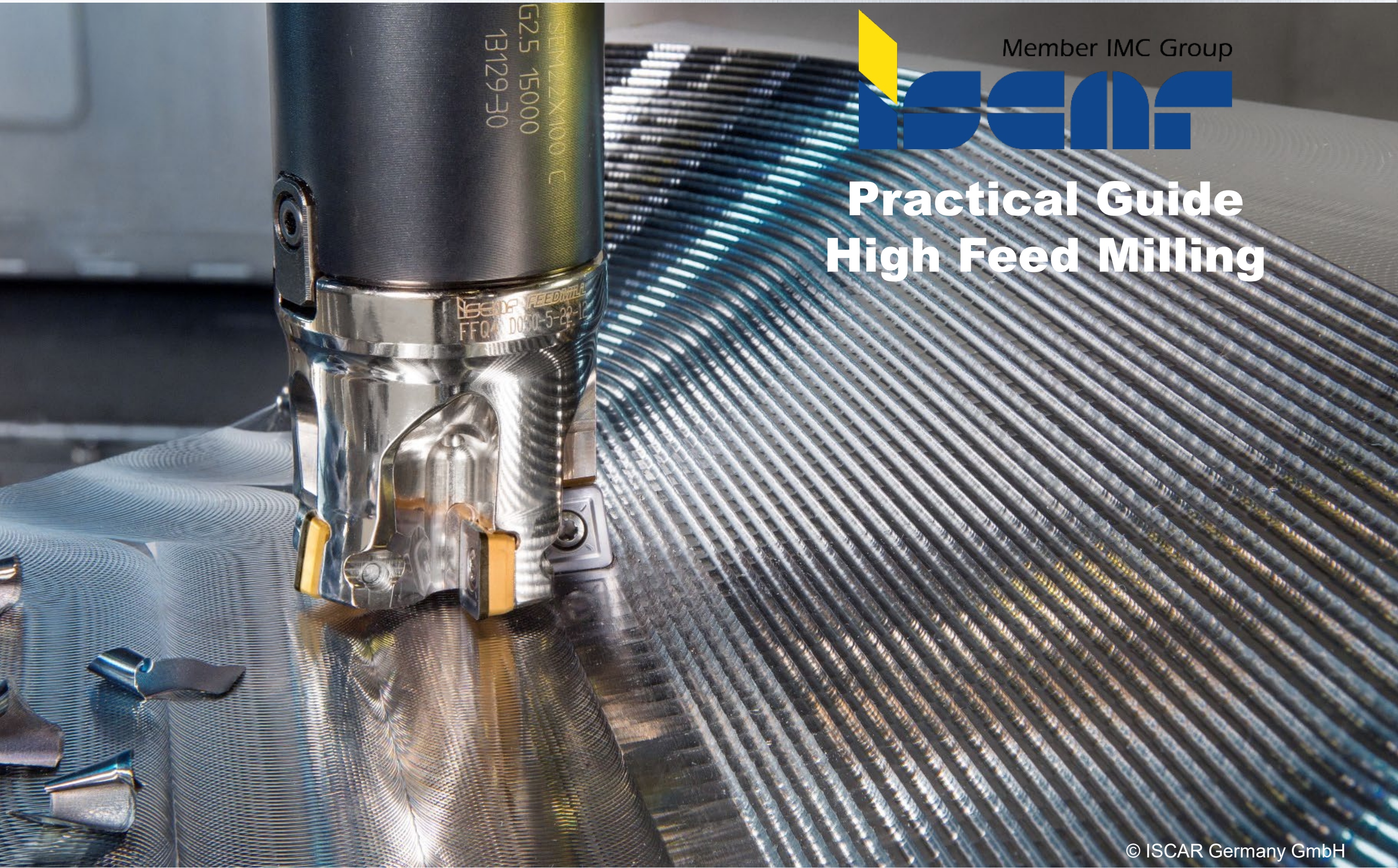
Where Innovation Never Stops

Member IMC Group

ISCAR



Practical Guide High Feed Milling

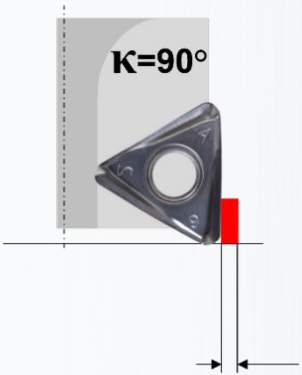
Explanation High Feed Milling

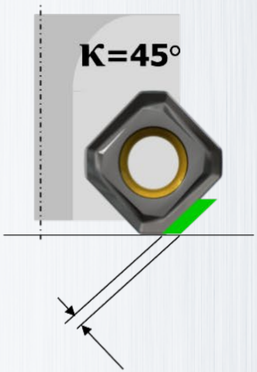
High feed for more metal removal rates

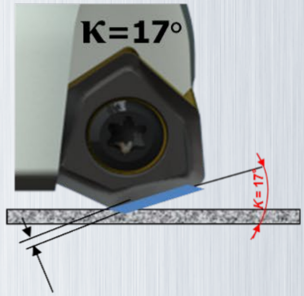
- The prerequisite is a dynamic machine. The principle of „high-feed milling“ is based on high feed rates at low cutting depths.

- Multipass milling from the contour in several steps with low cutting dephts, allowing „high-feed milling“ to fully exploit ist advantage of high feed rates.

- The small cutting edge angle minimize the radial effect of the cutting force and increase the axial effect. The **tooth feed** for a high-feed milling cutter with 9° cutting angle **can be increased by a factor of 6** in order to achieve the same chip thickness with 90° milling cutter.
  This allows significantly **higher feed rates to be achieved**.







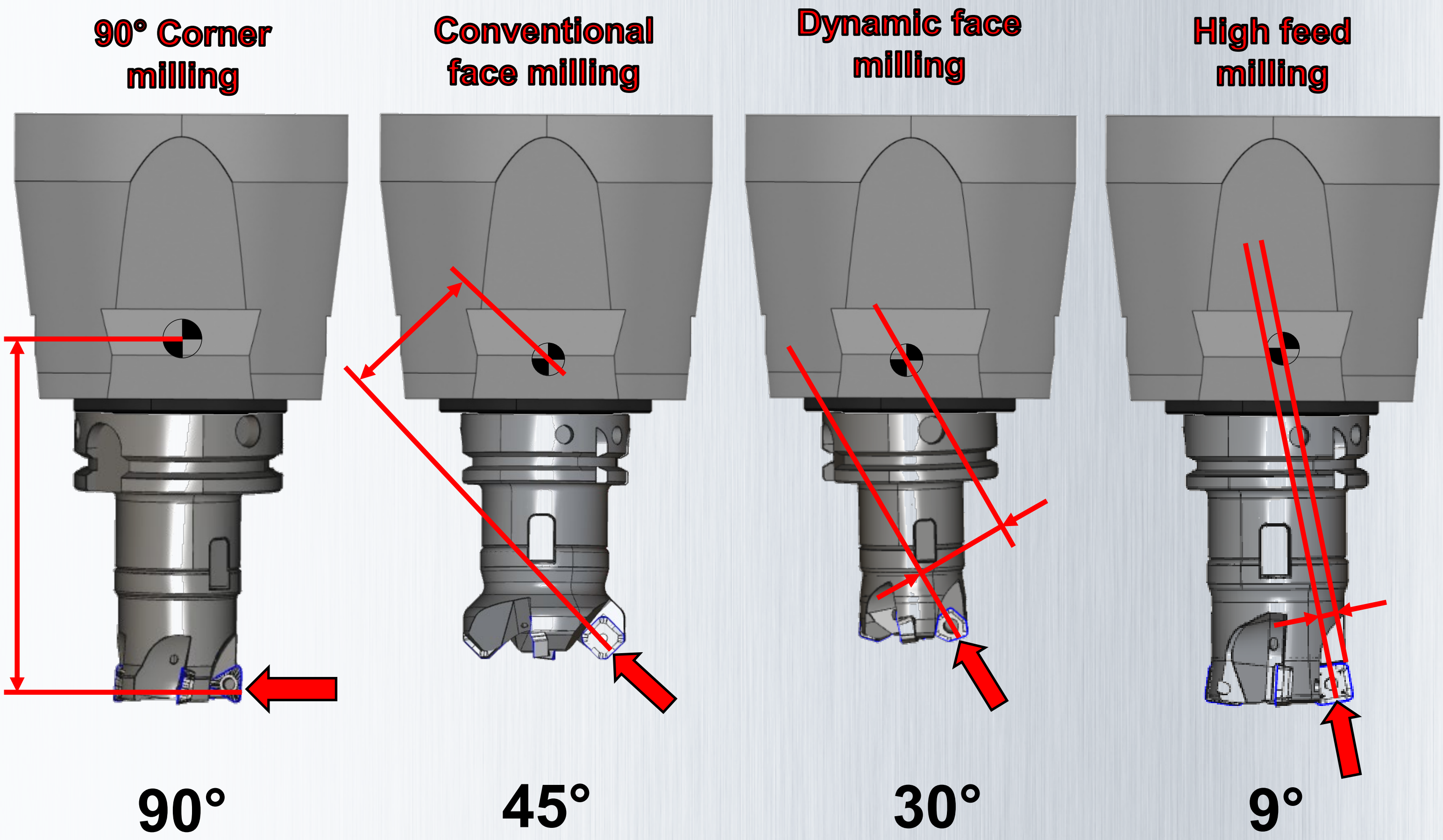
$h = f_z = 0{,}2932\,mm$

$f_z = \frac{0{,}2932\,mm}{\sin 45°} = 0{,}4146\,mm$

$f_z = \frac{0{,}2923\,mm}{\sin 17°} = 1{,}0\,mm$

$f_z = \frac{0{,}2923\,mm}{\sin 9°} = 1{,}87\,mm$

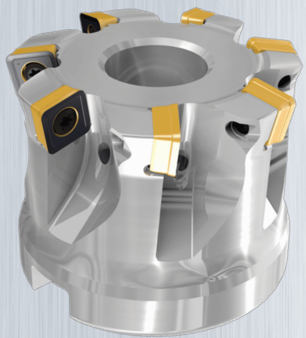
Forces and displacement during milling

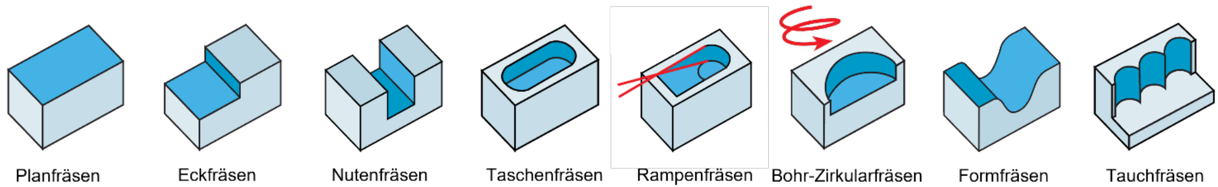


A smaller cutting angle reduces displacement and vibrations during machining.

Advantages in high feed milling

- Significantly increased metal removal rate (especially in comparison to 90° milling cutters)
- Reduces the chip thickness and the load on the cutting edges
- High process reliability even with long overhang from 4 up to 7 x D
- Low radial deflection and a soft cut on the component
- Reduces heat in the cutting zone
- Extremely versatile in use





Recommendation high feed milling systems

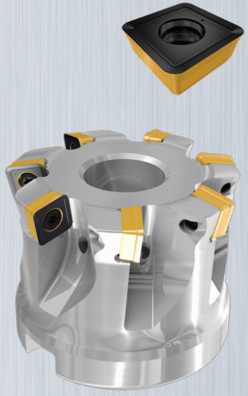
<table>
<tr><th>Ø - Area</th><th>Productive solution</th><th>Universal Solution</th><th>Economic Solution</th></tr>
<tr><td>1 - 10 mm</td><td>SOLID FEED MILL
S. 11 Z 2 - 6</td><td>SOLID FEED MILL
S. 11 Z 2 - 6</td><td>NANO3FEED
NANO FEED MILL
S. 10 Z 2 - 3</td></tr>
<tr><td>10 - 16 mm</td><td>MULTI FEED MASTER
S. 11 Z 2 - 6</td><td>MULTI FEED MASTER
S. 11 Z 2 - 6</td><td rowspan="2">MICRO3FEED
MF 300 ENDMILL
S. 9 Z 2 - 6</td></tr>
<tr><td>16 - 25 mm</td><td>MICRO3FEED
MF 300 ENDMILL
S. 9 Z 4 - 6</td><td>LOGIQ4FEED
HIGH FEED MILLING
S. 6 Z 2 - 4</td></tr>
<tr><td>25 - 40 mm</td><td>LOGIQ4FEED
HIGH FEED MILLING
S. 6 Z 4 - 6</td><td rowspan="2">MILL4FEED
HIGH FEED
S. 5 Z 5 - 8</td><td rowspan="2">MILL4FEED
HIGH FEED
S. 5 Z 5 - 8</td></tr>
<tr><td>40 - 63 mm</td><td>MILL4FEED
HIGH FEED
S. 5 Z 5 - 8</td></tr>
<tr><td>63 - 125 mm</td><td>LOGIQ4FEED
HIGH FEED MILLING
S. 6 Z 5 - 10</td><td>MILL4FEED
HIGH FEED
S. 5 Z 6 - 10</td><td>NEOFEED
HIGH FEED LINE
S. 5 Z 6 - 8</td></tr>
<tr><td>125 - 160 mm</td><td>MILL4FEED
HIGH FEED
S. 5 Z 8 - 10</td><td>MILL4FEED
HIGH FEED
S. 5 Z 8 - 10</td><td>HELI6FEED
UPFEED LINE
S. 8 Z 9 - 11</td></tr>
</table>

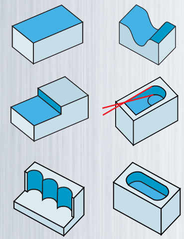
High part of face milling
(Low part of milling on the wall)

Pockets, contour and helical Milling
(High part of milling on the wall)

MILL4FEED HIGH FEED — The All-Rounder

- ✓ Positive, single-sided inserts with 4 cutting edges
- ✓ Very soft cut
- ✓ Effective machining for face and profile milling
- ✓ Universally using
- ✓ Flexible use in the ISO P / M / K / S / H



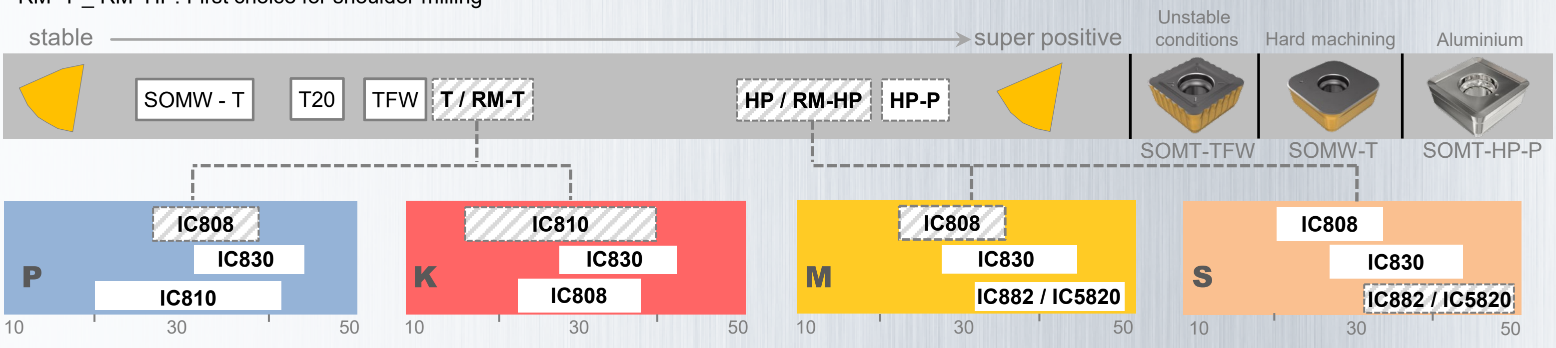


Product selection / chip formers / cutting grades

- End mill: Ø 22 - 35 mm *FFQ4 D…W/M_*
- Shell mill: Ø 40 - 160 mm *FFQ4 D_*
- Connection: shank / arbor / Flexfit
- Pitch: Coarse and fine pitch with internal coolant
- Insert sizes: 09 / 12 / 17

Recommended chip formers & cutting grades

RM–T _ RM–HP: First choice for shoulder milling



LOGIQ4FEED
HIGH FEED MILLING

The Specialist for Pocket Milling

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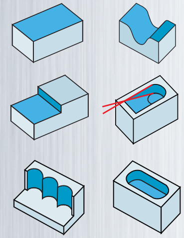
- ✓ Double-sided insert with 4 cutting edges
- ✓ Very soft cut
- ✓ Effective machining in pocket and profile milling
- ✓ High shoulder clearance
- ✓ Flexible use for ISO P / M / K / S / H

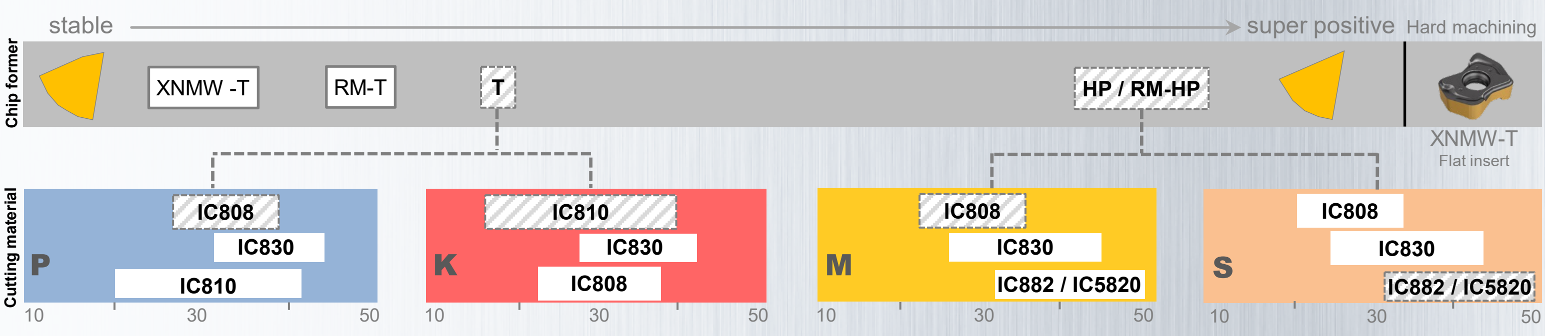


Product selection / chip former / cutting materials

- End mill: Ø 12 - 32 mm *FFX4 ED…M / MM_*
- Shell mill: Ø 32 - 125 mm *FFX4 FD_*
- Connections: shank / arbor / Flexfit / Multi Master
- Insert sizes: 04 / 08

