	0,080	0,107	0,134	0,031	0,042	0,052	0,062	0,083	0,104
P	ferritic martensitic	12	0,027	0,036	0,045	0,054	0,072	0,090	0,043	0,058	0,072	0,086	0,115	0,144	0,034	0,045	0,056	0,067	0,090	0,112
		13	0,025	0,034	0,042	0,050	0,067	0,084	0,040	0,053	0,067	0,080	0,106	0,133	0,031	0,042	0,052	0,062	0,083	0,104

M Stainless Steel

Tool Type	roughing	semi-finishing	finishing	trochoidal HSC	Characteristics	Benefits
EC-H4M S / L / XL	①	①	③	③	unequal pitch/ helix, Z=4, sharp cutting edge, smooth cut	smooth running, large flute space, Full slot, up to 1.5xD
EC-H5M	②	①	②	②	unequal pitch/ helix, Z=5, stable cutting edge, smooth cut	smooth running, trimming with full depth of cut
ECP-E3L ECP-E4L	①	②	/	③	chip splitter, Z=3 and Z=4, sharp cutting edge	reduce cutting forces, large flute space, also for weak workpieces
EC-H7-CF	/	④	①	①	Z=7, Submicron IC902 unequal pitch, unequal helix	perfect also for hard machining up to 62 HRC, 1. choice for HSC-machining, Long tool life due to Z=7
EFS-B44	②	①	②	④	2 roughing and 2 finishing cutting edges Smooth cut	Roughing and finishing in one cut, perfect for Semi-Finishing
EFS-B44-C	①	①	②	④	Similar to EFS-B44 but with coolant holes into flutes	Better cooling in cutting zone while full slot Better chip evacuation
EFS-E44-CF	①	①	②	④	unequal pitch, bigger flute space, Cutting edge similar Finished EFS-B44	Troubleshooter on weak workpiece fixture, or thin walls
ECK-H4M-CFR (C)	①	①	②	③	Different cutting edge geometry, Z=4 stable cutting edge, C = coolant into flute space	1. Choice for machining Titanium, coolant into cutting zone and better chip evacuation
ECY-S5-CFR	①	①	②	③	Z=5, Sub-flute with variable helix for stable machining	Dedicated geometry for stainless steel and PH

① = first choice, ② = second choice

„ / “ = not to be used

		IC900 general steel machining					IC300 wet machining, also difficult to cut materials		
		Roughing		Trochoidal / dyn. Milling			general machining		
ae		40% up to full slot		10% up to 20%			20% up to 35%		
ap		1 x D		max. cutting length			2 x D		
Gruppe		IC900 IC300		IC900 IC902 / IC903 IC300			IC900 IC902 / IC903 IC300		
ISO		cutting speed Vc in m/min							
M	austenitic 14.1	80	80	150	190	150	110	130	110
	PH 14.2	70	70	120	160	120	90	105	90
	Duplex 14.3	60	50	100	120	85	65	70	55
	heat res. cast steel Ni>20% 14.4	75	75	130	170	130	90	110	90

		feed per tooth fz in mm																	
		Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20
M	austenitic 14.1	0,024	0,032	0,041	0,049	0,065	0,081	0,038	0,050	0,063	0,075	0,100	0,125	0,030	0,040	0,051	0,065	0,850	0,120
	PH 14.2	0,024	0,032	0,041	0,049	0,065	0,081	0,038	0,050	0,063	0,075	0,100	0,125	0,030	0,040	0,051	0,065	0,085	0,120
	Duplex 14.3	0,020	0,027	0,037	0,044	0,060	0,075	0,035	0,048	0,060	0,073	0,095	0,102	0,026	0,036	0,048	0,056	0,076	0,095
	heat res. cast steel Ni>20% 14.4	0,023	0,030	0,035	0,044	0,065	0,080	0,038	0,050	0,063	0,075	0,100	0,125	0,028	0,038	0,050	0,060	0,080	0,100

