hard material matters

MaxiMill HFC
'Feed matters', rapid milling

EN

CERATIZIT - secrets of success

Secrets of success

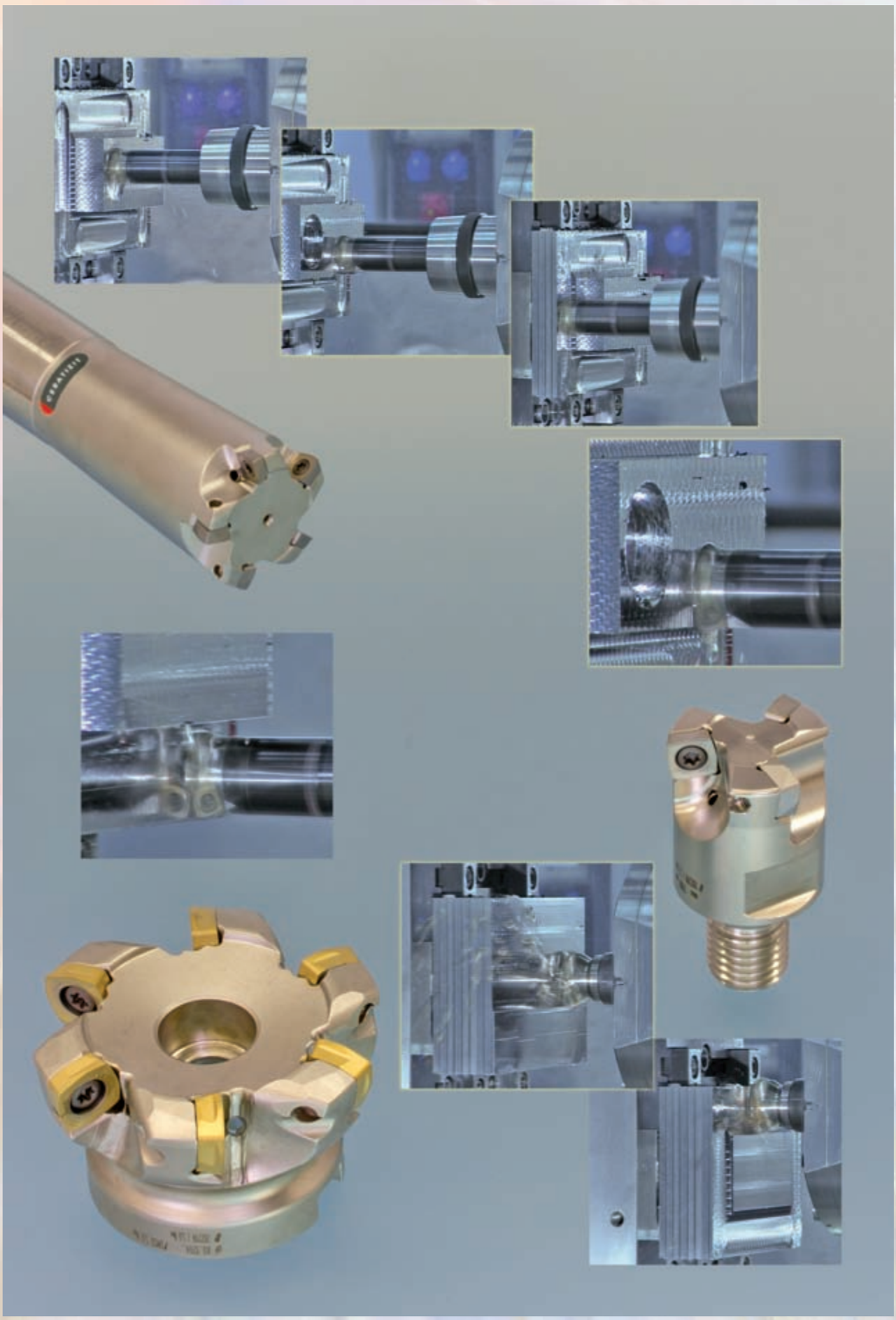
- CERATIZIT is your partner for exceptional hard material solutions. Hard materials and tools from CERATIZIT - our solutions to complex problems are an integral part of our customers' success. Our products guarantee: economy - long life - speed! And it is precisely this combination which gives our business partners a direct competitive advantage.
- Premier performance is only possible through a total appreciation of the requirements of our business partners. A performance achieved through flexible thinking and continuous dialogue with our customers. A pioneering spirit and a deep understanding of powder metallurgy characterize the history of CERATIZIT. One of the attributes of our company philosophy is the search for perfection: target oriented - sustainably - passionately!
- Intensive research and development activities, taking into account the precise requirements and working processes of the customer, are today's investment for the solutions of tomorrow - and beyond.

Corporate values

1. The views and focus of our business partners matter
2. Innovative and flexible thinking matters
3. Communication matters
4. Employee development matters
5. Professionalism matters
6. Our environment matters

Tailored cutting tool solutions

- Cutting materials, coatings, inserts, tooling systems and machining solutions - all this is included in the cutting tool division at CERATIZIT.
- Worldwide well-known companies process advanced materials applying cutting tool products from CERATIZIT: from the automotive industry to the aerospace industry, mechanical engineering, and tool construction to the oil industry.
- The basis of these long-term business relations is the faith of the customers in the extensive know-how of the carbide specialists.



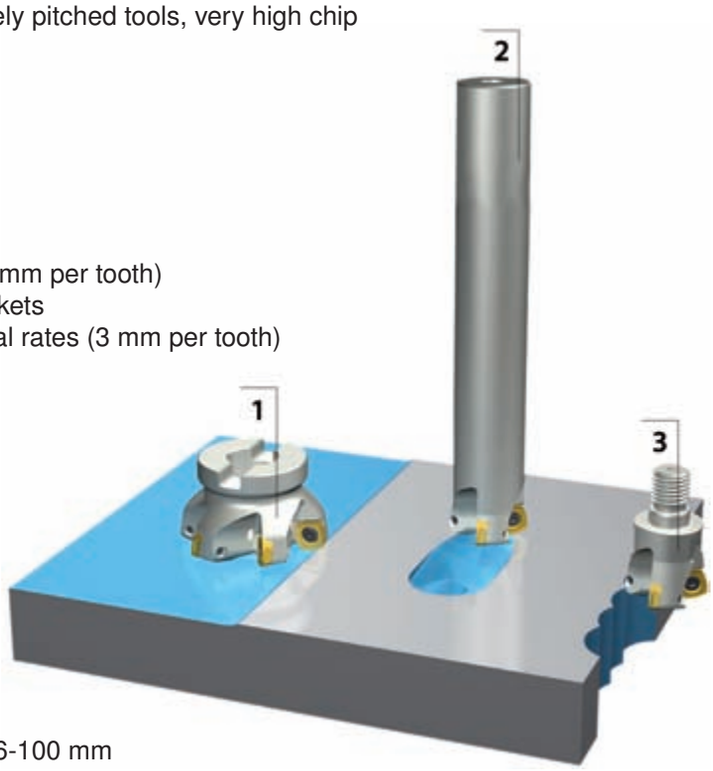
System MaxiMill HFC
Milling system - customer benefits

Extreme face milling
The CERATIZIT solution: MaxiMill HFC

With feed rates up to 3 mm/tooth and closely pitched tools, very high chip removal rates are achieved.