Recommended chip formers & cutting grades

RM–T: Reinforced cutting edge geometry for milling interrupted cut
RM–HP: Modified radius geometry for demanding ISO M / S materials



NEOFEED
HIGH FEED LINE

The Economical All-Rounder

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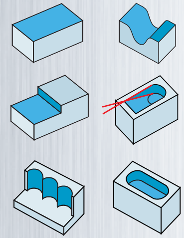
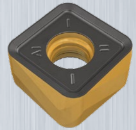
- ✓ Double-sided insert with 8 cutting edges
- ✓ Very soft cut
- ✓ Effective machining in face and profile milling
- ✓ Excellent price per insert
- ✓ Flexible use for ISO P / M / K / S / H

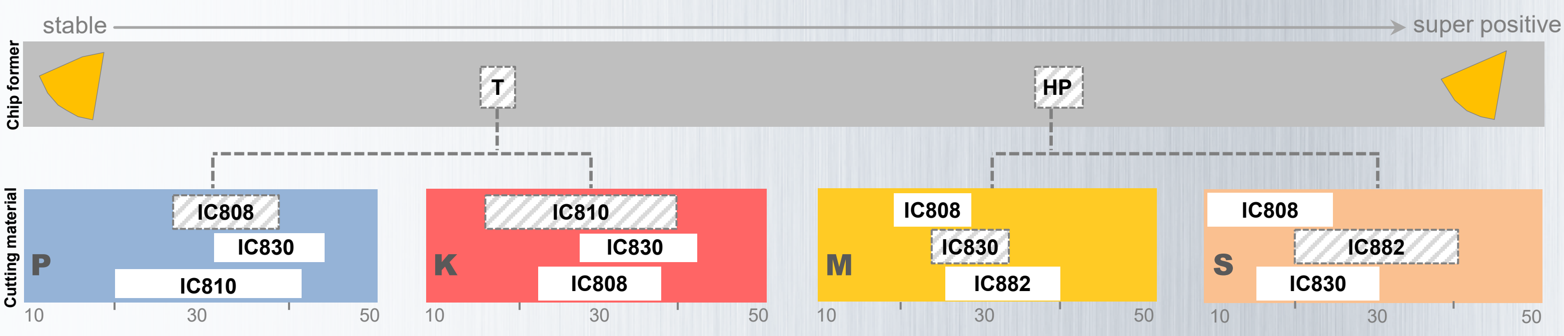


Product selection / chip former / cutting materials

- Shell mill: Ø 50 - 100 mm *FFQ8 / MFQ8 D_*
- Connections: arbor
- Insert sizes: 12
- Type: MF_22° = Medium feed (a_p 3,0 mm)
  > V_f bis 6.000 mm/min
  FF_12° = Fast feed (a_p 1,5 mm)
  > V_f bis 15.000 mm/min



Recommended chip formers & cutting grades



HELI6FEED UPFEED LINE — The Flexible Problem Solver

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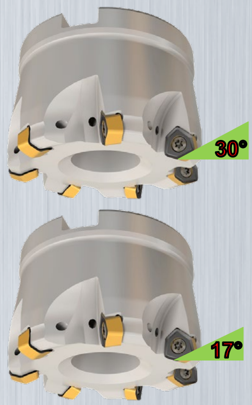
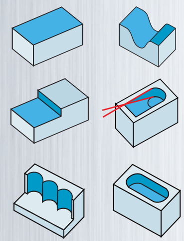
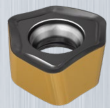
- ✓ Double-sided insert with 6 cutting edges
- ✓ Low power consumption
- ✓ Effective machining of all applications
- ✓ Wide product range
- ✓ Flexible use for ISO P / M / K / S / H



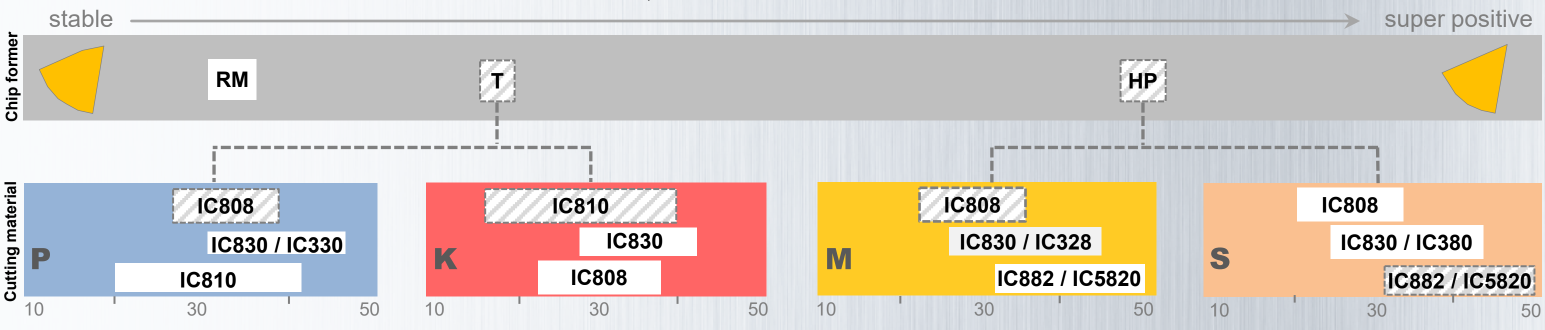


Product selection / chip former / cutting materials

- End mill: Ø 16 - 40 mm *FF / MF FWX_*
- Shell mill: Ø 40 - 160 mm *FF / MF EWX…M / MM_*
- Connections: shank / arbor / Flexfit / Multi Master
- Insert sizes: 04 / 05 / 07 / 08
- Type: MF_30° = Medium feed (a_p 1,5 - 3,0 mm)
  > V_f bis 6.000 mm/min
  FF_17° = Fast feed (a_p 0,8 - 1,5 mm)
  > V_f bis 15.000 mm/min



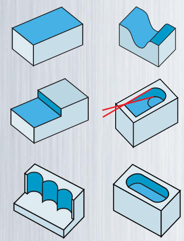
Recommended chip formers & cutting grades



MICRO3FEED
MF 300 ENDMILL

The Economical Alternative for Solid Carbide

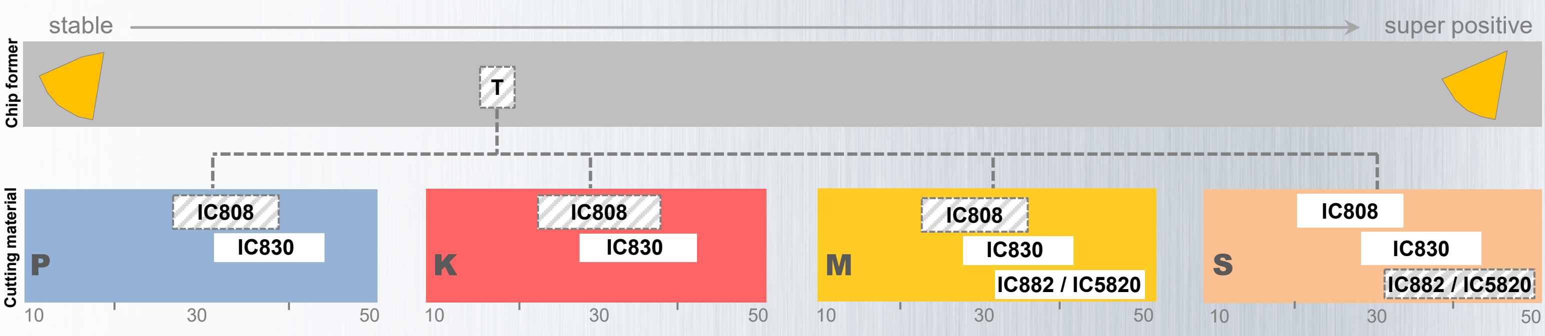
- ✓ Positive, single-sided inserts with 3 cutting edges
- ✓ Very soft cut
- ✓ Effective machining in pocket and profile milling
- ✓ High cost efficiency compared to solid carbide
- ✓ Flexible use for ISO P / M / K / S



Product selection / chip former / cutting materials

- End mill: Ø 08 - 25 mm *FFT3 EFM_03*
- Multi - Master: Ø 10 - 25 mm *FFT3 EFM…MM_03*
- Connections: Cylindrical shank / Multi - Master
- Insert sizes: 03

Recommended chip formers & cutting grades



NAN3FEED NANO FEED MILL

The Economical Alternative for Solid Carbide

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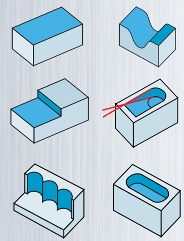
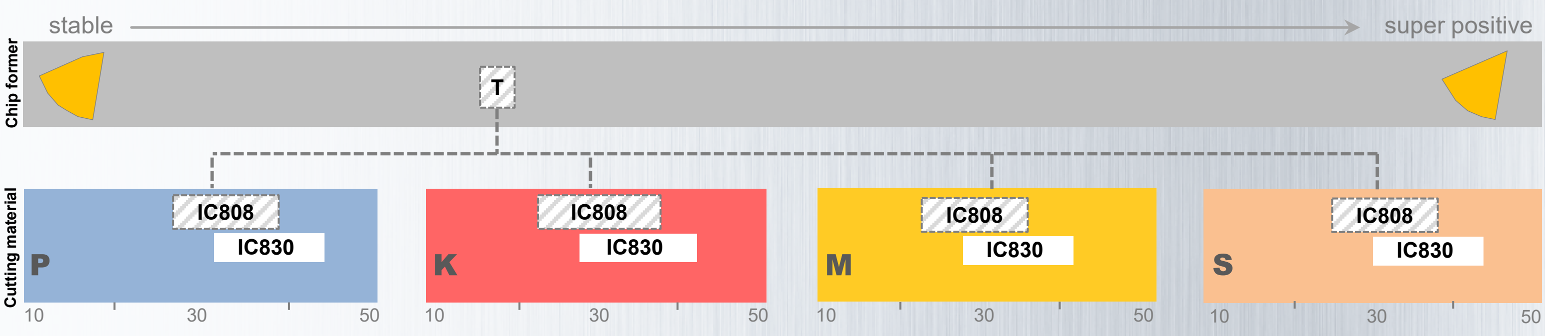
- ✓ Positive, single-sided inserts with 3 cutting edges
- ✓ Very soft cut
- ✓ Effective machining in pocket and profile milling
- ✓ High cost efficiency compared to solid carbide
- ✓ Flexible use for ISO P / M / K / S / H



Product selection / chip former / cutting materials

- End mill: Ø 8 - 10 mm *FFT3 EFM_02*
- Multi - Master: Ø 8 - 10 mm *FFT3 EFM…MM_02*
- Connections: Cylindrical shank / Multi - Master
- Insert sizes: 02

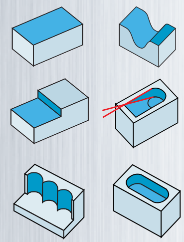
Recommended chip formers & cutting grades



SOLID FEED MILL
MULTI FEED MASTER

The Precise and Productive High-Feed milling cutter

- ✓ Precise and sharp cutting geometry
- ✓ High number of teeth / wide range
- ✓ Flexible for ISO P / M / K / S / H



Solid Carbide End mill

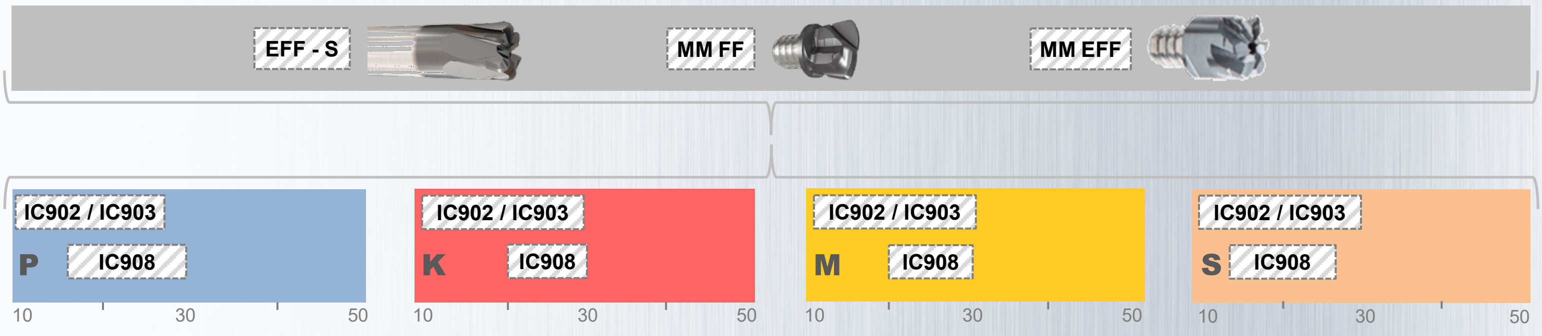
- Diameter range: Ø 1 - 20 mm *EFF-S…*
- Teeth number: Z 2 - 6

Multi Master Exchangeable Head

- Diameter range: Ø 10 - 20 mm *MM FF…*
- Number of teeth / thread: Z 2 / T06 – T12

- Diameter range: Ø 8 - 25 mm *MM EFF…*
- Number of teeth / thread: Z 4 & 6 / T05 – T15
- Internal cooling: Ø 10 – 20 mm

Start recommendation cutting materials



Material Numbers According to Workpiece Materials

ISO	Material		Condition	Tensile strength $[N/mm^2]$	Hardness HB	Material No.	Material reference number																			
P	Non-alloy steel and cast steel, free cutting steel	< 0.25 %C	Annealed	420	125	1	1.0715	1.0718	1.0721	1.0722	1.0736	1.0737	1.0972	1.0976	1.0982	1.0984	1.0986	1.1121	1.1141	1.1151	1.2083	1.8900				
		>= 0.25 %C	Annealed	650	190	2	1.0406	1.0416	1.0473	1.0501	1.0503	1.0511	1.0540	1.0551	1.0553	1.0577	1.0726	1.0727	1.1157	1.1158	1.1166	1.1170	1.1178	1.1180	1.1181	1.1183
							1.1191	1.1206	1.1213	1.5423																
		< 0.55 %C	Quenched and tempered	850	250	3	1.0481	1.0503	1.0614	1.0616	1.0618	1.1165	1.1167	1.1186	1.1191	1.1201	1.7242	1.7337	1.7362							
		>= 0.55 %C	Annealed	750	220	4	1.0535	1.0601	1.0603	1.0605	1.1203	1.1209	1.1221	1.1231	1.1248	1.1269	1.1274	1.1663								
			Quenched and tempered	1000	300	5	1.0070	1.7238	1.7701																	
	Low alloy steel and cast steel (less than 5% of alloying elements)		Annealed	600	200	6	1.0116	1.0841	1.0904	1.0961	1.2067	1.2108	1.2210	1.2241	1.2311	1.2330	1.2419	1.2510	1.2542	1.2550	1.2713	1.2721	1.2842	1.3501	1.3505	1.3505
							1.5024	1.5025	1.5026	1.5027	1.5028	1.5120	1.5415	1.5419	1.5622	1.5732	1.5752	1.6587	1.6657	1.7015	1.7033	1.7035	1.7045	1.7131	1.7139	1.7176
							1.7220	1.7223	1.7225	1.7228	1.7262	1.7321	1.7335	1.7335	1.7380	1.7715	1.8509									
			vergütet	930	275	7	1.0038	1.5710	1.5755	1.6523	1.6546	1.6565	1.7218	1.7733	1.7755	1.8070										
				1000	300	8	1.0503	1.2332	1.3401	1.5736	1.6511	1.7361	1.8159	1.8161	1.8515	1.8523										
				1200	350	9	1.4882	1.5864																		
	High alloyed steel, cast steel, and tool steel		Annealed	680	200	10	1.0347	1.0401	1.0723	1.2080	1.2083	1.2085	1.2162	1.2210	1.2311	1.2312	1.2316	1.2343	1.2344	1.2363	1.2379	1.2436	1.2581	1.2601	1.2606	
							1.3343	1.5662	1.5680																	
			Quenched and tempered	1100	325	11	1.3202	1.3207	1.3243	1.3246	1.3247	1.3249	1.3255	1.3343	1.3348	1.3355	1.4718	1.4935								
	Stainless ferritic and stainless martensitic steel		Ferritic and martensitic	680	200	12	1.400	1.4001	1.4002	1.4005	1.4006	1.4016	1.4027	1.4028	1.4086	1.4104	1.4112	1.4113	1.4340	1.4417	1.4418	1.4510	1.4511	1.4512	1.4720	1.4724
							1.4742	1.4747	1.4749	1.4762	1.4871															
			Martensitic	820	240	13	1.4021	1.4031	1.4034	1.4057	1.4313	1.4544	1.4546	1.4922	1.4923											
M	Stainless steel and stainless cast steel		Austenitic	600	180	14	1.4301	1.4305	1.4306	1.4308	1.4310	1.4311	1.4312	1.4350	1.4362	1.4371	1.4401	1.4404	1.4406	1.4408	1.4410	1.4429	1.4435	1.4436	1.4438	1.4439
							1.4440	1.4449	1.4460	1.4462	1.4500	1.4504	1.4521	1.4539	1.4541	1.4542	1.4545	1.4547	1.4550	1.4552	1.4568	1.4571	1.4581	1.4583	1.4585	1.4821
							1.4823	1.4828	1.4833	1.4845	1.4878	1.4891	1.4893	1.4948	1.4980											
K	Grey cast iron (GG)		Ferritic and martensitic		180	15	0.6010	0.6015	0.6020	0.6660	0.7040															
			Perlitic		260	16	0.6020	0.6025	0.6030	0.6035	0.6040															
	Cast iron nodular (GGG)		Ferritic		160	17	0.7033	0.7043	0.7050	0.7652	0.7660															
			Perlitic		250	18	0.7060	0.7070																		
	Malleable cast iron		Ferritic		130	19	0.8055	0.8135	0.8145																	
			Perlitic		230	20	0.8035	0.8040	0.8045	0.8065	0.8155	0.8165	0.8170													
N	Aluminium Knetlegierungen		Not curable		60	21	3.0205	3.0255	3.3315																	
			Cured		100	22	3.1325	3.1655	3.2315	3.4345	3.2381	3.2382														
	Aluminum wrought alloys	<=12% Si	Not curable		75	23	3.2383	3.2581	3.3561	3.5101	3.5103	3.5812	3.5912													
			Cured		90	24	2.1871	3.1754	3.2163	3.2371	3.2373	3.5106														
		>12% Si	Over-eutectic		130	25																				
	Copper alloys	>1% Pb	Free cutting steel		110	26	2.1090	2.1096	2.1098	2.1182																
			Brass		90	27	2.0240	2.0321	2.0590	2.0592	2.0596	2.1293														
			Electrolytic copper		100	28	2.0060	2.0375	2.0966	2.0975	2.1050	2.1052	2.1292	2.4764												
	Non-ferrous		Fibreplastic/Duroplastics			29																				
			Hard rubber			30																				
S	High temp. Alloys	Fe Basis	Annealed		200	31	1.4558	1.4562	1.4563	1.4864	1.4865	1.4958	1.4562	1.4563	1.4864	1.4865	1.4958	2.4668								
			Cured		280	32	1.4977																			
		Ni or Co Basis	Annealed		250	33	2.4360	2.4603	2.4610	2.4630	2.4630	2.4642	2.4856	2.4858												
			Cured		350	34	2.4375	2.4631	2.4668	2.4694	2.4955	2.4668	2.4670	2.4662	2.4964											
			Bast		320	35	2.4669	2.4685	2.4810	2.4973	3.7115															
	Titanium and Ti-alloys		Pure	Rm = 400	Rm= 400(	36	3.7025	3.7225	2.4674																	
			Alpha+Beta alloys	Rm = 1050	Rm=	37	3.7124	3.7145	3.7165	3.7185	3.7195															
H	Hardened steel		Cured		55 HRC	38	1.1545	1.1545	1.2762	1.4125	1.6746															
			Cured		60 HRC	39																				
	Chilled cast iron		Cast		400	40	0.9620	0.9325	0.9630	0.9640	0.9650	0.9655	1.4841													
	Cast iron		Cured		55 HRC	41	0.9635	0.9645																		