K Cast iron

Tool Type	roughing	Semi-finishing	finishing	Trochoidal HSC	Characteristics	Benefits
EC-E4L	①	①	③	③	unequal pitch, Z=4, stable cutting edge, with honing	Smooth running, large flute space, Full slot, up to 2xD
EC-E5L	②	①	②	②	unequal pitch, Z=5, stable cutting edge, honing	smooth running, trimming with full depth of cut
ECR-B	①	/	/	④	Roughing profile, Z=4-7, Cutting length of 1-2xD	Reduce cutting forces due to profile, full slot up to 1,5xD, also for weak workpieces
ECR-B-MF	①	/	/	④	Roughing profile, Z=4 und Z=6, Cutting edge more stable than ECR-B	Perfect on difficult to cut cast materials, reduce cutting forces
EFS-E44-CF	①	①	②	④	unequal pitch, bigger flute space, Cutting edge similar Finished EFS-B44	Troubleshooter on weak workpiece fixture, or thin walls
EC-H7-CF	/	④	①	①	Z=7, Submicron IC902 unequal pitch, unequal helix	perfect also for hard machining up to 62 HRC, 1. choice for HSC-machining, Long tool life due to Z=7
EC-H Multiflute	/	/	①	③ Take care of Dynamic	per every mm diameter one cutting edge, unequal pitch/ helix, smooth cut, Max. ae = 6% of tool diameter	Perfect for finishing, hard machining with IC902 Smooth running, long tool life due to high number of teeth
EC-H4M-E	②	①	②	③	unequal pitch, unequal helix, Z=4,	For general use, both stainless and steel materials

① = first choice, ② = second choice

„ / “ = not to be used

		IC900 general machining		IC902 / IC903 trimming and hard machining																
		Roughing		Trochoidal / dyn. Milling		general machining														
		ae		10% up to 20%		20% up to 35%														
		ap		max. cutting length		2 x D														
Gruppe		IC900		IC900		IC902 / IC903		IC900		IC902 / IC903										
ISO		Cutting speed Vc in m/min																		
K	grey cast iron	15 - 16	250						450		540		325		390					
	spheroidal cast	17 - 18	200						360		450		260		325					
		Feed per tooth fz in mm																		
K	grey cast iron	15 - 16	0,033	0,044	0,055	0,066	0,088	0,110	0,052	0,069	0,087	0,104	0,138	0,173	0,041	0,055	0,069	0,083	0,110	0,138
	spheroidal cast	17 - 18	0,030	0,040	0,050	0,060	0,080	0,100	0,048	0,064	0,080	0,096	0,128	0,160	0,038	0,050	0,063	0,076	0,101	0,126

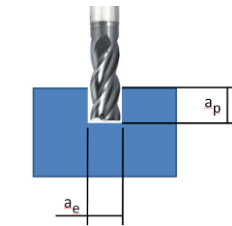


Non ferrous materials

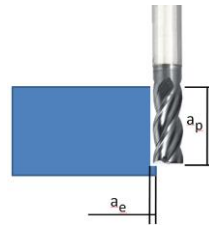
Tool Type	roughing	Semi-finishing	finishing	Trochoidal HSC	Characteristics	Benefits
ECA-H3-CF	①	②	②	②	unequal pitch/ helix, Z=3, assorted corner radii	smooth running, roughing and finishing, full slot up to 1,5xD
ECA-H3-CF-C	①	②	②	②	Identical with ECA-H3-CF Coolant exits into flute space	Better chip evacuation, Direct cooling on cutting zone
ECAP-H3-CF-C	①	②	②	②	Identical with ECA-H3-CF Central coolant hole	chip evacuation to direction of shank while full slot operation
ECA-H4-CF	②	①	①	①	Dynamically balanced, Z = 4 Depth of cut up to 2xD	Perfect for trimming with large ae Full slot up to 1xD
ECR-B3-R-C	①	/	/	/	Roughing profile Coolant exits into flute space	Very good chip evacuation, low cutting force Direct cooling on cutting zone
EPX (CFK)	①	②	③	③	Left/right helix, Compression cutter	Roughing and finishing, avoid delamination
EPN C / D / E (CFK)	③	①	①	③	Boring and milling (Type D) trimming and circular milling (Type C) Trimming (Type F)	Roughing and finishing,

① = first choice, ② = second choice

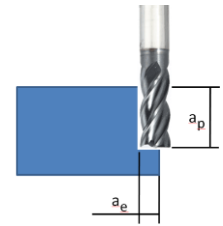
„ / “ = not to be used



roughing and finishing



Trochoidal / dyn. milling



general machining

ae	40% up to full slot	10% up to 20%	20% up to 35%
ap	1 x D	max. cutting length	2 x D