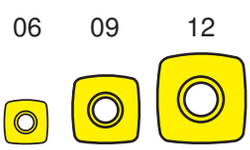
- Extreme feed rates
- Soft cutting with chip groove M50
- HyperCoat inserts

1 Face milling with maximum feed rate (3 mm per tooth)
2 Ramping for the production of deep pockets
3 Plunge milling for maximum chip removal rates (3 mm per tooth)



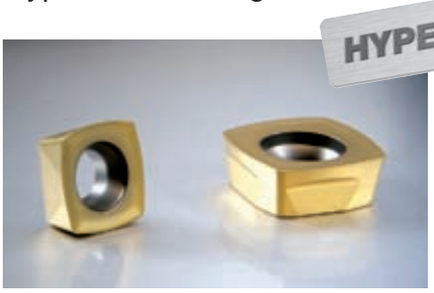

normal


close



Milling cutters Ø 16-100 mm

Maximum tool life
HyperCoat coating



CTC5240
CTC5235
CTP1235
CTP2235
CTC3215

SR226+

Application advantages

- Maximum tool life thanks to HyperCoat coating
- Reduced machining noise and vibration, light cutting geometries
- Optimal cutting performance with low depths of cut
- Maximum economy thanks to 4 cutting edges
- Feed rate up to 3 mm/tooth

Flexibility thanks to coolant holes with MQL* design

- Central coolant supply in all tools.
- Tapered coolant exit hole for minimum quantity lubrication.
- Optimum position of coolant exit hole close to the cutting edge

Increased flexibility when choosing the coolant (air, mist or lubricant).
Reduced tool and work piece heating.
Support for chip evacuation when milling deep pockets.

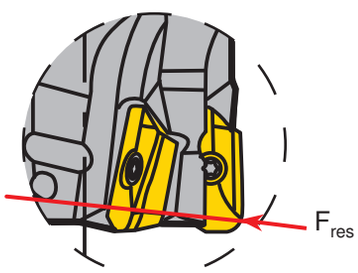
* MQL = minimum quantity lubrication

MaxiMill HFC
Customer benefits

Reduced machining noise and vibration
Light cutting geometries

Extremely positive cutting angle: soft cutting and reduced cutting noise! The cutting forces are mainly in the **axial direction**:
Even with long overhang lengths there is almost no vibration, and little stress on the machine spindle.

MaxiMill 211

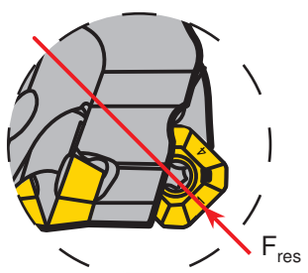


Shoulder milling system with approach angle $k_r = 90°$
→ strong radial forces on the tool and the machine spindle:

$F_r >> F_a$

F_a – axial force on the spindle

MaxiMill 274

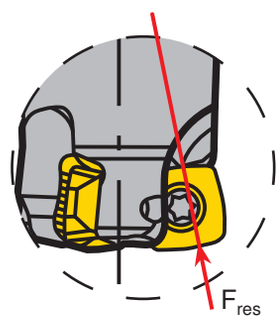


Face milling systems with approach angle $k_r = 45°$
→ the generated forces are divided into approximately equal components:

$F_r = F_a$

F_r – radial force on the spindle

MaxiMill HFC

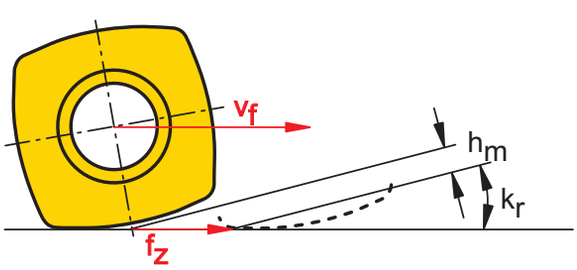


High feed milling systems with approach angle $k_r = 15°$
→ the generated axial forces are in the direction of the machine spindle:

$F_r << F_a$

F_{res} – resulting force on the spindle

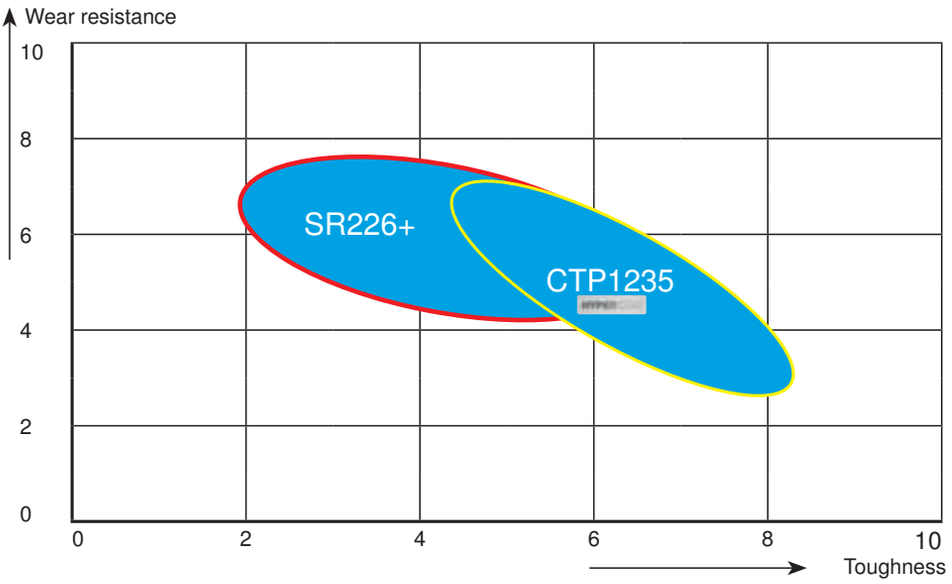
$h_m \approx f_z \times \sin k_r$

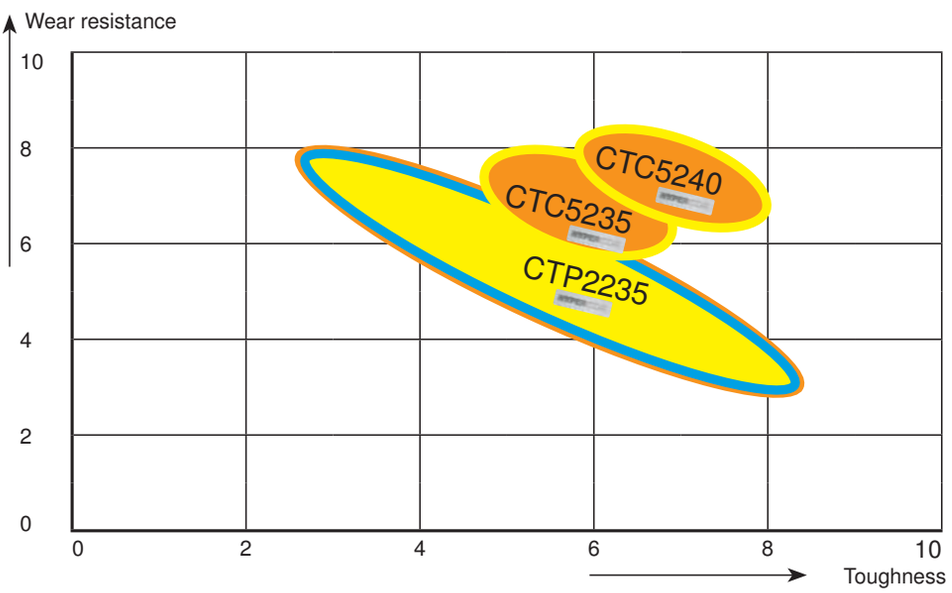


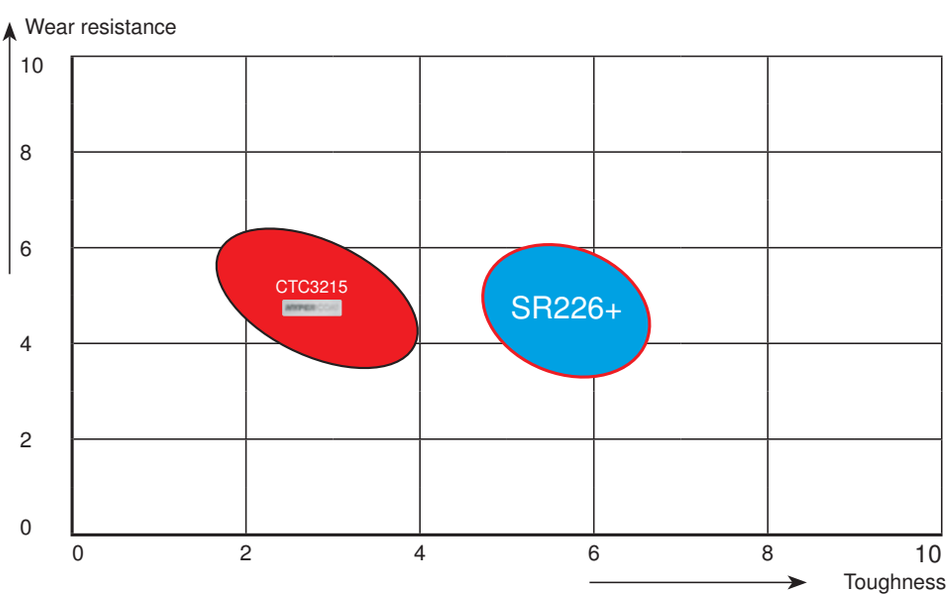
1. **Small approach angles k_r**
   → k_r between 15 and 20°!
2. **Small medium chip thickness h_m**
   → The smaller the approach angle, the smaller is the medium chip thickness!
3. **High feed rate per tooth f_z**
   → In order to reach the same medium chip thickness, the feed rate per tooth must be increased!

High metal removal rate also with low depths of cut thanks to the small approach angle, low medium chip thickness and high feed rates per tooth!

Grade overview
Wear resistance / toughness

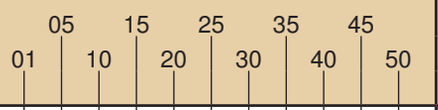






Grade overview

Grade designation	Standard designation	Cutting material	Application range	A Steel	R Stainless	F Cast iron	N Non ferrous metals	S Heat resistant	H Hard materials
CTC3215	HC-K15	C				●			
CTC5235	HC-M35	C		○	●	○		●	
CTC5240	HC-M40	C						●	
CTP1235	HC-P35	P		●					
	HC-M30	P			○			○	
CTP2235	HC-P40	P		○					
	HC-M40	P			●			○	
SR226+	HC-P25	C		●					
	HC-M25	C			○				
	HC-K20	C				●			

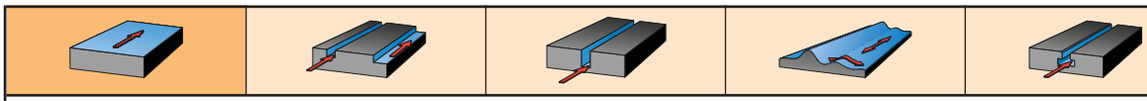


● Main application

○ Extended application

Inserts

Shape X



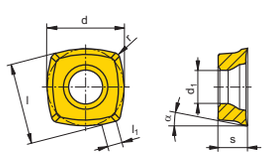
F40

M50

R50

(l) [mm]	Type, description	CTC3215	SR226+	CTP1235	CTC5235	CTC5240	CTP2235	d [mm]	l [mm]	s [mm]	l_1 [mm]	r [mm]	d_1 [mm]	α [°]
06	XPLX 060305ER-F40				●			6,35	6,00	2,75	1,0	0,50	2,80	11
	XPLX 060305SR-M50			●							1,0			
09	XDLX 09T308ER-F40				●	●		9,60	9,00	3,97	2,4	0,80	4,40	15
	XDLX 09T308SR-M50	●	●	●			●				1,5			
12	XOLX 120410ER-F40				●	●		12,70	12,00	4,76	2,2	1,00	5,50	9
	XOLX 120410SR-M50	●	●	●			●				2,2			
	XOLX 120410SR-R50			●										