Feed per Tooth for MILL4FEED FFQ4… 09 / 12 / 17

MILL4FEED HIGH FEED

ISO	Material		Hardness HB	Material No.	V_c [m/min]	FFQ4 - 09			FFQ4 - 12					FFQ4 - 17		
						SOMT09… T & RM-T	SOMT09… HP & RM-HP	SOMW09…T	SOMT12… T & RM-T	SOMT12… HP & RM-HP	SOMT12… HP-P	SOMT12… T20	SOMW12…T	SOMT17… T & RM-T	SOMT17… HP & RM-HP	SOMW17…T
P	Non-alloy steel and cast steel, free cutting steel	< 0.25 %C >= 0.25 %C < 0.55 %C >= 0.55 %C	125 190 250 220 300	1 2 3 4 5	140-180-250	fz = 1.5-0.8-0.5 ap = 0.4-0.8-1.2	-	fz = 1.5-0.8-0.5 ap = 0.4-0.8-1.2	fz = 2.0-0.9-0.5 ap = 0.5-0.9-1.5	-	-	-	fz = 2.0-0.9-0.5 ap = 0.5-0.9-1.5	fz = 2.0-1.4-0.5 ap = 0.5-2.4-3.0	-	fz = 2.0-1.4-0.5 ap = 0.5-2.2-3.0
P	Low alloy steel and cast steel (less than 5 % of alloying elements)		200 275 300	6 7 8	130-160-200	fz = 1.5-0.8-0.5 ap = 0.4-0.8-1.2	-	fz = 1.5-0.8-0.5 ap = 0.4-0.8-1.2	fz = 2.0-0.9-0.5 ap = 0.5-0.9-1.5	-	-	-	fz = 2.0-0.9-0.5 ap = 0.5-0.9-1.5	fz = 2.0-1.3-0.5 ap = 0.5-2.2-3.0	-	fz = 2.0-1.3-0.5 ap = 0.5-2.2-3.0
P	Low alloy steel and cast steel (less than 5 % of alloying elements)		350	9	130-140-180	fz = 1.4-0.7-0.5 ap = 0.4-0.8-1.2	-	fz = 1.4-0.7-0.5 ap = 0.4-0.8-1.2	fz = 1.8-0.8-0.5 ap = 0.5-0.8-1.5	-	-	-	fz = 1.8-0.8-0.5 ap = 0.5-0.8-1.5	fz = 1.8-1.1-0.5 ap = 0.5-2.0-3.0	-	fz = 1.8-1.1-0.5 ap = 0.5-2.0-3.0
P	High alloyed steel, cast steel and tool steel		200 325	10 11	120-130-180	fz = 1.4-0.6-0.5 ap = 0.4-0.8-1.2	-	fz = 1.4-0.6-0.5 ap = 0.4-0.8-1.2	fz = 1.8-0.7-0.5 ap = 0.5-0.9-1.5	-	-	-	fz = 1.8-0.7-0.5 ap = 0.5-0.9-1.5	fz = 1.8-1.1-0.5 ap = 0.5-2.0-3.0	-	fz = 1.8-1.1-0.5 ap = 0.5-2.0-3.0
P	Stainless ferritic and stainless martensitic steel		200 240	12 13	90-110-160	fz = 1.4-0.7-0.5 ap = 0.4-0.7-1.2	-	fz = 1.4-0.7-0.5 ap = 0.4-0.7-1.2	fz = 1.8-0.8-0.5 ap = 0.5-0.9-1.5	-	-	-	fz = 1.8-0.8-0.5 ap = 0.5-0.9-1.5	fz = 1.8-1.0-0.5 ap = 0.5-2.0-3.0	-	fz = 1.8-1.0-0.5 ap = 0.5-2.0-3.0
M	Stainless steel and stainless cast steel		180	14	80-140-180	-	fz = 1.4-0.7-0.4 ap = 0.4-0.6-1.2	-	-	fz = 1.8-0.8-0.4 ap = 0.4-0.8-1.5	-	-	-	-	fz = 2.0-1.0-0.5 ap = 0.4-2.0-3.0	-
K	Grey cast iron (GG)		180 260	15 16	140-180-280	fz = 1.5-1.0-0.5 ap = 0.4-1.0-1.2	-	fz = 1.5-1.0-0.5 ap = 0.4-1.0-1.2	fz = 2.0-1.2-0.5 ap = 0.5-1.2-1.5	-	-	fz = 2.0-1.2-0.5 ap = 0.4-1.2-1.5	fz = 2.0-1.2-0.5 ap = 0.5-1.2-1.5	fz = 2.0-1.4-0.5 ap = 0.5-2.4-3.0	-	fz = 2.0-1.4-0.5 ap = 0.5-2.4-3.0
K	Cast iron nodular (GGG) Malleable cast iron		160 250 130 230	17 18 19 20	120-160-250	fz = 1.5-1.0-0.5 ap = 0.4-1.0-1.2	-	fz = 1.5-1.0-0.5 ap = 0.4-1.0-1.2	fz = 2.0-1.2-0.5 ap = 0.5-1.2-1.5	-	-	fz = 2.0-1.2-0.5 ap = 0.4-1.2-1.5	fz = 2.0-1.2-0.5 ap = 0.5-1.2-1.5	fz = 2.0-1.4-0.5 ap = 0.5-2.4-3.0	-	fz = 2.0-1.4-0.5 ap = 0.5-2.4-3.0
N	Aluminum wrought alloys		60	21	400-530-640	-	-	-	-	-	fz = 1.8-1.2-0.5 ap = 0.5-1.2-1.5	-	-	-	-	-
N	Aluminum wrought alloys		100	22		-	-	-	-	-		-	-	-	-	-
N	Aluminum cast alloys	Si <=12%	75	23		-	-	-	-	-		-	-	-	-	-
N	Aluminum cast alloys	Si <=12%	90	24		-	-	-	-	-		-	-	-	-	-
N	Aluminum cast alloys	>12% Si	130	25	240-280-500	-	-	-	-	-	fz = 1.8-1.0-0.5 ap = 0.5-1.0-1.5	-	-	-	-	-
N	Copper alloys	>1% Pb	110	26	240-280-550	-	-	-	-	-	fz = 1.8-1.2-0.5 ap = 0.5-1.2-1.5	-	-	-	-	-
N	Copper alloys		90	27		-	-	-	-	-		-	-	-	-	-
N	Copper alloys		100	28	160-220-400	-	-	-	-	-		-	-	-	-	-
N	Non-ferrous			29	-	-	-	-	-	-		-	-	-	-	-
N	Non-ferrous			30	-	-	-	-	-	-		-	-	-	-	-
S	High temp. alloys	Fe Basis	200 280	31 32	20-60-100	-	fz = 1.0-0.6-0.4 ap = 0.4-0.7-1.2	-	-	fz = 1.0-0.7-0.4 ap = 0.4-0.9-1.5	-	-	-	-	fz = 1.4-0.8-0.5 ap = 0.4-1.5-3.0	-
S	High temp. alloys	Ni or Co Basis	250 350 320	33 34 35	20-35-80	-	fz = 1.0-0.4-0.3 ap = 0.4-0.5-1.2	-	-	fz = 1.0-0.4-0.3 ap = 0.4-0.6-1.5	-	-	-	-	fz = 1.4-0.6-0.5 ap = 0.4-1.5-3.0	-
S	Titanium and Ti alloys		Rm= 400 Rm= 1050	36 37	30-50-80	-	fz = 1.0-0.7-0.4 ap = 0.4-0.6-1.2	-	-	fz = 1.0-0.7-0.4 ap = 0.4-0.9-1.5	-	-	-	-	fz = 1.4-0.8-0.5 ap = 0.4-1.5-3.0	-
H	Hardened steel		45 -55 HRC	38	40-60-120	fz = 1.2-0.5-0.3 ap = 0.4-0.6-1.2	-	fz = 1.2-0.5-0.3 ap = 0.4-0.6-1.2	fz = 1.2-0.7-0.3 ap = 0.5-0.8-1.5	-	-	-	fz = 1.4-0.7-0.3 ap = 0.5-0.8-1.5	fz = 1.6-1.0-0.3 ap = 0.5-1.5-2.5	-	fz = 1.6-1.0-0.3 ap = 0.5-1.5-2.5
H	Hardened steel		55-58 HRC	39	30-50-80	-	-	fz = 0.8-0.4-0.2 ap = 0.2-0.4-0.8	-	-	-	-	fz = 0.8-0.4-0.2 ap = 0.2-0.4-0.8	-	-	-
H	Hardened steel		58-62 HRC	39	30-40-70	-	-	fz = 0.5-0.3-0.2 ap = 0.1-0.2-0.4	-	-	-	-	fz = 0.5-0.3-0.2 ap = 0.1-0.2-0.4	-	-	-
H	Chilled cast iron		400	40	60-80-140	fz = 1.2-0.7-0.5 ap = 0.4-0.7-1.2	-	fz = 1.2-0.7-0.5 ap = 0.4-0.7-1.2	fz = 1.6-0.8-0.5 ap = 0.5-1.0-1.5	-	-	-	fz = 1.6-0.8-0.5 ap = 0.5-1.0-1.5	fz = 1.6-1.0-0.5 ap = 0.5-2.0-1.5	-	fz = 1.6-1.0-0.5 ap = 0.5-2.0-1.5
H	Cast iron		55 HRC	41	30-60-120	fz = 1.2-0.5-0.3 ap = 0.4-0.6-1.2	-	fz = 1.2-0.5-0.3 ap = 0.4-0.6-1.2	fz = 1.2-0.7-0.3 ap = 0.5-0.8-1.5	-	-	-	fz = 1.2-0.7-0.3 ap = 0.5-0.8-1.5	fz = 1.6-0.8-0.3 ap = 0.5-1.2-2.5	-	fz = 1.6-0.8-0.3 ap = 0.5-1.2-2.5
Radius for programming:						**2,5 mm**		**3 mm**	**3 mm**				**4 mm**	**5,5 mm**		**6,4 mm**

Feed per Tooth for LOGIQ4FEED FFX4… 04 – 08

ISO	Material		Condition	Tensile Strength [N/mm²]	Hardness HB	Material No.	V_c [m/min]	FFX4 - 04 XNMU04… T & RM-T	FFX4 - 04 XNMU04… HP & RM-HP	FFX4 - 04 XNMW04… T	FFX4 - 08 XNMU08… T	FFX4 - 08 XNMU08… HP
P	Non-alloy steel and cast steel, free cutting steel	< 0.25 %C	Annealed	420	125	1	140-180-250	fz = 1.2-1.0-0.4 ap = 0.2-0.7-0.8	-	fz = 1.2-1.0-0.4 ap = 0.2-0.7-0.8	fz = 1.2-1.0-0.2 ap = 0.2-1.6-2.0	-
		>= 0.25 %C	Annealed	650	190	2						
		< 0.55 %C	Quenched and tempered	850	250	3						
		>= 0.55 %C	Annealed	750	220	4						
			Quenched and tempered	1000	300	5						
	Low alloy steel and cast steel (less than 5 % of alloying elements)		Annealed	600	200	6	130-160-200	fz = 1.2-0.9-0.4 ap = 0.2-0.7-0.8	-	fz = 1.2-0.9-0.4 ap = 0.2-0.7-0.8	fz = 1.2-0.9-0.2 ap = 0.2-1.6-2.0	-
			Quenched and tempered	930	275	7						
				1000	300	8						
				1200	350	9	130-140-180	fz = 1.2-0.8-0.4 ap = 0.2-0.6-0.8	-	fz = 1.2-0.8-0.4 ap = 0.2-0.6-0.8	fz = 1.2-0.8-0.2 ap = 0.2-1.4-2.0	-
	High alloyed steel, cast steel and tool steel		Annealed	680	200	10	120-130-180	fz = 1.2-0.7-0.4 ap = 0.2-0.6-0.8	-	fz = 1.2-0.7-0.4 ap = 0.2-0.6-0.8	fz = 1.2-0.7-0.2 ap = 0.2-1.4-2.0	-
			Quenched and tempered	1100	325	11						
	Stainless ferritic and stainless martensitic steel		Ferritic, martensitisch	680	200	12	100-150-180	fz = 1.2-0.8-0.4 ap = 0.2-0.6-0.8	-	fz = 1.2-0.8-0.4 ap = 0.2-0.6-0.8	fz = 1.2-0.8-0.2 ap = 0.2-1.4-2.0	-
			Martensitic	820	240	13						
M	Stainless steel and stainless cast steel		Austenitic	600	180	14	80-140-180	-	fz = 0.9-0.6-0.4 ap = 0.2-0.6-0.8	-	-	fz = 0.8-0.6-0.2 ap = 0.5-1.4-2.0
K	Grey cast iron (GG)		Ferritic/ martensitic		180	15	140-180-280	fz = 1.2-1.0-0.4 ap = 0.2-0.7-0.8	-	fz = 1.2-1.0-0.4 ap = 0.2-0.7-0.8	fz = 1.2-1.0-0.2 ap = 0.2-1.6-2.0	-
			Pearlitic		260	16						
	Cast iron nodular (GGG)		Ferritic		160	17	120-160-250	fz = 1.2-1.0-0.4 ap = 0.2-0.7-0.8	-	fz = 1.2-1.0-0.4 ap = 0.2-0.7-0.8	fz = 1.2-1.0-0.2 ap = 0.2-1.6-2.0	-
			Pearlitic		250	18						
	Malleable cast iron		Ferritic		130	19						
			Pearlitic		230	20						
S	High temp. alloys	Fe Basis	Annealed		200	31	20-60-100	-	fz = 0.9-0.6-0.4 ap = 0.2-0.6-0.8	-	-	fz = 0.8-0.6-0.2 ap = 0.5-1.2-2.0
			Cured		280	32						
		Ni or Co Basis	Annealed		250	33	20-35-80	-	fz = 0.9-0.4-0.4 ap = 0.2-0.7-0.8	-	-	fz = 0.8-0.4-0.2 ap = 0.5-1.0-2.0
			Cured		350	34						
			Cast		320	35						
	Titanium and Ti alloys		Pure titanium	Rm = 400	Rm= 400	36	30-50-80	-	fz = 0.9-0.6-0.4 ap = 0.2-0.6-0.8	-	-	fz = 0.8-0.6-0.2 ap = 0.5-1.2-2.0
			Alpha+beta alloy	Rm = 1050	Rm= 1050	37						
H	Hardened steel		Hardened	HARDOX	45 -55 HRC	38	40-60-120	fz = 0.8-0.4-0.2 ap = 0.2-0.5-0.8	-	fz = 0.8-0.4-0.2 ap = 0.2-0.5-0.8	fz = 1.0-0.6-0.2 ap = 0.2-0.8-2.0	-
			Hardened		55-58 HRC	39	30-50-80	fz = 0.8-0.4-0.2 ap = 0.2-0.5-0.8	-	fz = 0.8-0.4-0.2 ap = 0.2-0.5-0.8	-	-
					58-62 HRC		30-40-70	-	-	-	-	-
	Chilled cast iron		Cast		400	40	60-80-140	fz = 1.2-0.6-0.5 ap = 0.4-0.6-1.2	-	fz = 1.2-0.6-0.5 ap = 0.4-0.6-1.2	fz = 1.0-0.8-0.2 ap = 0.2-1.0-2.0	-
	Cast iron		Hardened		55 HRC	41	30-60-120	fz = 0.7-0.4-0.2 ap = 0.2-0.5-0.8	-	fz = 0.7-0.4-0.2 ap = 0.2-0.5-0.8	fz = 1.0-0.6-0.2 ap = 0.2-0.7-2.0	-
Radius for programming:								**1,8 mm**		**1,72 mm**	**4,0 mm**	