Group	IC08	IC08 coated	IC02	IC2018	IC08	IC08 coated	IC02	IC2018	IC08	IC08 coated	IC02	IC2018
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ISO		cutting speed Vc in m/min											
N	Al-forging alloy	21-22	400	-	-	-	720	-	-	-	520	-	-
	cast-Al (Si>10%)	23-25	180	250	-	-	324	450	-	-	234	325	-
	copper alloys	26-27	300	-	-	-	540	-	-	-	390	-	-
		28	-	-	-	-	-	-	-	-	-	-	-
	E-CuZn	150	-	-	-	270	-	-	-	195	-	-	-
non ferrous	29-30	-	-	150	200	-	-	270	360	-	-	195	260

		feed per tooth fz in mm																		
		Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	
N	Al-forging alloy	21-22	0,042	0,056	0,070	0,084	0,112	0,140	0,067	0,089	0,112	0,134	0,178	0,223	0,053	0,070	0,088	0,105	0,140	0,175
	cast-Al (Si>10%)	23-25	0,035	0,046	0,058	0,069	0,092	0,115	0,056	0,074	0,093	0,111	0,148	0,185	0,044	0,058	0,073	0,087	0,116	0,145
	copper alloys	26-27	0,045	0,060	0,075	0,090	0,120	0,150	0,072	0,096	0,120	0,144	0,192	0,240	0,057	0,076	0,095	0,114	0,152	0,190
		28	0,035	0,046	0,058	0,069	0,092	0,115	0,056	0,074	0,093	0,111	0,148	0,185	0,044	0,058	0,073	0,087	0,116	0,145
	E-CuZn	0,035	0,046	0,058	0,069	0,092	0,115	0,056	0,074	0,093	0,111	0,148	0,185	0,044	0,058	0,073	0,087	0,116	0,145	
non ferrous	29-30	0,020	0,026	0,033	0,039	-	-	0,032	0,042	0,053	0,063	-	-	0,025	0,034	0,042	0,050	-	-	

S

Superalloys and Ti-alloys

Tool Type	roughing	Semi-finishing	finishing	Trochoidal HSC	Characteristics	Benefits
EC-H4M S / L / XL	①	①	③	③	unequal pitch/ helix, Z=4, Sharp cutting edge, smooth cut	Smooth running, large flute space, Full slot up to 1,5xD
EC-H5M-CFR	②	①	②	②	unequal pitch/ helix, Z=5, Stable cutting edge, smooth cut	Smooth running, Trimming with full depth of cut
ECK-H4M-CFR (C)	①	①	②	③	Different cutting edge geometry, Z=4 Stable cutting edge, C = coolant into flute space	1. Choice for Ti machining, C = coolant into cutting zone and better chip evacuation
ECK-H7/9-CFR	/	②	②	①	unequal pitch/ helix, Z=7 and Z=9 smooth cut	Smooth running, Finishing and Semi-Finish
EC-H7-CF	/	④	①	①	unequal pitch/ helix, Z=7, Submicron IC902	perfect also for hard machining up to 62 HRC, 1. choice for HSC-machining, Long tool life due to Z=7
ECH-B-6	/	②	②	①	Z = 6, smooth cut	Smooth running, Finishing and Semi-Finish
EC-H Multiflute	/	/	①	③ Take care of Dynamic	per every mm diameter one cutting edge, unequal pitch/ helix, smooth cut, Max. ae = 6% of tool diameter	Perfect for finishing, hard machining with IC902 Smooth running, long tool life due to high number of teeth