	CTC3215	SR226+	CTP1235	CTC5235	CTC5240	CTP2235
Steel		●	●	○		○
Stainless		○	○	●		●
Cast iron	●	●		○		
Non ferrous metals						
Heat resistant			○	●	●	○
Hard materials						



● Main application

○ Extended application

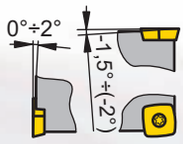
● International CERATIZIT range, for present availability see price list

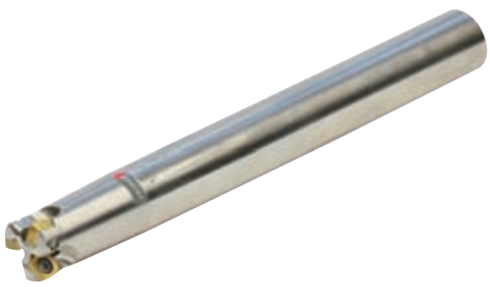
Ordering example: 10 pieces XPLX 060305ER-F40 CTC5235

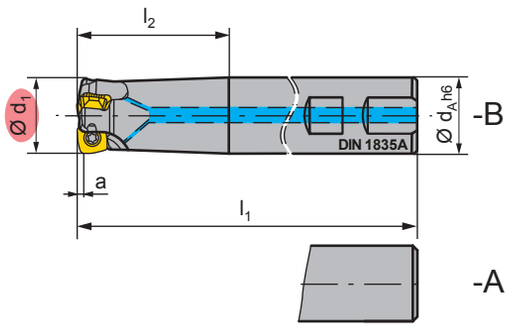
	CHFC-06/09/12	GHFC-06/09/12	AHFC-09/12		
					

Face milling cutters

CHFC-06/-09/-12







d1 [mm]	Type, description	l1 [mm]	l2 [mm]	dA [mm]	a [mm]	nmax [min-1]	z	
16	CHFC.16.R.02-06-A-40-200	200	40	16	0,8	4.600	2	XP.. 0603
	CHFC.16.R.02-06-B-40	89	40	16		17.300	2	
20	CHFC.20.R.03-06-A-50-225	225	50	20		4.200	3	
	CHFC.20.R.03-06-B-50	101	50	20		14.500	3	
25	CHFC.25.R.04-06-A-50-225	225	50	25		4.600	4	
	CHFC.25.R.04-06-B-50	107	50	25		15.600	4	
32	CHFC.32.R.05-06-A25-60-225	225	60	25		3.900	5	
	CHFC.32.R.05-06-B25-60	117	60	25		11.000	5	
25	CHFC.25.R.02-09-A-50-225	225	50	25	1	9.000	2	XD.. 09T3
	CHFC.25.R.03-09-A-50-225	225	50	25		9.000	3	
32	CHFC.32.R.03-09-A-63-250	250	63	32		8.100	3	
	CHFC.32.R.02-12-A-63-250	250	63	32	2	6.480	2	XO.. 1204
35	CHFC.35.R.03-12-A-63-250	250	63	32		6.408	3	

Ordering example: 1 piece CHFC.16.R.02-06-A-40-200

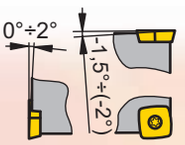
Supply details: cutter body and clamping screws for inserts

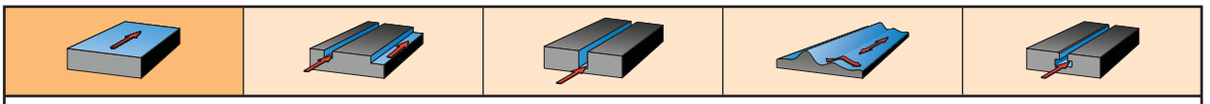
	d1 [mm]			
X_LX 0603	**16 - 32**	7883204/M2,5X5/T08	7724106/TORX T08	DMSD 1,2Nm/SORT T08
X_LX 09T3	**25**	7722111/M3,5X7,2/T15	7724103/TORX T15	DMSD 3,2Nm/SORT T15
X_LX 09T3	**32**	7883209/M3,5X8,6/T15	7724103/TORX T15	DMSD 3,2Nm/SORT T15
X_LX 1204	**32 - 35**	7822114/M4,5X10,5/T20	7724104/TORX T20	DMSD 5,0Nm/SORT T20

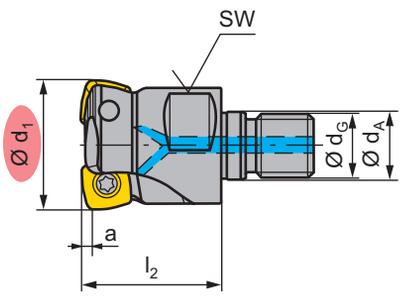
	XP.. 0603	XD.. 09T3	XO.. 1204		

Face milling cutters

GHFC-06/-09/-12







d_1 [mm]	Type, description	l_2 [mm]	d_A [mm]	d_G [mm]	a [mm]	n_{max} [min^{-1}]	z	
16	GHFC.16.R.02-06-27	27	8,5	8	0,8	20.800	2	XP.. 0603
20	GHFC.20.R.03-06-33	33	10,5	10		19.800	3	
25	GHFC.25.R.04-06-35	35	12,5	12		18.700	4	
32	GHFC.32.R.05-06-35	35	17,0	16		22.000	5	
25	GHFC.25.R.02-09	35	12,5	12	1	30.000	2	XD.. 09T3
	GHFC.25.R.03-09	35	12,5	12		30.000	3	
32	GHFC.32.R.03-09	35	17,0	16		27.000	3	
	GHFC.32.R.02-12	35	17,0	16	2	21.600	2	XO.. 1204
35	GHFC.35.R.03-12	35	17,0	16		21.360	3	

Ordering example: 1 piece GHFC.16.R.02-06-27

Supply details: cutter body and clamping screws for inserts

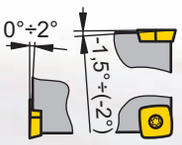
n_{max} = depends on the overhang and number of interfaces in the complete tool