Feed per Tooth for NEOFEED FFQ8... 12

NEOFEED
HIGH FEED LINE

ISO	Material		Condition	Tensile Strength [N/mm²]	Hardness HB	Material No.	v_c [m/min]	FFQ8 SZMU12... T	FFQ8 SZMU12... HP	MFQ8 SZMU12... T	MFQ8 SZMU12... HP
P	Non-alloy steel and cast steel, free cutting steel	< 0.25 %C	Annealed	420	125	1	140-180-250	fz = 1.5-1.2-0.4 ap = 0.5-1.0-1.5	-	fz = 1.2-1.0-0.2 ap = 0.5-1.6-3.0	-
		>= 0.25 %C	Annealed	650	190	2					
		< 0.55 %C	Quenched and tempered	850	250	3					
		>= 0.55 %C	Annealed	750	220	4					
			Quenched and tempered	1000	300	5					
	Low alloy steel and cast steel (less than 5 % of alloying elements)		Annealed	600	200	6	130-160-200	fz = 1.5-1.0-0.4 ap = 0.5-1.0-1.5	-	fz = 1.2-0.9-0.2 ap = 0.5-1.6-3.0	-
			Quenched and tempered	930	275	7					
				1000	300	8					
				1200	350	9	130-140-180	fz = 1.5-0.8-0.4 ap = 0.5-1.0-1.5	-	fz = 1.2-0.8-0.2 ap = 0.5-1.4-3.0	-
	High alloyed steel, cast steel and tool steel		Annealed	680	200	10	120-130-180	fz = 1.8-0.7-0.5 ap = 0.4-1.0-1.5	-	fz = 1.2-0.7-0.2 ap = 0.5-1.4-3.0	-
			Quenched and tempered	1100	325	11					
	Stainless ferritic and stainless martensitic steel		Ferritic, martensitisch	680	200	12	100-150-180	fz = 1.8-0.8-0.5 ap = 0.4-1.0-1.5	-	fz = 1.2-0.8-0.2 ap = 0.5-1.4-3.0	-
			Martensitic	820	240	13					
M	Stainless steel and stainless cast steel		Austenitic	600	180	14	80-140-180	-	fz = 0.9-0.6-0.4 ap = 0.2-0.6-0.8	-	fz = 0.8-0.6-0.2 ap = 0.5-1.4-3.0
K	Grey cast iron (GG)		Ferritic/ martensitic		180	15	140-180-280	fz = 2.0-1.2-0.5 ap = 0.4-1.2-1.5	-	fz = 1.2-1.0-0.2 ap = 0.5-1.6-3.0	-
			Pearlitic		260	16					
	Cast iron nodular (GGG)		Ferritic		160	17	120-160-250	fz = 2.0-1.2-0.5 ap = 0.4-1.2-1.5	-	fz = 1.2-1.0-0.2 ap = 0.5-1.6-3.0	-
			Pearlitic		250	18					
	Malleable cast iron		Ferritic		130	19					
			Pearlitic		230	20					
S	High temp. alloys	Fe Basis	Annealed		200	31	20-60-100	-	fz = 0.9-0.6-0.4 ap = 0.2-0.6-0.8	-	fz = 0.8-0.6-0.2 ap = 0.5-1.4-3.0
			Cured		280	32					
		Ni or Co Basis	Annealed		250	33	20-35-80	-	fz = 0.9-0.4-0.4 ap = 0.2-0.7-0.8	-	fz = 0.8-0.4-0.2 ap = 0.5-1.4-3.0
			Cured		350	34					
			Cast		320	35					
	Titanium and Ti alloys		Pure titanium	Rm = 400	Rm= 400	36	30-50-80	-	fz = 0.9-0.6-0.4 ap = 0.2-0.6-0.8	-	fz = 0.8-0.6-0.2 ap = 0.5-1.4-3.0
			Alpha+beta alloy	Rm = 1050	Rm= 1050	37					
H	Hardened steel		Hardened	HARDOX	45 -55 HRC	38	40-60-120	fz = 1.2-0.7-0.3 ap = 0.4-0.8-1.5	-	fz = 1.0-0.5-0.2 ap = 0.5-1.0-3.0	-
			Hardened		55-58 HRC	39	30-50-80	fz = 0.8-0.5-0.3 ap = 0.1-0.4-1.0	-	fz = 0.8-0.4-0.2 ap = 0.2-0.6-1.4	-
					58-62 HRC		30-40-70	-	-	-	-
	Chilled cast iron		Cast		400	40	60-80-140	fz = 1.6-0.8-0.5 ap = 0.4-1.0-1.5	-	fz = 1.0-0.8-0.2 ap = 0.2-1.2-2.0	-
	Cast iron		Hardened		55 HRC	41	30-60-120	fz = 1.2-0.7-0.3 ap = 0.4-0.8-1.5	-	fz = 1.0-0.6-0.2 ap = 0.2-1.0-2.0	-
Radius for programming:								**3,6 mm**		**5,0 mm**	

Feed per Tooth for HELI6FEED FF H600… 04 / 05 / 07 / 08

HELI6FEED UPFEED LINE

ISO	Material		Condition	Tensile Strength [N/mm^2]	Hardness HB	Material No.	V_c [m/min]	H600 - 04		H600 - 05		H600 - 07		H600 - 08		
								WXCU 04... T	WXCU 04... HP	WXCU 05... T	WXCU 05... HP	WXCU 07... T	WXCU 07... HP	WXCU 08... T	WXCU 08... HP	WXCU 08... RM
P	Non-alloy steel and cast steel, free cutting steel	< 0.25 %C	Annealed	420	125	1	140-180-250	fz = 1.1-0.7-0.35 ap = 0.5-0.7-0.8	-	fz = 1.1-0.7-0.35 ap = 0.5-0.8-1.0	-	fz = 1.4-0.8-0.5 ap = 0.5-0.8-1.5	-	fz = 1.4-1.0-0.5 ap = 0.5-1.2-2.0	-	fz = 1.4-1.0-0.5 ap = 0.5-1.2-2.0
		>= 0.25 %C	Annealed	650	190	2										
		< 0.55 %C	Quenched and tempered	850	250	3										
		>= 0.55 %C	Annealed	750	220	4										
			Quenched and tempered	1000	300	5										
	Low alloy steel and cast steel (less than 5 % of alloying elements)		Annealed	600	200	6	130-160-200	fz = 1.1-0.7-0.35 ap = 0.5-0.7-0.8	-	fz = 1.1-0.7-0.35 ap = 0.5-0.8-1.0	-	fz = 1.4-0.8-0.5 ap = 0.5-0.8-1.5	-	fz = 1.4-1.0-0.5 ap = 0.5-1.2-2.0	-	fz = 1.4-1.0-0.5 ap = 0.5-1.2-2.0
			Quenched and tempered	930	275	7										
				1000	300	8										
				1200	350	9	130-140-180	fz = 1.1-0.6-0.35 ap = 0.5-0.7-0.8	-	fz = 1.1-0.6-0.35 ap = 0.5-0.8-1.0	-	fz = 1.4-0.7-0.5 ap = 0.5-0.8-1.5	-	fz = 1.4-0.9-0.5 ap = 0.5-1.0-2.0	-	fz = 1.4-0.9-0.5 ap = 0.5-1.0-2.0
	High alloyed steel, cast steel and tool steel		Annealed	680	200	10	120-130-180	fz = 1.1-0.5-0.35 ap = 0.5-0.7-0.8	-	fz = 1.1-0.5-0.35 ap = 0.5-0.8-1.0	-	fz = 1.4-0.6-0.5 ap = 0.5-0.8-1.5	-	fz = 1.4-0.8-0.5 ap = 0.5-1.0-2.0	-	fz = 1.4-0.8-0.5 ap = 0.5-1.0-2.0
			Quenched and tempered	1100	325	11										
	Stainless ferritic and stainless martensitic steel		Ferritic, martensitisch	680	200	12	90-110-160	fz = 1.1-0.7-0.35 ap = 0.5-0.7-0.8	-	fz = 1.1-0.7-0.35 ap = 0.5-0.8-1.0	-	fz = 1.4-0.8-0.5 ap = 0.5-0.8-1.5	-	fz = 1.4-1.0-0.5 ap = 0.5-1.2-2.0	-	fz = 1.4-1.0-0.5 ap = 0.5-1.2-2.0
			Martensitic	820	240	13										
M	Stainless steel and stainless cast steel		Austenitic	600	180	14	80-140-180	-	fz = 0.7-0.6-0.35 ap = 0.5-0.6-0.8	-	fz = 0.7-0.6-0.35 ap = 0.5-0.7-1.0	-	fz = 0.9-0.6-0.35 ap = 0.5-0.8-1.5	-	fz = 0.9-0.6-0.35 ap = 0.5-1.2-2.0	-
K	Grey cast iron (GG)		Ferritic/ martensitic		180	15	140-180-280	fz = 1.1-0.7-0.35 ap = 0.5-0.7-0.8	-	fz = 1.1-0.7-0.35 ap = 0.5-0.8-1.0	-	fz = 1.4-0.8-0.5 ap = 0.5-0.8-1.5	-	fz = 1.4-1.0-0.5 ap = 0.5-1.2-2.0	-	fz = 1.4-1.0-0.5 ap = 0.5-1.2-2.0
			Pearlitic		260	16										
	Cast iron nodular (GGG)		Ferritic		160	17	120-160-250	fz = 1.1-0.7-0.35 ap = 0.5-0.7-0.8	-	fz = 1.1-0.7-0.35 ap = 0.5-0.8-1.0	-	fz = 1.4-0.8-0.5 ap = 0.5-0.8-1.5	-	fz = 1.4-1.0-0.5 ap = 0.5-1.2-2.0	-	fz = 1.4-1.0-0.5 ap = 0.5-1.2-2.0
			Pearlitic		250	18										
	Malleable cast iron		Ferritic		130	19										
			Pearlitic		230	20										
S	High temp. alloys	Fe Basis	Annealed		200	31	20-60-100	-	fz = 0.7-0.4-0.35 ap = 0.2-0.3-0.8	-	fz = 0.7-0.4-0.35 ap = 0.2-0.4-1.0	-	fz = 0.9-0.4-0.35 ap = 0.2-0.5-1.5	-	fz = 0.9-0.5-0.35 ap = 0.2-0.6-1.5	-
			Cured		280	32										
		Ni or Co Basis	Annealed		250	33	20-35-80	-	fz = 0.7-0.35-0.35 ap = 0.2-0.3-0.8	-	fz = 0.7-0.35-0.35 ap = 0.2-0.3-1.0	-	fz = 0.9-0.4-0.35 ap = 0.2-0.5-1.5	-	fz = 0.9-0.4-0.35 ap = 0.2-0.6-2.0	-
			Cured		350	34										
			Cast		320	35										
	Titanium and Ti alloys		Pure titanium	Rm = 400	Rm= 400	36	30-50-80	-	fz = 0.7-0.4-0.35 ap = 0.2-0.4-0.8	-	fz = 0.7-0.4-0.35 ap = 0.2-0.4-1.0	-	fz = 0.9-0.5-0.35 ap = 0.2-0.5-1.5	-	fz = 0.9-0.6-0.35 ap = 0.2-0.6-2.0	-
			Alpha+beta alloy	Rm = 1050	Rm= 1050	37										
H	Hardened steel		Hardened	HARDOX	45 -55 HRC	38	40-60-120	fz = 1.1-0.6-0.35 ap = 0.5-0.6-0.8	-	fz = 1.1-0.7-0.35 ap = 0.5-0.6-1.0	-	fz = 1.4-0.8-0.5 ap = 0.5-0.6-1.5	-	fz = 1.4-0.8-0.5 ap = 0.5-1.0-2.0	-	fz = 1.4-0.8-0.5 ap = 0.5-1.0-2.0
			Hardened		55-58 HRC	39	30-50-80	-	-	-	-	-	-	-	-	-
					58-62 HRC		30-40-70	-	-	-	-	-	-	-	-	-
	Chilled cast iron		Cast		400	40	60-80-140	fz = 1.1-0.6-0.35 ap = 0.5-0.7-0.8	-	fz = 1.1-0.7-0.35 ap = 0.5-0.7-1.0	-	fz = 1.4-0.8-0.5 ap = 0.5-0.7-1.5	-	fz = 1.4-0.7-0.5 ap = 0.5-0.9-2.0	-	fz = 1.4-0.7-0.5 ap = 0.5-0.9-2.0
	Cast iron		Hardened		55 HRC	41	30-60-120	fz = 1.1-0.6-0.35 ap = 0.5-0.7-0.8	-	fz = 1.1-0.7-0.35 ap = 0.5-0.7-1.0	-	fz = 1.4-0.8-0.5 ap = 0.5-0.7-1.5	-	fz = 1.4-0.8-0.5 ap = 0.5-1.0-2.0	-	fz = 1.4-0.8-0.5 ap = 0.5-1.0-2.0
Radius for programming:								**1,9 mm**		**2,3 mm**		**3,1 mm**		**3,3 mm**		**3,7 mm**

Feed per Tooth for HELI6FEED MF H600… 04 / 05 / 07 / 08

HELI6FEED UPFEED LINE

ISO	Material		Condition	Tensile Strength $[N/mm^2]$	Hardness HB	Material No.	V_c [m/min]	H600 - 04 WXCU 04... T	H600 - 04 WXCU 04... HP	H600 - 05 WXCU 05... T	H600 - 05 WXCU 05... HP	H600 - 07 WXCU 07... T	H600 - 07 WXCU 07... HP	H600 - 08 WXCU 08... T	H600 - 08 WXCU 08... HP	H600 - 08 WXCU 08... RM
P	Non-alloy steel and cast steel, free cutting steel	< 0.25 %C	Annealed	420	125	1	140-180-250	fz = 0.6-0.4-0.2 ap = 0.5-1.2-1.5	-	fz = 0.6-0.4-0.2 ap = 0.5-1.4-2.0	-	fz = 0.8-0.6-0.4 ap = 0.5-2.0-2.7	-	fz = 0.8-0.6-0.4 ap = 0.5-2.5-3.5	-	fz = 0.8-0.6-0.4 ap = 0.5-2.5-3.5
		>= 0.25 %C	Annealed	650	190	2										
		< 0.55 %C	Quenched and tempered	850	250	3										
		>= 0.55 %C	Annealed	750	220	4										
			Quenched and tempered	1000	300	5										
	Low alloy steel and cast steel (less than 5 % of alloying elements)		Annealed	600	200	6	130-160-200	fz = 0.6-0.4-0.2 ap = 0.5-1.2-1.5	-	fz = 0.6-0.4-0.2 ap = 0.5-1.4-2.0	-	fz = 0.8-0.6-0.4 ap = 0.5-2.0-2.7	-	fz = 0.8-0.6-0.4 ap = 0.5-2.5-3.5	-	fz = 0.8-0.6-0.4 ap = 0.5-2.5-3.5
			Quenched and tempered	930	275	7										
				1000	300	8										
				1200	350	9	130-140-180	fz = 0.6-0.3-0.2 ap = 0.5-1.2-1.5	-	fz = 0.6-0.3-0.2 ap = 0.5-1.4-2.0	-	fz = 0.8-0.5-0.4 ap = 0.5-2.0-2.7	-	fz = 0.8-0.5-0.4 ap = 0.5-2.5-3.5	-	fz = 0.8-0.5-0.4 ap = 0.5-2.5-3.5
	High alloyed steel, cast steel and tool steel		Annealed	680	200	10	120-130-180	fz = 0.6-0.2-0.2 ap = 0.5-1.2-1.5	-	fz = 0.6-0.2-0.2 ap = 0.5-1.4-2.0	-	fz = 0.8-0.4-0.4 ap = 0.5-2.0-2.7	-	fz = 0.8-0.4-0.4 ap = 0.5-2.5-3.5	-	fz = 0.8-0.4-0.4 ap = 0.5-2.5-3.5
			Quenched and tempered	1100	325	11										
	Stainless ferritic and stainless martensitic steel		Ferritic, martensitisch	680	200	12	90-110-160	fz = 0.6-0.3-0.2 ap = 0.5-1.2-1.5	-	fz = 0.6-0.3-0.2 ap = 0.5-1.4-2.0	-	fz = 0.8-0.5-0.4 ap = 0.5-2.0-2.7	-	fz = 0.8-0.5-0.4 ap = 0.5-2.5-3.5	-	fz = 0.8-0.5-0.4 ap = 0.5-2.5-3.5
			Martensitic	820	240	13										
M	Stainless steel and stainless cast steel		Austenitic	600	180	14	80-140-180	-	fz = 0.4-0.3-0.2 ap = 0.5-1.2-1.5	-	fz = 0.4-0.3-0.2 ap = 0.5-1.4-2.0	-	fz = 0.5-0.4-0.2 ap = 0.5-2.0-2.7	-	fz = 0.5-0.4-0.2 ap = 0.5-2.5-3.5	-
K	Grey cast iron (GG)		Ferritic/ martensitic		180	15	140-180-280	fz = 0.6-0.4-0.2 ap = 0.5-1.2-1.5	-	fz = 0.6-0.4-0.2 ap = 0.5-1.4-2.0	-	fz = 0.8-0.6-0.4 ap = 0.5-2.0-2.7	-	fz = 0.8-0.6-0.4 ap = 0.5-2.5-3.5	-	fz = 0.8-0.6-0.4 ap = 0.5-2.5-3.5
			Pearlitic		260	16										
	Cast iron nodular (GGG)		Ferritic		160	17	120-160-250	fz = 0.6-0.4-0.2 ap = 0.5-1.2-1.5	-	fz = 0.6-0.4-0.2 ap = 0.5-1.4-2.0	-	fz = 0.8-0.6-0.4 ap = 0.5-2.0-2.7	-	fz = 0.8-0.6-0.4 ap = 0.5-2.5-3.5	-	fz = 0.8-0.6-0.4 ap = 0.5-2.5-3.5
			Pearlitic		250	18										
	Malleable cast iron		Ferritic		130	19										
			Pearlitic		230	20										
S	High temp. alloys	Fe Basis	Annealed		200	31	20-60-100	-	fz = 0.4-0.3-0.2 ap = 0.5-0.6-1.5	-	fz = 0.4-0.3-0.2 ap = 0.5-0.7-2.0	-	fz = 0.5-0.3-0.2 ap = 0.5-0.8-2.7	-	fz = 0.5-0.3-0.2 ap = 0.5-0.9-3.5	-
			Cured		280	32										
		Ni or Co Basis	Annealed		250	33	20-35-80	-	fz = 0.4-0.2-0.2 ap = 0.5-0.4-1.5	-	fz = 0.4-0.2-0.2 ap = 0.5-0.5-2.0	-	fz = 0.5-0.2-0.2 ap = 0.5-0.6-2.7	-	fz = 0.5-0.2-0.2 ap = 0.5-0.7-3.5	-
			Cured		350	34										
			Cast		320	35										
	Titanium and Ti alloys		Pure titanium	Rm = 400	Rm= 400	36	30-50-80	-	fz = 0.4-0.3-0.2 ap = 0.5-0.6-1.5	-	fz = 0.4-0.3-0.2 ap = 0.5-0.7-2.0	-	fz = 0.5-0.3-0.2 ap = 0.5-0.8-2.7	-	fz = 0.5-0.3-0.2 ap = 0.5-0.9-3.5	-
			Alpha+beta alloy	Rm = 1050	Rm= 1050	37										
H	Hardened steel		Hardened		55 HRC	38	40-60-120	fz = 0.6-0.4-0.2 ap = 0.5-1.0-1.5	-	fz = 0.6-0.4-0.2 ap = 0.5-1.2-2.0	-	fz = 0.8-0.5-0.4 ap = 0.5-1.6-2.7	-	fz = 0.8-0.5-0.4 ap = 0.5-2.0-3.5	-	fz = 0.8-0.5-0.4 ap = 0.5-2.0-3.5
			Hardened		60 HRC	39	30-50-80	-	-	-	-	-	-	-	-	-
							30-40-70	-	-	-	-	-	-	-	-	-
	Chilled cast iron		Cast		400	40	60-80-140	fz = 0.6-0.3-0.2 ap = 0.5-1.0-1.5	-	fz = 0.6-0.3-0.2 ap = 0.5-1.2-2.0	-	fz = 0.8-0.4-0.4 ap = 0.5-1.6-2.7	-	fz = 0.8-0.4-0.4 ap = 0.5-2.0-3.5	-	fz = 0.8-0.4-0.4 ap = 0.5-2.0-3.5
	Cast iron		Hardened		55 HRC	41	30-60-120	fz = 0.6-0.3-0.2 ap = 0.5-1.0-1.5	-	fz = 0.6-0.3-0.2 ap = 0.5-1.2-2.0	-	fz = 0.8-0.4-0.4 ap = 0.5-1.6-2.7	-	fz = 0.8-0.4-0.4 ap = 0.5-2.0-3.5	-	fz = 0.8-0.4-0.4 ap = 0.5-2.0-3.5
Radius for programming:								**2,6 mm**		**3,3 mm**		**4,1 mm**		**4,8 mm**		**5,2 mm**