① = first choice ② = second choice

„ / “ = not to be used

		IC900 general machining		IC902 / IC903 trimming		IC900 Trochoidal / dyn. Milling		IC902 / IC903 Trochoidal / dyn. Milling		IC900 general machining		IC902 / IC903 general machining								
		40% up to full slot		1 x D		10% up to 20%		max. cutting length		20% up to 35%		2 x D								
		Group IC900		Group IC902 / IC903		Group IC900		Group IC902 / IC903		Group IC900		Group IC902 / IC903								
		cutting speed Vc in m/min																		
S	Ni-Base alloys	33-35	27	-	-	49	63	35	46	59	72	59	72							
S	Ti and Ti-alloys	36-37	45	-	-	81	100	59	72	59	72	59	72							
		feed per tooth fz in mm																		
		Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	
S	Ni-Base alloys	33-35	0,020	0,027	0,034	0,041	0,054	0,068	0,032	0,042	0,053	0,063	0,084	0,105	0,025	0,033	0,042	0,050	0,066	0,083
S	Ti and Ti-alloys	36-37	0,024	0,032	0,041	0,049	0,065	0,081	0,038	0,050	0,063	0,075	0,100	0,125	0,030	0,040	0,051	0,061	0,081	0,101

H

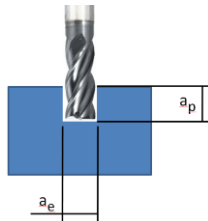
Hardened materials

Tool Type	roughing	Semi-finishing	finishin	Trochoidal HSC	Characteristics	Benefits
ECR-B	④	/	/	④	Roughing profile, Z=4-7, Depth of cut von 1-2xD	reduce cutting force due to roughing profile, full slot up to 1,5xD , also for weak workpieces
ECR-B-MF	③	/	/	③	Roughing profile, Z=4 and Z=6, More stable cutting edge than ECR-B	Perfect on difficult to cut cast materials, reduce cutting forces
EBRF-T	②	/	/	④	Ball nose cutter with roughing profile , also at radius section, Z = 3 and Z = 4	Smooth running, perfect for roughing up to 48 HRC, if radius on root is needed
EC-H7-CF	/	② max 15% ae	①	①	unequal pitch/ helix, Z=7, Submicron IC902	perfect also for hard machining up to 62 HRC, 1. choice for HSC-machining, Long tool life due to Z=7
EC-B6-H	/	② max 15% ae	①	①	Z=6, Submicron IC702 Special Geometry for hard machining	Specialist for hard milling up to 65 HRC, 1. Choice for HSC-machining,
ECH-B-6	/	② max 15% ae	②	①	Z = 6, Smooth cut	Smooth running Finishing and Semi-Finish
EC-H Multiflute	/	/	①	② Take care of Dynamic	per every mm diameter one cutting edge, unequal pitch/ helix, smooth cut, Max. ae = 6% of tool diameter	Perfect for finishing, hard machining with IC902 Smooth running, long tool life due to high number of teeth

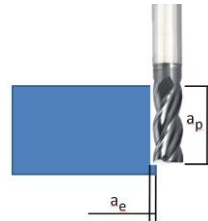
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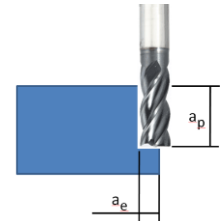
full slot operation in hardened material from 55 HRC is basically NOT successful!
Please prefer roughing strategy "trochoid/dynamic"
only DRY operation for hard machining



Roughing



Trochoidal / dyn. Milling



general machining

ae	40% up to full slot	10% up to 20%	20% up to 35%
ap	1 x D	max. cutting length	2 x D

Group	IC900	IC902 / IC903	IC702	IC900	IC902 / IC903	IC702	IC900	IC902 / IC903	IC702
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Cutting speed Vc in m/min

ISO		IC900	IC902 / IC903	IC702	IC900	IC902 / IC903	IC702	IC900	IC902 / IC903	IC702
H	44-48 HRC	80	80	80	144	144	144	104	104	104
	up to 57 HRC	-	60	60	-	108	108	-	78	78
	up to 62 HRC	-	-	40	-	72	72	-	52	52

Feed per tooth fz in mm

		Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20
H	44-48 HRC	0,025	0,034	0,042	0,050	0,067	0,084	0,040	0,054	0,067	0,080	0,107	0,134	0,031	0,042	0,052	0,062	0,083	0,104
	up to 57 HRC	0,020	0,026	0,033	0,039	0,052	0,065	0,032	0,042	0,053	0,063	0,084	0,105	0,025	0,033	0,042	0,050	0,066	0,083
	up to 62 HRC	-	-	-	-	-	-	0,026	0,034	0,043	0,051	0,068	0,085	0,021	0,028	0,035	0,041	0,055	0,069

only limited possible (choose HSC Strategy)