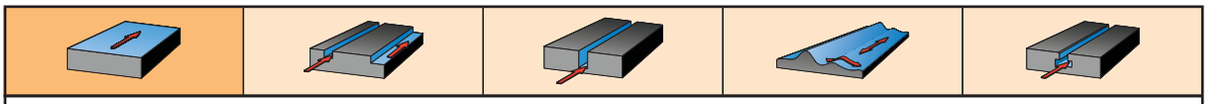
	d_1 [mm]			
X_LX 0603	16 - 32	7883204/M2,5X5/T08	7724106/TORX T08	DMSD 1,2Nm/SORT T08
X_LX 09T3	25	7722111/M3,5X7,2/T15	7724103/TORX T15	DMSD 3,2Nm/SORT T15
X_LX 09T3	32	7883209/M3,5X8,6/T15	7724103/TORX T15	DMSD 3,2Nm/SORT T15
X_LX 1204	32 - 35	7822114/M4,5X10,5/T20	7724104/TORX T20	DMSD 5,0Nm/SORT T20

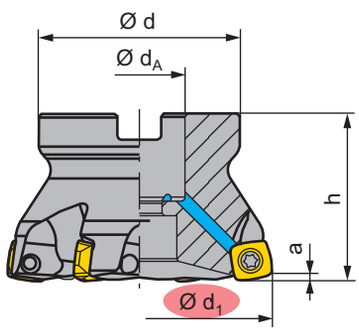
	XP.. 0603	XD.. 09T3	XO.. 1204		

Face milling cutters

AHFC-09/-12







d_1 [mm]	Type, description	d_A [mm]	a [mm]	d [mm]	h [mm]	n_{max} [min^{-1}]	z		
32	AHFC.32.R.03-09	16	1	38	40	27.000	3		XD.. 09T3
35	AHFC.35.R.04-09	16		38	40	26.700	4		
40	AHFC.40.R.04-09	16		38	40	26.400	4		
42	AHFC.42.R.05-09	16		38	40	26.100	5		
50	AHFC.50.R.05-09	22		43	40	23.500	5		
52	AHFC.52.R.06-09	22		43	40	23.000	6		
63	AHFC.63.R.06-09	22		48	40	20.500	6		
66	AHFC.66.R.07-09	22		48	40	20.000	7		
40	AHFC.40.R.03-12	16	2	38	40	21.120	3		XO.. 1204
42	AHFC.42.R.04-12	16		38	40	20.880	4		
50	AHFC.50.R.04-12	22		43	40	18.800	4		
52	AHFC.52.R.05-12	22		43	40	18.400	5		
63	AHFC.63.R.05-12	22		48	40	16.400	5		
66	AHFC.66.R.06-12	22		48	40	16.000	6		
80	AHFC.80.R.07-12	27		58	50	14.000	7		
100	AHFC.100.R.08-12	32		78	50	12.000	8		

Ordering example: 1 piece AHFC.32.R.03-09

Supply details: cutter body and clamping screws for inserts

	d_1 [mm]				
XD_X 09T3	**32 - 42**	7883209/M3,5X8,6/T15	7724103/TORX T15	DMSD 3,2Nm/SORT T15	7818267/M8,0x30,0
XD_X 09T3	**50 - 63**	7883209/M3,5X8,6/T15	7724103/TORX T15	DMSD 3,2Nm/SORT T15	
XO_X 1204	**40 - 42**	7822114/M4,5X10,5/T20	7724104/TORX T20	DMSD 5,0Nm/SORT T20	7818267/M8,0x30,0
XO_X 1204	**50 - 100**	7822114/M4,5X10,5/T20	7724104/TORX T20	DMSD 5,0Nm/SORT T20	

XD_X 09T3	**32 - 42**	S4/SW4
XO_X 1204	**40 - 42**	S4/SW4

	XD.. 09T3	XO.. 1204			

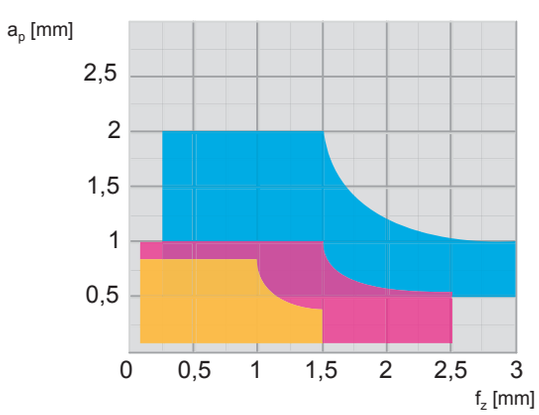
Cutting data

Tool, material

	v_c (m/min)	f_z (mm)	a_p (mm)	v_c (m/min)	f_z (mm)	a_p (mm)	v_c (m/min)	f_z (mm)	a_p (mm)
MaxiMill HFC-06									
▼	280 - 100	–	–	–	0,1 - 1,5	0,1 - 0,4	–	0,1 - 1,0	0,1 - 0,8
▼	260 - 140	–	–	–	0,1 - 1,5	0,1 - 0,4	–	0,1 - 1,0	0,1 - 0,8
▼	230 - 110	–	–	–	0,1 - 1,5	0,1 - 0,4	–	0,1 - 1,0	0,1 - 0,8
MaxiMill HFC-09									
▼	280 - 100	–	–	–	0,1 - 2,5	0,1 - 0,5	–	0,1 - 1,5	0,5 - 1,0
▼	260 - 140	–	–	–	0,1 - 2,5	0,1 - 0,5	–	0,1 - 1,5	0,5 - 1,0
▼	230 - 110	–	–	–	0,1 - 2,5	0,1 - 0,5	–	0,1 - 1,5	0,5 - 1,0
MaxiMill HFC-12									
▼	280 - 100	–	–	–	0,1 - 3,0	0,5 - 1,2	–	0,1 - 2,0	1,0 - 2,0
▼	260 - 140	–	–	–	0,1 - 3,0	0,5 - 1,2	–	0,1 - 2,0	1,0 - 2,0
▼	230 - 110	–	–	–	0,1 - 3,0	0,5 - 1,2	–	0,1 - 2,0	1,0 - 2,0

Recommendations for economic milling

HFC



l [mm]	a_p	f_z
06	0,1 - 0,8	1,5 - 0,10
09	0,1 - 1	2,5 - 0,10
12	0,5 - 2	3,0 - 0,25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Cutting data
Grades / materials