Feed per Tooth for MICRO3FEED / NAN3FEED FFT3… 03 / 02

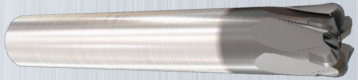
MICRO3FEED
MF 300 ENDMILL

NAN3FEED
NANO FEED MILL

ISO	Material		Condition	Tensile Strength [N/mm²]	Hardness HB	Material No.	v_c [m/min]	FFT3 - 03 WXMT03…T	FFT3 - 02 TXMT02…T
P	Non-alloy steel and cast steel, free cutting steel	< 0.25 %C	Annealed	420	125	1	140-180-250	fz = 0.2-0.5-0.8 ap = 0.6-0.4-0.2	fz = 0.7-0.3-0.2 ap = 0.2-0.3-0.6
		>= 0.25 %C	Annealed	650	190	2			
		< 0.55 %C	Quenched and tempered	850	250	3			
		>= 0.55 %C	Annealed	750	220	4			
			Quenched and tempered	1000	300	5			
	Low alloy steel and cast steel (less than 5 % of alloying elements)		Annealed	600	200	6	130-160-200	fz = 0.2-0.4-0.8 ap = 0.6-0.4-0.2	fz = 0.7-0.3-0.2 ap = 0.2-0.3-0.6
			Quenched and tempered	930	275	7			
				1000	300	8			
				1200	350	9	130-140-180	fz = 0.2-0.3-0.8 ap = 0.6-0.4-0.2	fz = 0.7-0.25-0.2 ap = 0.2-0.3-0.6
	High alloyed steel, cast steel and tool steel		Annealed	680	200	10	120-130-180	fz = 0.2-0.3-0.8 ap = 0.6-0.3-0.2	fz = 0.7-0.25-0.2 ap = 0.2-0.3-0.6
			Quenched and tempered	1100	325	11			
	Stainless ferritic and stainless martensitic steel		Ferritic, martensitisch	680	200	12	100-150-180	fz = 0.2-0.3-0.8 ap = 0.6-0.4-0.2	fz = 0.7-0.25-0.2 ap = 0.2-0.3-0.6
			Martensitic	820	240	13			
M	Stainless steel and stainless cast steel		Austenitic	600	180	14	80-140-180	fz = 0.2-0.4-0.8 ap = 0.6-0.4-0.2	-
K	Grey cast iron (GG)		Ferritic/ martensitic		180	15	140-180-280	fz = 0.2-0.5-0.8 ap = 0.6-0.4-0.2	-
			Pearlitic		260	16			
	Cast iron nodular (GGG)		Ferritic		160	17	120-160-250	fz = 0.2-0.5-0.8 ap = 0.6-0.4-0.2	-
			Pearlitic		250	18			
	Malleable cast iron		Ferritic		130	19			
			Pearlitic		230	20			
S	High temp. alloys	Fe Basis	Annealed		200	31	20-60-100	fz = 0.2-0.3-0.8 ap = 0.6-0.4-0.2	-
			Cured		280	32			
		Ni or Co Basis	Annealed		250	33	20-35-80	fz = 0.2-0.3-0.8 ap = 0.6-0.3-0.2	-
			Cured		350	34			
			Cast		320	35			
	Titanium and Ti alloys		Pure titanium	Rm = 400	Rm= 400	36	30-50-80	fz = 0.2-0.3-0.8 ap = 0.6-0.4-0.2	-
			Alpha+beta alloy	Rm = 1050	Rm= 1050	37			
H	Hardened steel		Hardened	HARDOX	45 -55 HRC	38	40-60-120	fz = 0.2-0.2-0.4 ap = 0.5-0.3-0.2	-
			Hardened		55-58 HRC	39	30-50-80	-	-
					58-62 HRC		30-40-70	-	-
	Chilled cast iron		Cast		400	40	60-80-140	fz = 0.2-0.3-0.4 ap = 0.5-0.3-0.2	-
	Cast iron		Hardened		55 HRC	41	30-60-120	fz = 0.2-0.2-0.4 ap = 0.5-0.3-0.2	-

Radius for programming: 1,1 mm

Feed per Tooth for SOLIDMILL EFF-S…



ISO	Material		Hardness HB	Material No.	V_c [m/min]	VHM EFF-S										
						1	2	3	4	5	6	8	10	12	16	20
P	Non-alloy steel and cast steel, free cutting steel	< 0.25 %C	125	1	140-180-250	fz = 0.02 ap max = 0.06	fz = 0.1 ap max = 0.11	fz = 0.1 ap max = 0.18	fz = 0.1 ap max = 0.2	fz = 0.1 ap max = 0.29	fz = 0.1 ap max = 0.29	fz = 0.1 ap max = 0.4	fz = 0.15 ap max = 0.5	fz = 0.15 ap max = 0.57	fz = 0.2 ap max = 0.8	fz = 0.2 ap max = 1
		>= 0.25 %C	190	2												
		< 0.55 %C	250	3												
		>= 0.55 %C	220	4												
			300	5												
	Low alloy steel and cast steel (less than 5 % of alloying elements)		200	6	130-160-200											
			275	7												
			300	8												
			350	9	130-140-180											
	High alloyed steel, cast steel and tool steel		200	10	120-130-180											
			325	11												
	Stainless ferritic and stainless martensitic steel		200	12	90-110-160											
			240	13												
M	Stainless steel and stainless cast steel		180	14	80-140-180	fz = 0.02 ap max = 0.06	fz = 0.1 ap max = 0.11	fz = 0.1 ap max = 0.18	fz = 0.1 ap max = 0.2	fz = 0.1 ap max = 0.29	fz = 0.1 ap max = 0.29	fz = 0.1 ap max = 0.4	fz = 0.15 ap max = 0.5	fz = 0.15 ap max = 0.57	fz = 0.2 ap max = 0.8	fz = 0.2 ap max = 1
K	Grey cast iron (GG)		180	15	140-180-280	fz = 0.02 ap max = 0.06	fz = 0.1 ap max = 0.11	fz = 0.1 ap max = 0.18	fz = 0.1 ap max = 0.2	fz = 0.1 ap max = 0.29	fz = 0.1 ap max = 0.29	fz = 0.1 ap max = 0.4	fz = 0.15 ap max = 0.5	fz = 0.15 ap max = 0.57	fz = 0.2 ap max = 0.8	fz = 0.2 ap max = 1
			260	16												
	Cast iron nodular (GGG)		160	17	120-160-250											
			250	18												
	Malleable cast iron		130	19												
			230	20												
S	High temp. alloys	Fe Basis	200	31	20-60-100	fz = 0.02 ap max = 0.06	fz = 0.1 ap max = 0.11	fz = 0.1 ap max = 0.18	fz = 0.1 ap max = 0.2	fz = 0.1 ap max = 0.29	fz = 0.1 ap max = 0.29	fz = 0.1 ap max = 0.4	fz = 0.15 ap max = 0.5	fz = 0.15 ap max = 0.57	fz = 0.2 ap max = 0.8	fz = 0.2 ap max = 1
			280	32												
		Ni or Co Basis	250	33	20-35-80											
			350	34												
			320	35												
	Titanium and Ti alloys		Rm= 400	36	30-50-80											
			Rm= 1050	37												
H	Hardened steel		45 -55 HRC	38	40-60-120	fz = 0.02 ap max = 0.06	fz = 0.1 ap max = 0.11	fz = 0.1 ap max = 0.18	fz = 0.1 ap max = 0.2	fz = 0.1 ap max = 0.29	fz = 0.1 ap max = 0.29	fz = 0.1 ap max = 0.4	fz = 0.15 ap max = 0.5	fz = 0.15 ap max = 0.57	fz = 0.2 ap max = 0.8	fz = 0.2 ap max = 1
			55-58 HRC	39	30-50-80											
			58-62 HRC		30-40-70											
	Chilled cast iron		400	40	60-80-140											
	Cast iron		55 HRC	41	30-60-120											
Radius for programming:						**0,15 mm**	**0,3 mm**	**0,5 mm**	**0,7 mm**	**0,9 mm**	**Depending on diameter and number of teeth, see catalog or E-Cat.**					

Feed per Tooth for MULTIMASTER MMFF / MM EFF…

Material		Hardness HB	Material No.	V_c [m/min]	MM FF				MM EFF					
					10	12	16	20	8	10	12	16	20	25
Non-alloy steel and cast steel, free cutting steel	< 0.25 %C	125	1	140-180-250	fz = 0.3 ap max = 0.6	fz = 0.5 ap max = 0.6	fz = 0.55 ap max = 1.10	fz = 0.75 ap max = 1.50	fz = 0.12 ap max = 0.4	fz = 0.16 ap max = 0.45	fz = 0.20 ap max = 0.6	fz = 0.20 ap max = 0.8	fz = 0.20 ap max = 1	fz = 0.25 ap max = 1.25
	>= 0.25 %C	190	2											
	< 0.55 %C	250	3											
	>= 0.55 %C	220	4											
		300	5											
Low alloy steel and cast steel (less than 5 % of alloying elements)		200	6	130-160-200										
		275	7											
		300	8											
		350	9	130-140-180										
High alloyed steel, cast steel and tool steel		200	10	120-130-180										
		325	11											
Stainless ferritic and stainless martensitic steel		200	12	90-110-160										
		240	13											
Stainless steel and stainless cast steel		180	14	80-140-180	fz = 0.3 ap max = 0.6	fz = 0.5 ap max = 0.6	fz = 0.55 ap max = 1.10	fz = 0.75 ap max = 1.50	fz = 0.12 ap max = 0.4	fz = 0.16 ap max = 0.45	fz = 0.20 ap max = 0.6	fz = 0.20 ap max = 0.8	fz = 0.20 ap max = 1	fz = 0.25 ap max = 1.25
Grey cast iron (GG)		180	15	140-180-280	fz = 0.3 ap max = 0.6	fz = 0.5 ap max = 0.6	fz = 0.55 ap max = 1.10	fz = 0.75 ap max = 1.50	fz = 0.12 ap max = 0.4	fz = 0.16 ap max = 0.45	fz = 0.20 ap max = 0.6	fz = 0.20 ap max = 0.8	fz = 0.20 ap max = 1	fz = 0.25 ap max = 1.25
		260	16											
Cast iron nodular (GGG)		160	17	120-160-250										
		250	18											
Malleable cast iron		130	19											
		230	20											
High temp. alloys	Fe Basis	200	31	20-60-100	fz = 0.3 ap max = 0.6	fz = 0.5 ap max = 0.6	fz = 0.55 ap max = 1.10	fz = 0.75 ap max = 1.50	fz = 0.12 ap max = 0.4	fz = 0.16 ap max = 0.45	fz = 0.20 ap max = 0.6	fz = 0.20 ap max = 0.8	fz = 0.20 ap max = 1	fz = 0.25 ap max = 1.25
		280	32											
	Ni or Co Basis	250	33	20-35-80										
		350	34											
		320	35											
Titanium and Ti alloys		Rm= 400	36	30-50-80										
		Rm= 1050	37											
Hardened steel		45 -55 HRC	38	40-60-120	fz = 0.3 ap max = 0.6	fz = 0.5 ap max = 0.6	fz = 0.55 ap max = 1.10	fz = 0.75 ap max = 1.50	fz = 0.12 ap max = 0.4	fz = 0.16 ap max = 0.45	fz = 0.20 ap max = 0.6	fz = 0.20 ap max = 0.8	fz = 0.20 ap max = 1	fz = 0.25 ap max = 1.25
		55-58 HRC	39	30-50-80										
		58-62 HRC		30-40-70										
Chilled cast iron		400	40	60-80-140										
Cast iron		55 HRC	41	30-60-120										
Radius for programming:					**2,0 mm**	**2,5 mm**	**3,0 mm**	**3,4mm**	**Diameter and geometry-dependent, see article designation R… or e-cat.**					