	Work piece material	Type of treatment / alloy		VDI 3323 group	Hard-ness HB
A	Non alloyed steel	annealed	≤ 0,15% C	1	125
		annealed	0,15% - 0,45% C	2	150 - 250
		tempered	≥ 0,45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Stainless steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Grey cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminium wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminium cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fibre reinforced plastics	29	–
			hard rubber	30	–
S	Heat resistant alloys	annealed	Fe base	31	200
		hardened	Fe base	32	280
		annealed	Ni or Co base	33	250
		hardened	Ni or Co base 30 - 58 HRC	34	–
		cast	Ni or Co base 1500 - 2200 Nmm^2	35	–
	Titanium alloys		Ni or Co base	36	R_m 440*
			alpha + beta alloys	37	R_m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* Rm = ultimate tensile strength, measured in MPa

Cutting data

Grades / materials

Coated carbide							
CTC3215		CTP1235		CTP2235		SR226+	
☐	☒	☐	☒	☐	☒	☒	☐
v_c [m/min]	v_c [m/min]	v_c [m/min]	v_c [m/min]	v_c [m/min]	v_c [m/min]	v_c [m/min]	v_c [m/min]
–	–	100-220	70-180	150 - 260	90 - 180	210 - 350	130 - 200
–	–	100-220	70-180	150 - 260	90 - 180	170 - 320	110 - 180
–	–	100-220	70-180	150 - 260	90 - 180	150 - 280	90 - 150
–	–	80-220	70-170	80 - 220	70 - 160	150 - 250	80 - 140
–	–	80-220	70-170	80 - 220	70 - 160	140 - 210	60 - 120
–	–	80-220	70-170	80 - 220	70 - 160	100 - 180	60 - 110
–	–	80-180	60-140	90 - 180	70 - 140	140 - 210	60 - 110
–	–	80-180	60-140	90 - 180	70 - 140	100 - 170	60 - 100
–	–	70-180	60-140	70 - 180	60 - 140	140 - 190	80 - 140
–	–	70-180	60-140	70 - 180	60 - 140	100 - 170	70 - 120
–	–	60-200	40-140	60 - 200	60 - 140	110 - 200	–
–	–	60-200	40-140	60 - 200	60 - 140	120 - 210	–
–	–	60-200	40-140	60 - 200	60 - 140	–	–
–	–	60-200	40-140	60 - 200	60 - 140	80 - 140	–
180 - 350	180 - 350	–	–	–	–	160 - 220	120 - 180
140 - 280	140 - 280	–	–	–	–	100 - 170	80 - 150
130 - 250	130 - 250	–	–	–	–	100 - 200	80 - 170
100 - 200	100 - 200	–	–	–	–	90 - 180	70 - 140
150 - 320	150 - 320	–	–	–	–	90 - 180	70 - 140
120 - 250	120 - 250	–	–	–	–	80 - 160	70 - 130
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
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–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
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–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	20-60	–	60 - 90
–	–	–	–	–	20-60	–	60 - 90
–	–	–	–	–	20-60	–	–
–	–	–	–	–	20-30	–	–
–	–	–	–	–	20-30	–	–
–	–	–	–	–	40-70	–	–
–	–	–	–	–	20-40	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	70 - 130	–
–	–	–	–	–	–	–	–

☒ Recommended application ☐ Possible application

Cutting data
Grades / materials

	Work piece material	Type of treatment / alloy		VDI 3323 group	Hard-ness HB
A	Non alloyed steel	annealed	≤ 0,15% C	1	125
		annealed	0,15% - 0,45% C	2	150 - 250
		tempered	≥ 0,45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Stainless steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Grey cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminium wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminium cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fibre reinforced plastics	29	–
			hard rubber	30	–
S	Heat resistant alloys	annealed	Fe base	31	200
		hardened	Fe base	32	280
		annealed	Ni or Co base	33	250
		hardened	Ni or Co base 30 - 58 HRC	34	–
		cast	Ni or Co base 1500 - 2200 Nmm^2	35	–
	Titanium alloys		Ni or Co base	36	R_m 440*
			alpha + beta alloys	37	R_m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* Rm = ultimate tensile strength, measured in MPa

Cutting data

Grades / materials

Coated carbide			
CTC5235		CTC5240	
☒	☒	☒	☐
v_c [m/min]	v_c [m/min]	v_c [m/min]	v_c [m/min]
150 - 260	90 - 180	–	–
150 - 260	90 - 180	–	–
150 - 260	90 - 180	–	–
80 - 220	70 - 160	–	–
80 - 220	70 - 160	–	–
80 - 220	70 - 160	–	–
90 - 180	70 - 140	–	–
90 - 180	70 - 140	–	–
70 - 180	60 - 140	–	–
70 - 180	60 - 140	–	–
220 - 350	–	–	–
150 - 240	–	–	–
80 - 160	60 - 140	–	–
80 - 200	60 - 180	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
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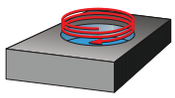
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	30 - 250
–	–	–	10 - 60
–	–	–	20 - 60
–	–	–	10 - 50
–	–	–	10 - 40
–	–	–	60 - 120
–	–	–	40 - 80
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–

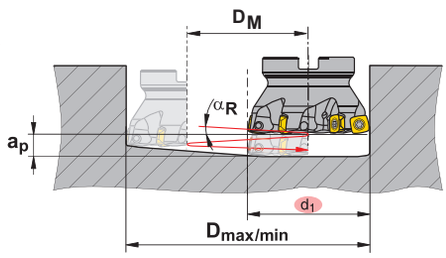
☒ Recommended application ☐ Possible application

Application data

HFC-06

Helical plunge milling



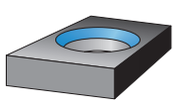


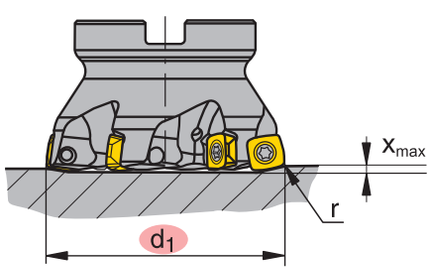
D_{max} [mm] = maximum diameter for flat bottom ground
D_{min} [mm] = minimum hole diameter
$D_M = D_{max} - d_1$ or $D_{min} - d_1$

d_1 [mm]	D_{max} [mm]	D_{min} [mm]	$\alpha_{R\ max}$ [°]
16	31	22	4,5°
20	39	30	2,3°
25	49	40	1,3°
32	63	54	0,9°