Helical interpolation / Radius for programming / Screw & torque

MDN - MDX & RPMX°																				Rg	Screw
Tool diameter	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	Ø 22	Ø 25	Ø 32	Ø 35	Ø 40	Ø 42	Ø 50	Ø 52	Ø 63	Ø 66	Ø 80	Ø 100	Ø 125	Ø 160		Torque
FFT3 TXMT 020105	10.2 - 15 10.8°	14.2 - 19 4.7°																		1.1 mm	SR M2X0.4-2.9 T6-HG 0.5 N/m
FFT3 WXMT 030206	11.6 - 15 1.1°	15.6 - 19 6.9°	19.6 - 23 4.7°	27.6 - 31 2.9°	35.6 - 39 2.0°		45.6 - 49 1.5°													1.1 mm	TS 18041I/HG 0.5 N/m
FFX4 XNMU 040310			16.6 - 23 3.6°	24.6 - 31 4.3°	32.6 - 39 2.7°		42.6 - 49 1.8°	56.6 - 63 1.2°	62.6 - 69 1.1°	72.6 - 79 0.9°	76.6 - 83 0.8°	92.6 - 99 0.7°	96.6 - 103 0.7°							T/HP: 1.8 mm W: 1.72 mm	SR M2.5X6-T7-60 0.9 N/m
FFX4 XNMU 080620												84.4 - 99 3.3°		110.4 - 125 2.3°		144.4 - 159 1.6°	184.4 - 199 1.2°	234.4 - 249 0.9°		4.0 mm	SR M5-14 IP20 9.0 N/m
FFQ4 SOMT 090412						29.7 - 43 8.2°	35.7 - 49 5.5°	49.7 - 63 3.2°	55.7 - 69 2.7°	65.7 - 79 2.0°		85.7 - 99 1.5°	89.7 - 103 1.4°	111.7 - 125 1.1°						T/HP: 2.5 mm W: 3.0 mm	SR M3X0.5-L7.4 IP9 2.0 N/m
FFQ4 SOMT 120516										58 - 79 4.3°		78 - 99 2.7°	81 - 103 2.5°	104 - 125 1.8°	109 - 131 1.6°	138 - 159 1.2°	178 - 199 0.9°	228 - 249 0.7°		T/HP: 3.0 mm W: 4.0 mm	SR M4X0.7-L9.6 IP15 4.8 N/m
FFQ4 SOMT 170625																130.8 - 159 1.2°	170.8 - 199 0.8°	220.8 - 249 0.6°	290.8 - 319 0.2°	T/HP: 5.5 mm W: 6.4 mm	SR M5-14 IP20 9.0 N/m
FFQ8 SZMU 120520												80.6 - 99 0.3°		106.6 - 125 0.2°	112.6 - 131 0.2°	140.6 - 159 0.2°	180.6 - 199 0.1°			3.6 mm	SR M4X0.7-L11.5 IP15 4.8 N/m
H600 WXCU 040310				24.6 - 31 5.0°	32.6 - 39 4.8°		42.6 - 49 3.3°													1.9 mm	SR M2.5X6-T7-60 0.9 N/m
H600 WXCU 05T312							40 - 49 5.0°	54 - 63 4.0°	60 - 69 3.5°	70.1 - 79 2.8°		90.1 - 99 2.0°	94.1 - 103 1.9°							2.3 mm	SR 10508600 2.0 N/m
H600 WXCU 070515								51 - 63 6.3°		67 - 79 4.2°		87 - 99 2.9°	91 - 103 2.8°	113 - 125 2.1°		147 - 159 1.6°	187 - 199 1.2°			3.1 mm	SR 34-535-SN 4.8 N/m
H600 WXCU 080612												84 - 99 4.8°	88 - 103 4.5°	110 - 125 3.3°	116 - 131 3.1°	144 - 159 2.3°	184 - 199 1.7°	234 - 249 1.3°	304 - 319 1.0°	T/HP: 3.3 mm RM: 3.7 mm	SR 14-591/H 9.0 N/m
MF / Moderate Feed (Milling tools for medium table feed)																					
FFQ8 SZMU 120520												81.6 - 99 0.3°		107.6 - 125 0.2°		141.6 - 159 0.2°	181.6 - 199 0.1°			5.0 mm	SR M4X0.7-L11.5 IP15 4.8 N/m
H600 WXCU 040310				25 - 31 3.8°	33 - 39 2.4°		43 - 49 1.7°													2.6 mm	SR M2.5X6-T7-60 0.9 N/m
H600 WXCU 05T312							40.5 - 49 3.0°	54.5 - 63 1.9°		70.6 - 79 1.4°		90.5 - 99 1.0°	94.5 - 103 1.0°	116.5 - 125 0.8°						3.3 mm	SR 10508600 2.0 N/m
H600 WXCU 070515								51.7 - 63 3.0°		67.7 - 79 2.0°		87.7 - 99 1.4°	91.7 - 103 1.3°	113.7 - 125 1.0°		147.7 - 159 0.8°	187.7 - 199 0.6°			4.1 mm	SR 34-535-SN 4.8 N/m
H600 WXCU 080612												84.7 - 99 2.5°		110.7 - 125 1.7°	116.7 - 131 1.7°	144.7 - 159 1.2°	184.7 - 199 0.9°	234.7 - 249 0.7°	304.7 - 319 0.5°	T/HP: 4.8 mm RM: 5.2 mm	SR 14-591/H 9.0 N/m

MDN – MDX = Minimum – maximum diameter in mm for helical interpolation
RPMX° = Maximum ramping angle
Rg = Radius for programming

If a pilot hole is made, the minimum diameter (MDN) can also be selected smaller.
Formula for the pilot hole: Dmin (MDN) – Dsoll + 1
Recommendation for Helical milling can be found at page 36 **“Milling strategies for tool life and process optimization”** under **Entering the workpiece**.

Recommended Cutting Speeds and Appliations According to Cutting Grades

Based on practical experience – average data

Grades with PVD coatings and Cermet

Material Group	IC330 min. to start max.	IC380 min. to start max.	IC845 min. to start max.	IC840 min. to start max.	IC830 min. to start max.	IC716 min. to start max.	IC882 min. to start max.	IC810 min. to start max.	IC808 min. to start max.	IC30N min. to start max.
P Non-alloy / alloy steel (1. Choice / 2. Choice)	120 **160** 230	160 **200** 250	80 **150** 220	---	120 **200** 230	---	---	160 **220** 250	180 **230** 250	90 **220** 350
P Ferritic / martensitic steel (1. Choice / 2. Choice)	80 **120** 140	---	100 **120** 160	---	100 **130** 160	---	---	---	140 **170** 220	100 **170** 220
M Stainless steel Reference: 1.4301, v_c200, try 1.4404, v_c90, wet 1.4462, v_c80, wet (1. Choice / 2. Choice)	60 **100** 160	120 **160** 220	---	90 **120** 160	60 **140** 200	---	70 **100** 140	---	120 **160** 220	---
K Gray cast iron (1. Choice / 2. Choice)	---	---	---	---	120 **160** 250	---	---	180 **250** 300	180 **220** 280	---
K Cast iron nodular (1. Choice / 2. Choice)	---	---	---	---	120 **140** 200	---	---	160 **200** 260	160 **180** 250	---
S High temp / titan alloys (1. Choice / 2. Choice)	30 **40** 100	30 **50** 100	---	25 **40** 90	30 **40** 100	20 **45** 70	20 **40** 60	---	30 **50** 100	---
N Aluminum / non ferrous (1. Choice / 2. Choice)	---	---	---	---	---	---	---	---	---	---
H Hardened steel (≤55HRc) (1. Choice / 2. Choice)	---	---	---	---	40 **80** 120	---	---	60 **100** 150	80 **120** 200	50 **100** 140

Legend: Cutting speed declaration (m/min)
- red line: dry machining
- blue line: wet machining
- bold font: recommended start value

Recommended Cutting Speeds and Appliations According to Cutting Grades

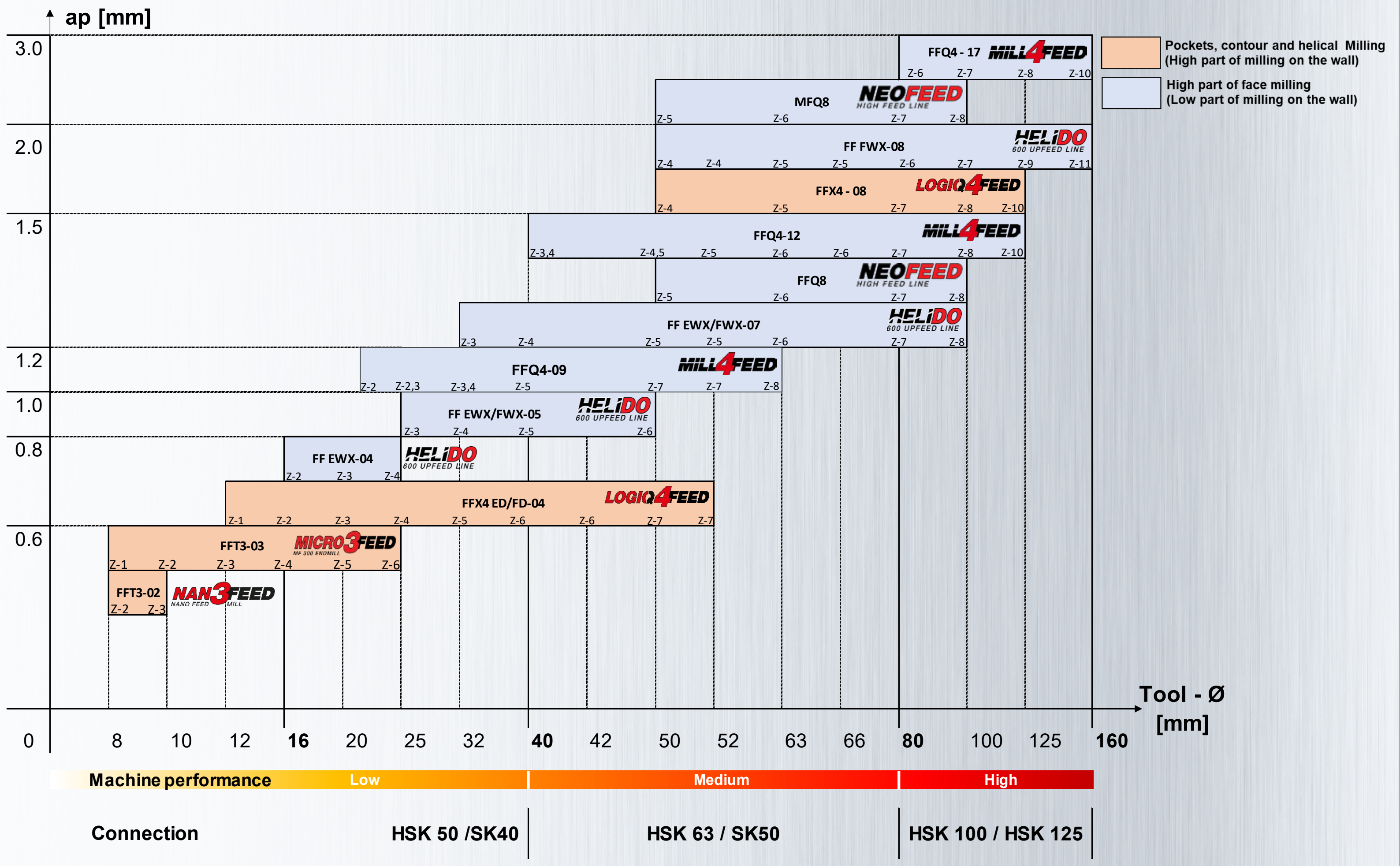
Based on practical experience – average data

Grades with CVD coatings, Ceramics, CBN and uncoated

Material Group		IC5400	IC5500	IC5600	IC5100	DT7150	IC5820	IS8/IS80	IB55/IB85	IC28	IC08
		min. to start max.	min. to start max.	min. to start max.	min. to start max.	min. to start max.	min. to start max.	min. to start max.	min. to start max.	min. to start max.	min. to start max.
P	Non-alloy / alloy steel (1. Choice / 2. Choice)	160 **200** 250	90 **200** 280	160 **210** 280	180 **250** 320	100 **160** 250	---	---	---	---	---
P	Ferritic / martensitic steel (1. Choice / 2. Choice)	140 **180** 240	140 **200** 270	150 **180** 240	---	---	---	---	---	---	---
M	Stainless steel (1. Choice / 2. Choice)	100 **130** 180	---	---	---	---	100 **120** 160	---	---	---	---
K	Gray cast iron (1. Choice / 2. Choice)	---	---	---	200 **280** 350	150 **220** 320	---	250 **500** 800	**Please ask your Product Management**	---	---
K	Cast iron nodular (1. Choice / 2. Choice)	120 **160** 250	---	---	---	160 **250** 350	---	250 **450** 900	---	---	---
S	High temp / titan alloys (1. Choice / 2. Choice)	---	---	---	---	---	25 **50** 95	---	---	---	10 **20** 50
N	Aluminum / non ferrous (1. Choice / 2. Choice)	---	---	---	---	---	---	---	---	160 **450** 650	350 **750** 1500
H	Hardened steel (≤55HRc) (1. Choice / 2. Choice)	---	---	---	---	---	---	---	**Please ask your Product Management**	---	---

Legend:	Cutting speed declaration (m/min)	
	red line:	dry machining
	blue line:	wet machining
	bold font:	recommended start value

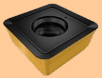
High-feed milling systems



Recommended application range

The All-Rounder

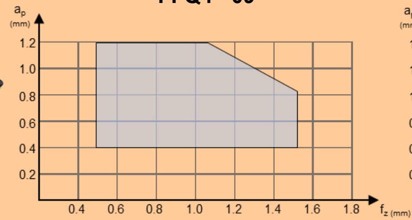
MILL4FEED HIGH FEED



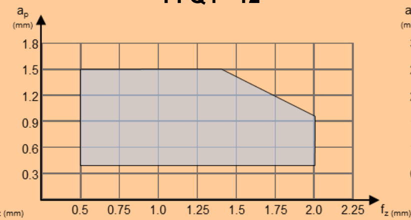
Soft cutting edge

★ ★ ★ ★ ★

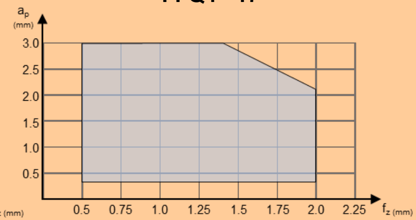
FFQ4 - 09



FFQ4 - 12



FFQ4 - 17



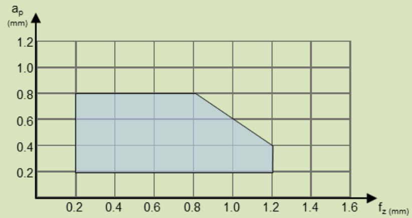
The Specialist for Pocket Milling

LOGIQ4FEED HIGH FEED MILLING

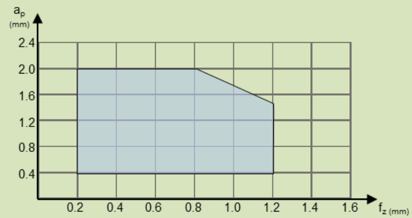
Soft cutting edge

★ ★ ★ ★ ★

FFX4 - 04

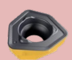


FFX4 - 08



The Economical Alternative to Solid Carbide

MICRO3FEED MF 300 ENDMILL

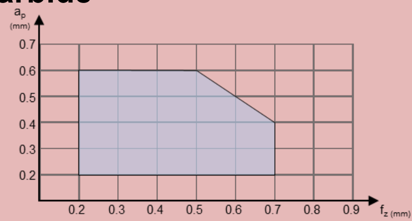


NAN3FEED NANO FEED MILL

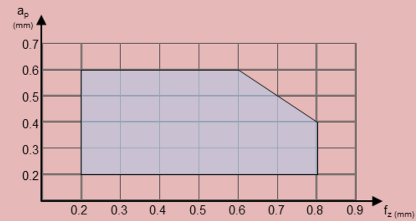
Soft cutting edge

★ ★ ★ ★ ★

FFT3 - 02



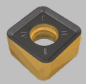
FFT3 - 03



Recommended application range

The Economical All-Rounder

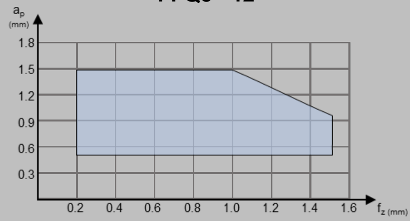
NEOFEED
HIGH FEED LINE



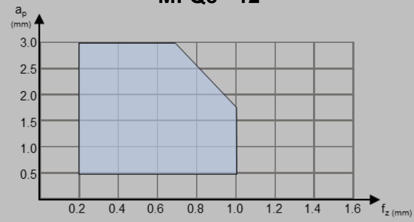
Soft cutting edge

★★★★☆

FFQ8 - 12

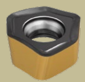


MFQ8 - 12



The Flexible Problem Solver

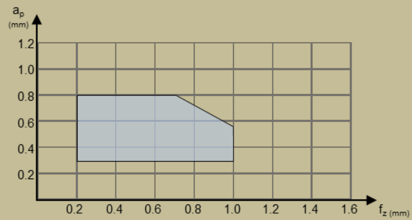
HELI6FEED
UPFEED LINE



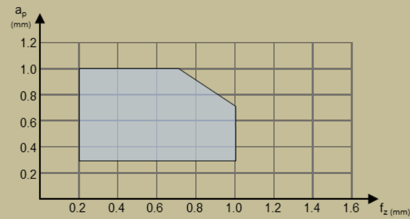
Soft cutting edge

★★★☆☆

H600 FF - 04

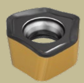


H600 FF - 05



The Flexible Problem Solver

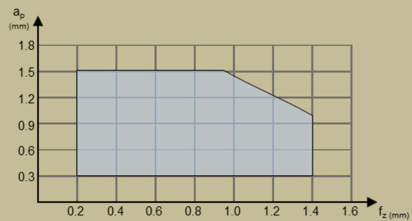
HELI6FEED
UPFEED LINE



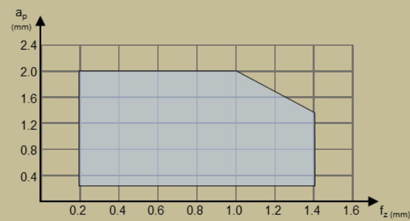
Soft cutting edge

★★★☆☆

H600 FF - 07



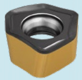
H600 FF - 08



Recommended application range

The Flexible Problem Solver

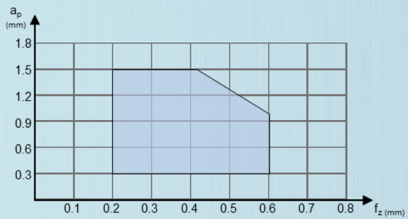
HELI6FEED UPFEED LINE



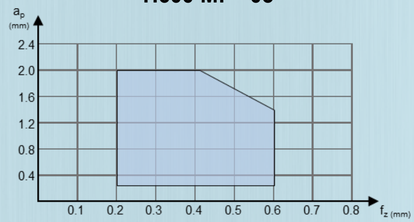
Soft cutting edge

★★★☆☆

H600 MF - 04

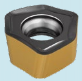


H600 MF - 05



The Flexible Problem Solver

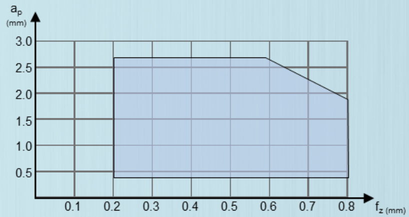
HELI6FEED UPFEED LINE



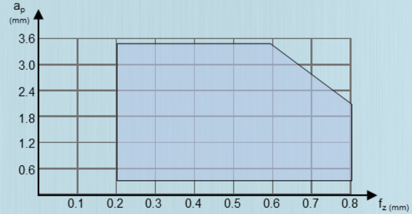
Soft cutting edge

★★★☆☆

H600 MF - 07



H600 MF - 08



Milling Inserts – Cutting Grades

P Steel (ISO P01–P50, hard → tough)