a_p [mm] = $D_M \times \pi \times \tan \alpha_R$

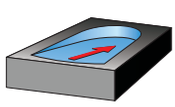
Axial plunging

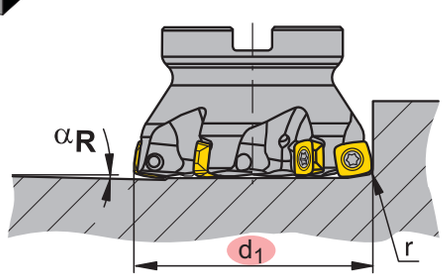




d_1 [mm]	X_{max} [mm]
16 - 32	0,5

Angled ramping



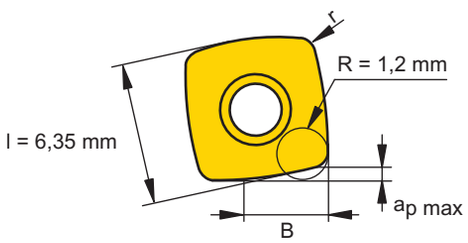


d_1 [mm]	$\alpha_{R\ max}$ [°]
16	5,9°
20	3,2°
25	2,0°
32	1,3°

Application data

HFC-06

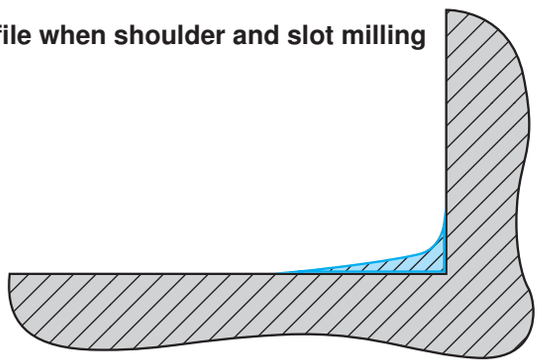
Depth of cut and remaining material



l [mm]	B [mm]	r [mm]	$a_{p\ max}$ [mm]
6,35	4,3	0,5	0,8

R = programmed radius

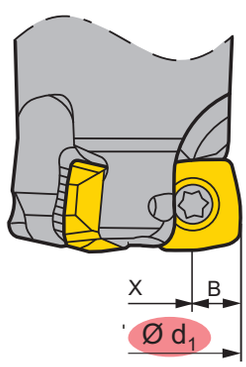
Profile when shoulder and slot milling



$f_z \geq 0.4$ / tooth

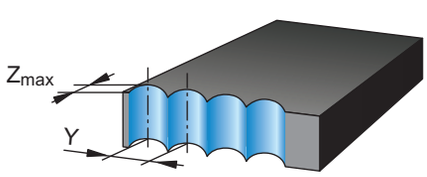
recommended

Width of cut for flat surfaces



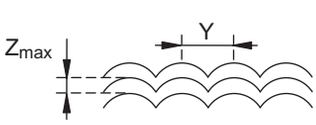
d_1 [mm]	X [mm]	B [mm]
16 - 32	d_1-(2 x B)	4,3

Engagement data when plunge milling

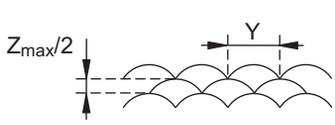


Z_{max} [mm]	f_z initial [mm]	f_z min [mm]	f_z max [mm]	Y_{max} [mm]
5,3	0,10	0,08	0,15	< 0,7 x d_1

Tool offset with optimum overlap



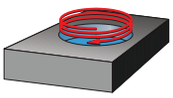
Tool offset for unstable conditions

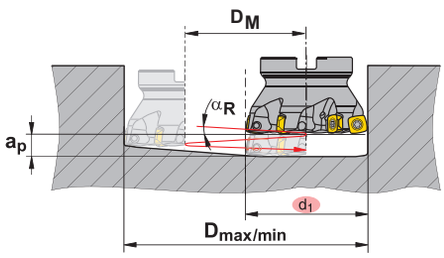


Application data

HFC-09

Helical plunge milling



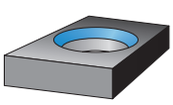


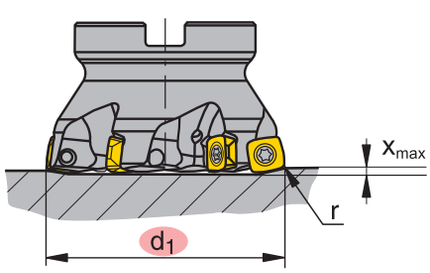
D_{max} [mm] = maximum diameter for flat bottom ground
D_{min} [mm] = minimum hole diameter
$D_M = D_{max} - d_1$ or $D_{min} - d_1$

d_1 [mm]	D_{max} [mm]	D_{min} [mm]	$\alpha_{R\ max}$ [°]
25	48	35	3,1
32	62	49	1,7
35	68	55	1,4
40	78	65	1,0
42	82	69	0,9
50	98	85	0,8
52	102	89	0,7
63	124	111	0,7
66	130	117	0,6

a_p [mm] = D_M x π x tan α_R

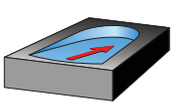
Axial plunging

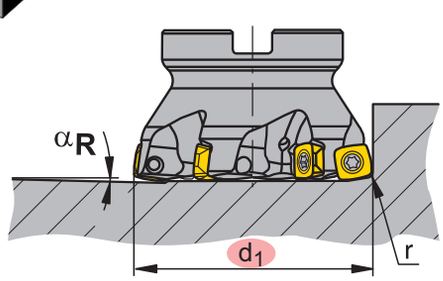




d_1 [mm]	X_{max} [mm]
25 - 66	0,75

Angled ramping



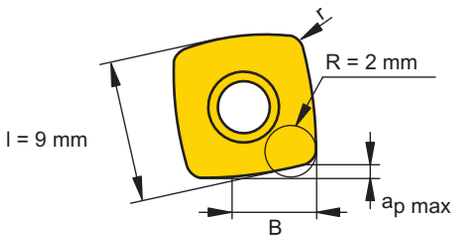


d_1 [mm]	$\alpha_{R\ max}$ [°]
25	3,6
32	2,0
35	1,6
40	1,2
42	1,1
50	0,9
52	0,8
63	0,8
66	0,7