	Range	Coating Type	Condition	Applications / Description
Basis				
IC808 (IC908)	P15-P30	PVD	Strong edge, wear resistance	Roughing, Roughing under stable conditions, medium to high cutting parameters
IC5600	P10-P15	CVD	Stable heat, strong edge, high wear resistance	Roughing and finishing udner stable conditions, high cutting speed, dry machining
IC5500	P15-P35	CVD	Stable heat, wear resistance	Roughing, ferritic and martensitic high alloyed steel (group 12 and 13), high cutting speed, dry machining
IC830 (IC928)	P20-P40	PVD	Tough, no breakage under mechanical load	Universal cutting grade, basic grade for initial machining, roughing, wet or dry
IC845	P30-P50	PVD	Tough, no breakage, thermal crack resistance	Roughing at high feed, interrupted cut
Special Grades				
IC5400	P05-P20	CVD	Stable heat resistance, wear resistance	Roughing at medium to high cutting speed, dry machining
IC30N	P10-P30	PVD, **Cermet**	Strong wear resistance against plastic deformation	Finishing at high cutting speeds and medium feed
IC810 (IC910)	P15-P30	PVD	Wear resistance, stable to breakage	Roughing of high-strength steel and tool steel (group 10 and 11), at medium feed
IC330 (IC328)	P25-P50	PVD, TiCN	Tough, no breakage, thermal crack resistance	Roughing at low cutting speed, interrupted cut, wet machining only

M Stainless Steel (ISO M01–M50, hard → tough)

	Range	Coating Type	Condition	Applications / Description
Basis				
IC840	M20-M40	PVD	Tough, thermal crack resistance	Roughing and finishing at low to medium cutting speed, wet or dry machining
IC830 (IC928)	M25-M35	PVD	Tough, resistance to breakage under high mechanical load	Universal grade for austenitic steel, low to medium cutting speed, wet or dry machining
IC808 (IC908)	M20-M30	PVD	Strong edges, wear resistance	Finishing at medium to high cutting speed under stable conditions, wet or dry machining
IC330 (IC328)	M30-M40	PVD	Tough, resistance to breakage under high mechanical load	Universal grade for austenitic steel, low cutting speed, interrupted cut, wet machining only
Special Grades				
IC5820	M20-M35	CVD	Tough, resistance to breakage, heat resistance	Roughing in austenitic and Duplex materials at high cutting speed under stable conditions
IC882	M25-M45	PVD	Tough, resistance to breakage, heat resistance	Roughing in austenitic and Duplex materials at low to medium cutting speed, wet machining

Milling Inserts – Cutting Grades

K Cast Iron

ISO: K01 K05 K10 K15 K20 K25 K30 K35 K40 K45 K50 (hard ← → tough)

Grade	Range	Coating Type	Condition	Application / Description
Basis				
IC5100	K10-K25	CVD	Thick coating, wear resistance	Grey cast (GG) at high cutting speed
IC810 (IC910)	K15-K35	PVD	Wear resistance, heat resistance	First choice for nodular cast iron and grey cast at low to medium cutting speed
Special Grades				
IS08	K01-K015	**Si_3N_4 Ceramic**	Uncoated, high heat resistance	Grey cast at very high cutting speed, medium feed under stable conditions
DT7150	K10-K25	PVD+CVD	Wear resistance, heat resistant	Optional grade instead of GG and GGG at medium cutting speeds, troubleshoot for wet machining
IC808 (IC908)	K20-K40	PVD	Stable edges, wear resistance	Finishing of nodular cast iron (GGG) under stable conditions
IC830 (IC928)	K15-K40	PVD	Tough, resistance to breakage under high mechanical load	For GGG40, under instable conditions, at low to medium cutting speeds and high feed
IC30N	P10-P30	PVD, **Cermet**	Extremely wear resistance against plastic deformation	GGG50 and above, finishing at high cutting speeds

N Non Ferrous Mat.

ISO: N01 N05 N10 N15 N20 N25 N30 N35 N40 N45 N50 (hard ← → tough)

Grade	Range	Caoting type	Condition	Applications / Description
Basis				
ID5	N01-N10	uncoated, **Diamond**	Soldered TIP based on solid carbide insert	Al-Si alloys <12 % Si share, graphite, general non-ferrous metals
ID8	N05-N15	uncoated., **Diamond**	Soldered TIP based on solid carbide insert	Al-Si alloys >12 % Si share, fibre composite materials (CFRP and GFK)
IC28	N15-N35	uncoated	Tough, resistance to breakage under high mechanical load	Roughing of aluminum alloys and non-ferrous metals, high feed, medium cutting speeds, wet machining
IC08	N05-N20	uncoated	Strong edges, wear resistance	Roughing and finishing of aluminum alloys, < 10 % S share, non-ferrous metals, wet machining
IC07	N05-N20	uncoated	Strong edges, high wear resistance	Optional grade for IC08, better wear resistance

Milling Inserts – Cutting Grades

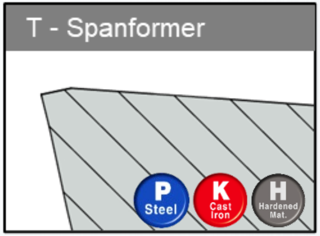
S – Super Alloy (ISO S01 – S50; hard ← → tough)

ISO	Grade	Range	Coating Type	Condition	Applications / Description
S	**Basis**				
	IC882	S30-S50	PVD	Tough, h. heat resistance, contains Rutenium	Roughing and finishing of HTSA, low to medium cutting speeds, wet machining only
	IC716	S20-25	PVD	Tough, h. heat resistance, thermal crack resistance	Roughing and finishing of titanium alloys (ISO S36-S37) at medium cutting speeds.
	IC808 (IC908)	S15-S30	PVD	Strong edges, wear resistance	Finishing under stable conditions, medium cutting speed
	IC840	S25-S40	PVD	Tough, thermal crack resistance	Roughing of Ti-alloys, low cutting speed, wet machining only
	Special Grades				
	IC380	S20-S30	PVD	Strong edges, wear resistant, special cutting	Roughing and finishing of titanium under lable conditions, wet machining only
	IC5820	S20-S35	CVD	High heat resistance, wear resistance, +Rutenium	Optional grade for IC882, high cutting speed, wet and dry machining
	IC830 (IC928)	S20-S40	PVD	Tough, resistance to breakage under high mechanical load	Optional grade for IC840 and IC808 at low cutting speeds, high feed, wet machining.
	IC330 (IC328)	S30-S50	PVD	Tough, resistance to breakage under high mechanical load	Optional grade for IC840, IC808, IC830, high thermal crack resistance, sufficient coolant supply is essential

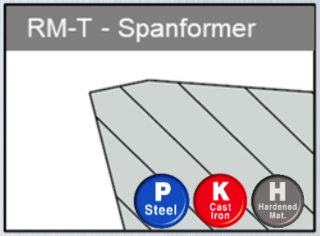
H – Hardened Mat. (ISO H01 – H50; hard ← → tough)

ISO	Grade	Range	Coating Type	Condition	Applications / Description
H	**Basis**				
	IC808 (IC908)	H10-H20	PVD	Strong edges, resistance to breakage	Hardened steel up to 55 HRc (max. 60 HRc), under stable conditions, down-mill only, max. 45 % a_e/D
	IB85	H01-H30	no coating, **CBN**	Soldered TIP based on solid carbide insert, resistance to breakage	Finishing of hardened steel up to 65 HRc, up-mill if possible
	Special Grades				
	IC30N	H10-H25	PVD, **Cermet**		Finishing under stable conditions at high cutting speeds

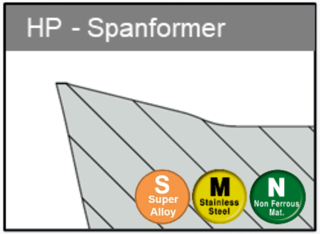
Geometries



T – for steel, ferritic and martensitic stainless steel, cast iron and hardened steel

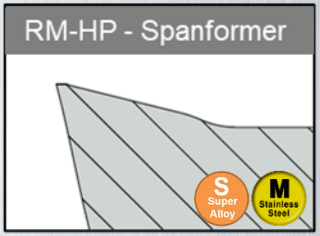


RM-T – for interrupted cut and machining on shoulders in steel, ferritic and martensitic stainless steel, cast iron and hardened steel

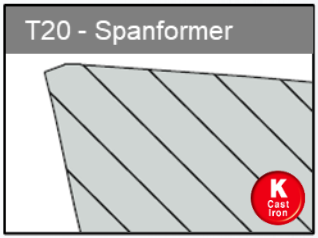


HP – for austenitic stainless steel and highly heat-resistant alloys

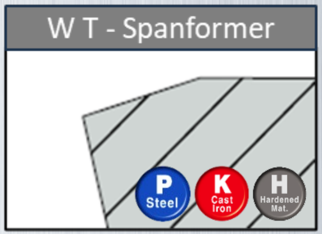
HP-P – for aluminum



RM-HP – for machining on the shoulder in austenitic stainless steel and highly heat-resistant alloys



T20 – optimized chip former for cast iron

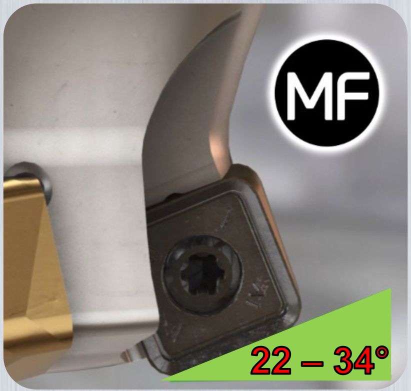


SOMW T – flat insert for interrupted cut and hard milling up to 62 hrc

Comparison Moderate Feed vs. Fast Feed Milling

Fast Feed Milling

Moderate Feed Milling



Principle:

Fast Feed Milling: High table feed with low depth of cut. v_f from 6.000 to 20.000 mm/min. Machines with medium to high dynamics

Moderate Feed Milling: High depth of cut with medium table feed. v_f from 2.000 to 6.000 mm/min. Machines with low to medium dynamics

Example Ø63 mm:

$$Q = \frac{a_e * ap * Vf}{1000}$$

Fast Feed Milling:

a_p = 1,5 mm a_e = 50 mm
f_z = 1,2 mm v_f = 8005 mm/min

Q = 600 cm³/min

Moderate Feed Milling:

a_p = 3,0 mm a_e = 50 mm
f_z = 0,65 mm v_f = 4335 mm/min

Q = 650 cm³/min

Moderate feed milling is a good strategy for machines with low to medium dynamics. Due to the higher depth of cut, similar metal removal rates are achieved as with high feed milling despite the reduced feed rate.

Bending Moment Load

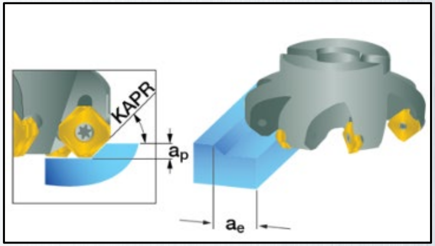
The longer the tool overhang, the more important it is to consider the bending moment.
Too high a bending moment can lead to massive spindle damage.

The bending moment can be calculated using the formula or using machining power.
The load limits can be requested from the machine manufacturer.

Calculate the spindle bending moment using the Machining Power tool : https://mpwr.iscar.com

MP²

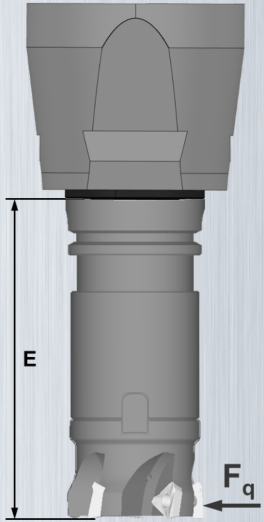
- Machining Power (Full)
- Vc/n - Cutting / Spindle speed
- Vf - Feed speed
- P/T - Power / Torque
- Q - Material removal rate
- F - Cutting forces
- h - Chip thickness
- T - Cutting time
- a_e - Max. cutting width
- M - Max. spindle bending moment



Cutting diameter (DC):	63	mm
Cutting width (a_e):	42	mm
Face effective cutting edge count (ZEFP):	5	
Feed per tooth (f_z):	0,2	mm
Depth of cut (a_p):	4	mm
Workpiece material: ...	C45E; Ck 45	DIN
Tool cutting edge angle (KAPR):	90	deg.
Effective rake angle (γ): ?	5	deg.
Tool extension (E):	250	mm

Reset | Calculate

Max spindle bending force:	2.818,88	N
Max spindle bending moment:	704,72	Nm



$$M_b = F_q \times E \quad [Nm]$$

General Guide Values

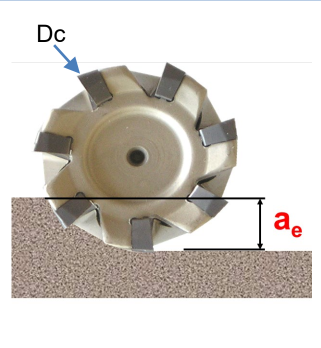
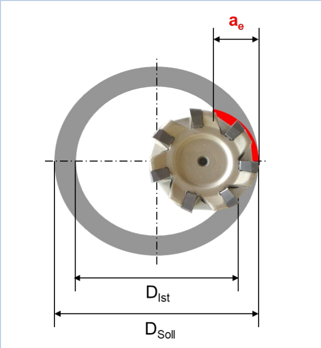
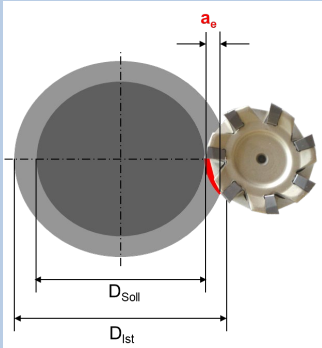
Interfaces	Bending moment limit [Nm]
HSK32	85
HSK40	140
HSK50	230
HSK63	450
HSK80	810
HSK100	1230
HSK125	2900
Big Plus 40	45
Big Plus 50	60
C5	420
C6	700
C8	1000
C10	1700
Driven tool holders	
VDI30	80
VDI40	150

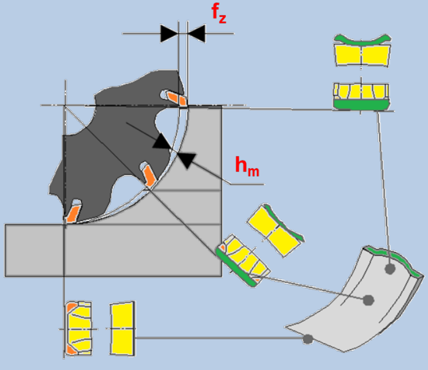
We cannot take a guarantee for the specified guideline values.

Feed per Tooth Calculation

According to Radial Depth of Cut a_e

$$a_e = \frac{{D_{ist}}^2 - {D_{soll}}^2}{4 \cdot (D_{soll} + Dc)}$$

Linear milling	Internal circular interpolation	External circular interpolation
		
$radial\ depth = ae$	$a_e = \frac{{D_{soll}}^2 - Dist^2}{4 \times (Dsoll - Dc)}$	$a_e = \frac{{D_{ist}}^2 - Dsoll^2}{4 \times (Dsoll + Dc)}$



Eingriffsverhältnis

$$E = \frac{a_e}{Dc} \times 100\%$$

mittlere Spandicke

$$h_m = fz \times \sqrt{ae/Dc}$$

Vorschub pro Zahn

$$f_z = hm \times \sqrt{Dc/ae}$$

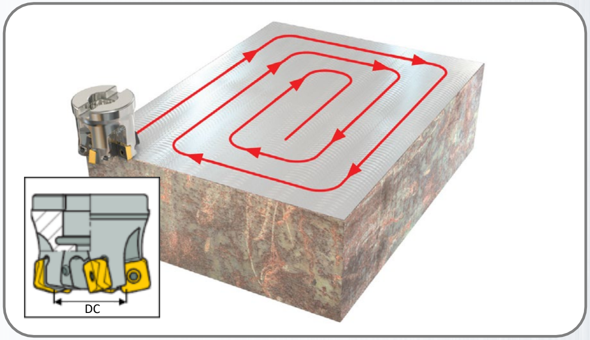
Info:

Only if the tooth feed is correctly calculated and set does the chip formation (constriction) required by the cutting geometry take place.

If the f_z values are too low, they promote premature wear and can cause the chips to jam.

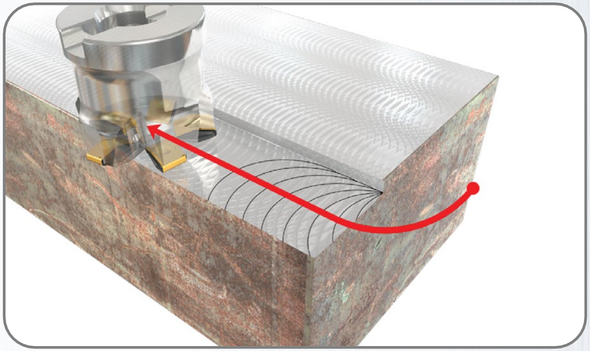
If the f_z values are too high, the cutting inserts will break due to overloading.

Face milling



No exceed of the maximum width of cut DC

- No overloading of the cutting edge by residual material from the previous cut.
- Surface free of steps.
- Down-Milling is to be preferred as the first choice.

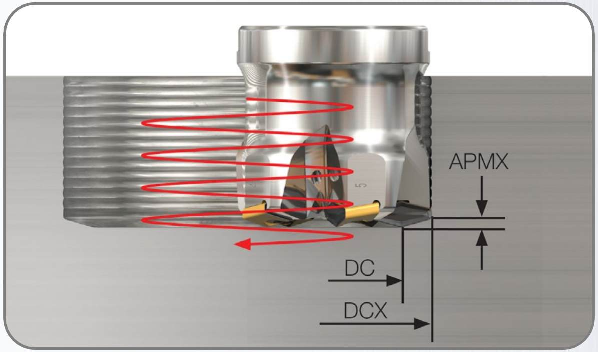


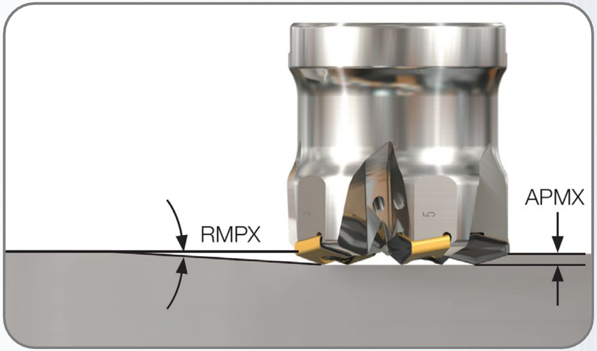
Cutting into material in a circular arc

- Cutting exit always at zero chip thickness [mm].
- No hook from tool when entering the material.
- Increased process reliability and tool life.
- Circular movement always clockwise rotation (G3).
- Recommended radius pivot point: 0,5 – 3 mm

Milling strategies for tool life and process optimization

Entering in the workpiece





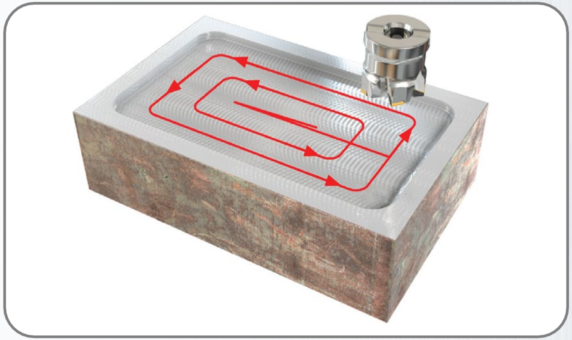
Helical milling

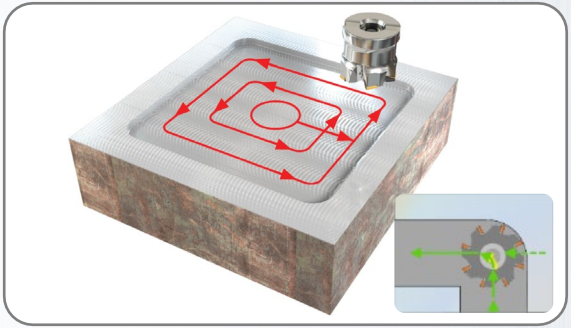
- Down-Milling is the first choice, with problematic chip evacuation (deep hole), Up-milling can lead to better results
- The pitch and the helix angle should not exceed the maximum depth of cut APMX and the maximum ramping angle RMPX
- It is recommended to reduce the feed per tooth by 30-40%
- Helical milling into full material, the minimum and maximum diameter for interpolation should not be below or above
- Dmax = 2 x DCX-1 / Dmin = DCX+DC
- If a pilot hole is made, the minimum diameter (MDN) can also be selected smaller.
  Formula for the pilot hole: Dmin (MDN) – Dsoll + 1

Ramp milling

- The ramping depth per pass and the ramping angle should not exceed the maximum depth of cut APMX and the maximum ramping angle RMPX.
- When entering in the material with ramping, Down-Milling is always preferable as the first choice.
- It is recommended to reduce the feed per tooth by 30-40%

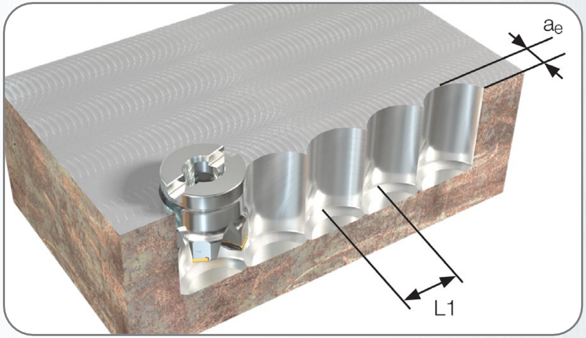
Pocket milling

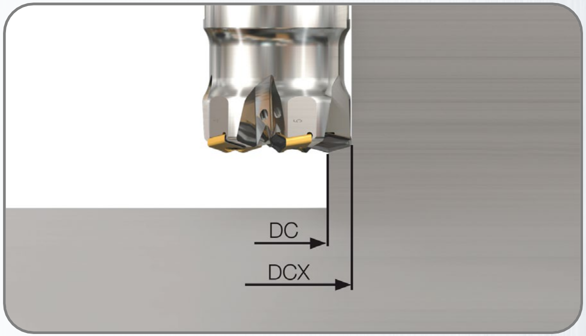




- For better chip evacuation, it is recommended to mill from the center to the outside cont.
- Down-Milling is the first choice, with problematic chip evacuation (deep pocket), Up-milling can lead to better results.
- For deep through-pockets, we recommend pre-drilling the corners or drilling a center hole to evacuate the chips downwards.
- When entering the pocket using helical interpolation or ramp milling, the pitch and the ramping angle should not exceed the maximum depth of cut APMX and the maximum ramping angle RMPX.
- It is recommended to mill the corners with circular arc, if this is not possible, the corner can be pre-drilled
- Recommended radius: $R_{arc} = D_{tool} \times 0{,}7$

Plunge milling





- Plunge milling is a good solution for unstable conditions or machines with poor performance.
- Plunge milling is an efficient method for processing deep contours and pockets.
- For long overhangs ≥ 3xD, it is recommended to reduce the cutting speed by 30 – 40%.

- The recommended feed range for plunge milling is 10% of the minimum to maximum tooth feed.
- $\mathbf{f_{z\ plunge} = Range\ of\ feed \times 0,1}$
- $\mathbf{a_{emax} = (DCX - DC)/2}$
- $\mathbf{L1_{max} = 2 \times \sqrt{DCX \times ae - ae^2}}$

Wear

Wear never occurs as individual appearance but always occurs in various combinations. Therefore, it is essential to monitor the tool's insert soonest possible in order to detect the main wear type and to take counter action accordingly.

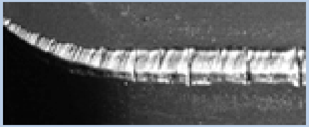
Type of wear	Flank wear	Crater wear	Notch wear	Chipping
				
Reason	• Cutting speed too high • Temperature too high • Wear resistance of carbide grade not sufficient	• Cutting speed too high • Temperature too high • Insufficient feed	• Cutting speed too high • Wear resistance of carbide grade not sufficient	• Wear resistance of carbide grade too strong • Cutting edge too positive • Build-up edge
Help	• Reduce cutting speed • Choose more wear resistant carbide grade • Choose reduced lead angle	• Reduce cutting speed • Choose harder carbide grade • Increase feed	• Reduce cutting speed • Choose more wear resistant carbide grade • Variable depth of cut	• Choose tougher carbide grade • Increase cutting speed • Choose more stable cutting edge

Important:

When adjusting or correcting the cutting parameters, we recommend to change the parameters one after another, (not several ones at the same time). To change the cutting conditions by 10 % -20 % (according to workpiece material).

Wear

Wear never occurs as individual appearance but always occurs in various combinations. Therefore, it is essential to monitor the tool‘s insert soonest possible in order to detect the main wear type and to take counter action accordingly.

	Breakage	Thermal cracks	Build-up-edge	Plastic deformation
Type of wear				
Reason	• Cutting edge too positive • Carbide grade too hard • Vibrations	• Various thermal stress • Strongly interrupted cut • Thermal cracks by coolant	• Low cutting speed • Feed to low • Cutting edge too negative	• Feed too high • Cutting speed too high • Carbide grade too tough
Help	• Reduce depth of cut • Reduce feed • Choose a more stable wedge	• Choose tougher carbide grade • Improve coolant supply • Dry machining	• Increase cutting speed • Increase feed • Smooth, positive cutting edge	• Reduce cutting speed • Reduce feed • Choose harder carbide grade

Important:

When adjusting or correcting the cutting parameters, we recommend to change the parameters one after another, (not several ones at the same time). To change the cutting conditions by 10 % -20 % (according to workpiece material).

General recommendations for insert milling

- ✓ Down-milling is to be preferred as the first choice - especially for shoulder milling due to the 90° setting angle.
- ✓ The milling strategy should be chosen so that the cutting forces are directed towards the support points of the clamping device; up-milling can be advantageous in some cases (Figure 1).
- ✓ The strategy regarding the positioning of the milling cutter on the component is of the utmost importance; planning in this regard should be carried out in great detail.
- ✓ For components that are clamped on a clamping tower, 90° milling cutters with a positive insert basic shape (HM390) are recommended. A wide cutter pitch can significantly improve machining, even with negative systems. In any case, the forces should be directed towards the machine bed (Figure 2). We advise against systems with an adjustment angle < 90° due to the higher axial force influence component.
- ✓ The choice of milling pitch should also depend on the stability of the entire system (machine, workpiece clamping, workpiece material, etc.)
- ✓ For SK40 and smaller machines, cutters with a wider pitch are recommended due to the limited stability.

Figure 1

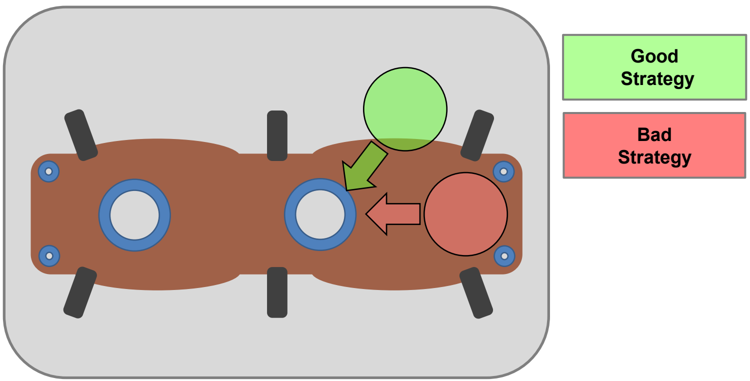
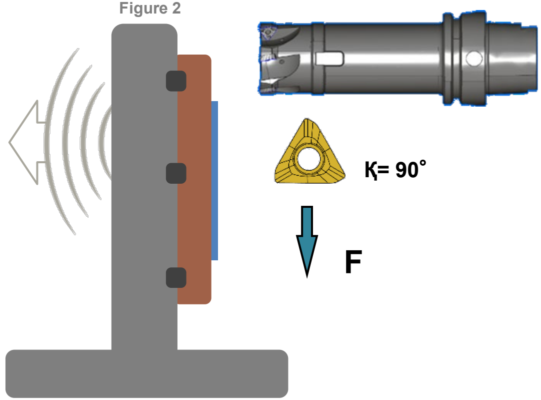
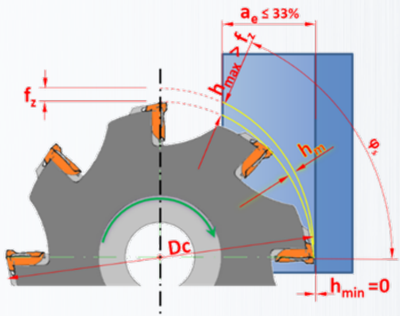


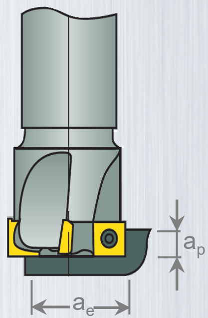
Figure 2

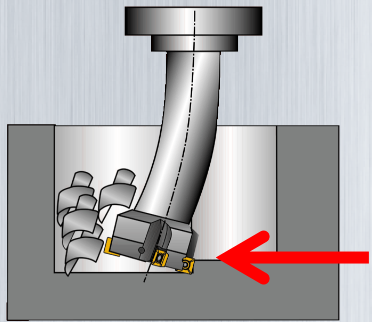


General recommendations for insert milling

- ✓ For the highest possible wall quality, we recommend a cutting depth that is less than 75% of the cutting edge length.
- ✓ For shoulder milling, we recommend starting with a tougher type of carbide than for face milling.
- ✓ When using extended flute cutters, the conditions are often very demanding, so we recommend starting with the toughest grade available, which is recommended for the respective ISO workpiece material range.
- ✓ To avoid vibrations: the deeper the cut, the lower the cutting speed should be. v_c can be chosen.
- ✓ If vibrations occur, we recommend as a first step to reduce the cutting speed v_c and increase the feed f_z to an acceptable range and pay attention to the recommended chip thickness.
- ✓ As a first choice, we recommend using ground inserts. The cutting pressure is lower due to the smaller cutting edge honing.
- ✓ Up-milling can also help stabilize the tool.
- ✓ Make sure that the required machine power is available for the selected cutting values and that the permissible bending moment is not exceeded.
- ✓ Use the ISCAR Machining Power program for this. https://mpwr.iscar.com/

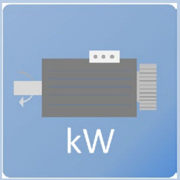






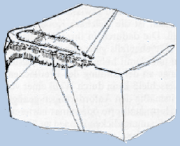
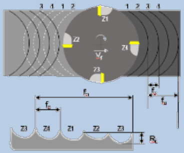
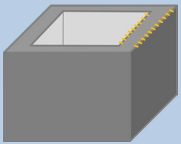
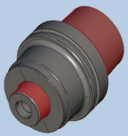
Problems and Troubleshooting

TIPS & TRICKS

	Problem	Reason	Troubleshooting
	Vibrations on tool	• Feed insufficient • Tool diameter too small • Instable tool clamping • Insufficient number of teeth in contact • Minor cutting-edge pushes	• Increase feed • Reduce tool overhang • Improve tool clamping • Use tool with fine tooth pitch • Choose a shorter minor cutting edge • Reduce lead angle
	Vibrations on workpiece	• Instable workpiece clamping • Instable tool • Instable tool clamping • Insufficient number of teeth in contact • Minor cutting-edge pushes	• Improve general clamping situation • Cutting force towards stopper • Reduce axial cutting forces • Reduce radial cutting force • Choose a shorter minor cutting edge • Choose more positive insert • Choose cutter with coarse tooth pitch
	Drive power	• Insufficient machine power • Metal removal rate too high • Insert too negative	• Reduce depth of cut • Reduce width of cut • Reduce feed per tooth • Reduce radial cutting force • Reduce $Z_{eff.}$ • Choose more positive insert

Problems and Troubleshooting

TIPS & TRICKS

	Problem	Reason	Troubleshooting
	Tool wear	Please refer to „Types of Wear And Help“	Please refer to „Types of Wear And Help“
	Re-cut on second side	• Radial cutting forces too high • Cutter vibrates • Cutter diameter too big • Spindle inclination	• Reduce depth of cut • Work with spindle inclination • Check position of wiper insert
	Breakages on workpiece	• Worn cutting edge • Insert too negative • Increased feed per tooth • High chip thickness at exit • Poor radial runout	• Choose cutter with very fine tooth pitch • Reduce lead angle • Reduce chip cross section • Choose sharper cutting edge • Soft exit from material
	Deformation of arbor Fretting corrosion by micro movements	• Adaptation too small • Depth of cut too big • Feed per tooth too big • Feather key not hardened	• Choose bigger adaptation • Reduce $Z_{eff.}$ • Reduce feed per tooth • Reduce depth of cut

General Formulas

Cutting speed

$$v_c = \frac{Dc \cdot \pi \cdot n}{1000} \, [m/min]$$

Feed per tooth

$$f_z = \frac{v_f}{n \cdot z} \, [\text{mm}]$$

Engagement ratio

$$E = \frac{a_e}{Dc} \cdot 100\%$$

RPM

$$n = \frac{v_c \cdot 1000}{Dc \cdot \pi} \, [\text{mm}^{-1}]$$

Feed

$$v_f = f_z \cdot z \cdot n \, [mm/min]$$

Medium chip thickness

$$h_m = f_z \cdot \sqrt{a_e/Dc}$$

Metal removal rate

$$Q = \frac{a_e \cdot a_p \cdot v_f}{1000} \, [cm^3/min]$$

Inserts needed for quantity ordered X

$$= \frac{\text{Workpiece} \cdot \text{number of teeth} \cdot \text{production days/month}}{\text{Toolife number of c.e./insert}}$$

Time of engagement

$$t_h = \frac{L \cdot i}{v_f} \, [\text{min}]$$

Cutting grade costs per workpiece

$$= \frac{\frac{\text{Cost}}{\text{Insert}} \cdot \text{number of pockets}}{\text{Number of cutting edges/insert} \cdot \text{toolife}}$$

Number of pieces per cutting edge

$$= \frac{\text{Toolife (in min.)} \cdot 60}{\text{Time of engagement/workpiece (in sec.)}}$$

Explanations:

Dc = Tool diameter
z = Number of effective c.e.

v_c = Cutting speed
n = RPM of tool
f_z = Feed per tooth
v_f = Feed

a_e = Cutting width (radial)
a_p = Depth of cut (axial)

E = Engagement ratio (%)
h_m = Medium chip thickness

l = Cutting length
i = Number of passes
Q = Metal removal rate
t_h = Main period of use

π = Pi (3,1415…)

Empirical Formulas for Theoretical Power Consumption

Calculation of performance and torque for cutting parameters review

Steel up to 1000 N/mm² (GGG50/60)	Cast	Aluminum alloys	Torque calculation
Performance	**Performance**	**Performance**	**Performance**
$P_{nutz} = \frac{a_p \cdot a_e \cdot v_f}{24.000}$ [kW]	$P_{nutz} = \frac{a_p \cdot a_e \cdot v_f}{30.000}$ [kW]	$P_{nutz} = \frac{a_p \cdot a_e \cdot v_f}{60.000}$ [kW]	$M = 9550 \cdot \frac{P_{nutz}}{n}$ [Nm]

Remark:

Performance and torque should be calculated before starting the machining process. By calculating these two parameters, one will be in the position to avoid later tool or machine damage. Just compare the performance and torque chart of the machine tool with the parameters calculated.

Important:

Only if both of these parameters are within the machine tool‘s performance and torque curve available, a metal cutting process with the metal removal rate calculated will be possible.

You can also carry out all calculations on the ISCAR Machining Power Tool. https://mpwr.iscar.com

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