Application data

HFC-09

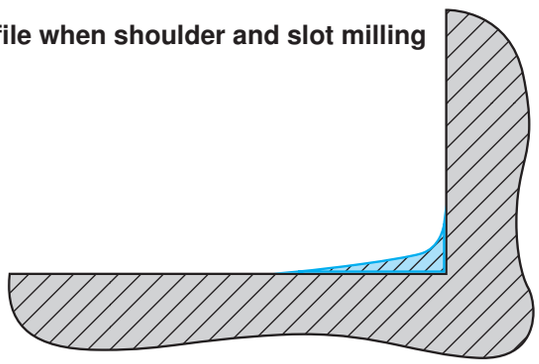
Depth of cut and remaining material



l [mm]	B [mm]	r [mm]	$a_{p\ max}$ [mm]
9	5,9	0,8	1

R = programmed radius

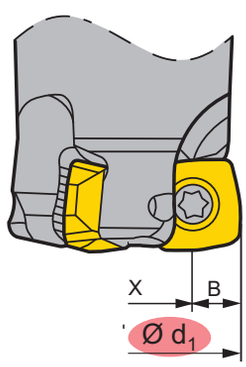
Profile when shoulder and slot milling



$f_z \geq 0.5$ / tooth

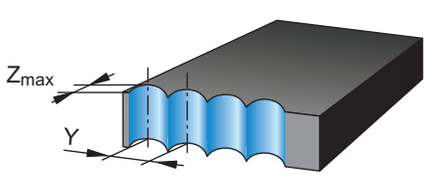
recommended

Width of cut for flat surfaces



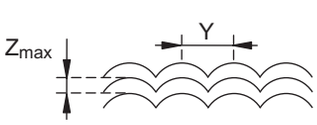
d_1 [mm]	X [mm]	B [mm]
25-66	d_1-(2 x B)	5,9

Engagement data when plunge milling

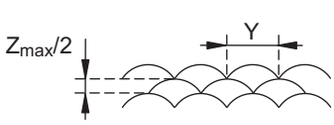


Z_{max} [mm]	f_z initial [mm]	f_z min [mm]	f_z max [mm]	Y_{max} [mm]
7,5	0,10	0,08	0,15	< 0,7 x d_1

Tool offset with optimum overlap



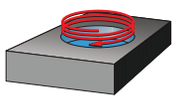
Tool offset for unstable conditions

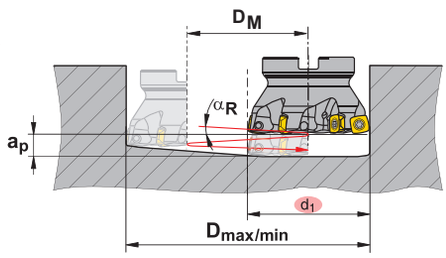


Application data

HFC-12

Helical plunge milling



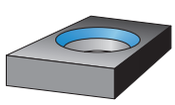


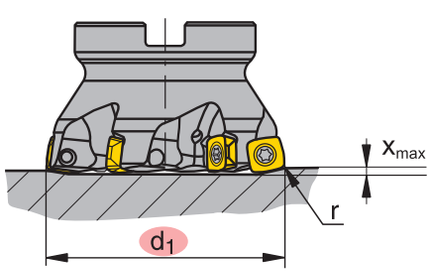
D_{max} [mm] = maximum diameter for flat bottom ground
D_{min} [mm] = minimum hole diameter
$D_M = D_{max} - d_1$ or $D_{min} - d_1$

d_1 [mm]	D_{max} [mm]	D_{min} [mm]	$\alpha_{R\ max}$ [°]
32	62	44	6,1
35	68	50	3,7
40	78	60	2,5
42	82	64	2,3
50	98	80	1,3
52	102	84	1,3
63	124	106	0,9
66	130	112	0,9
80	158	140	1,1
100	198	180	0,6

a_p [mm] = $D_M \times \pi \times \tan \alpha_R$

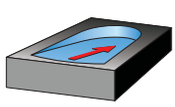
Axial plunging

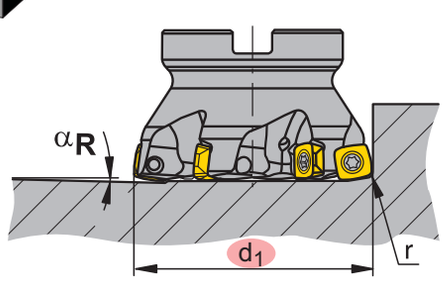




d_1 [mm]	X_{max} [mm]
32 - 100	1,15

Angled ramping



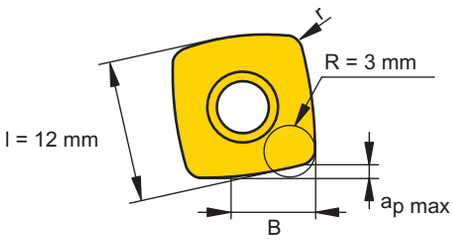


d_1 [mm]	$\alpha_{R\ max}$ [°]
32	7,2
35	4,4
40	2,9
42	2,7
50	1,5
52	1,5
63	1,1
66	1,1
80	1,3
100	0,7

Application data

HFC-12

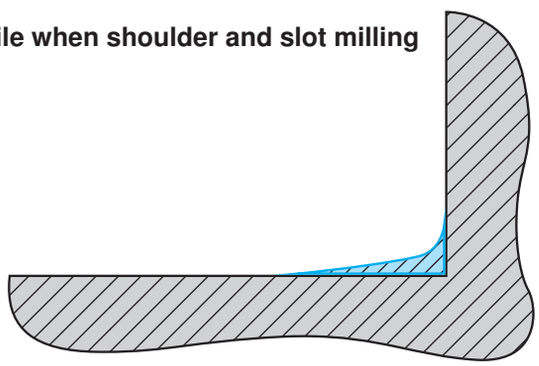
Depth of cut and remaining material



l [mm]	B [mm]	r [mm]	$a_{p\ max}$ [mm]
12	8,3	1,0	2

R = programmed radius

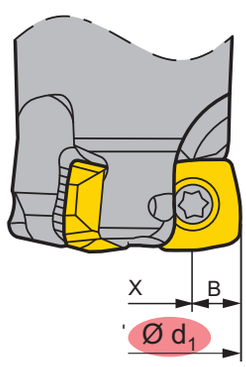
Profile when shoulder and slot milling



$f_z \geq 0.6$ / tooth

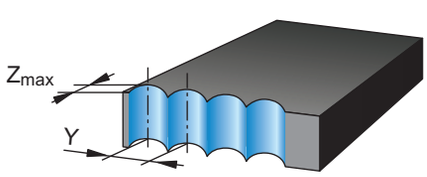
recommended

Width of cut for flat surfaces



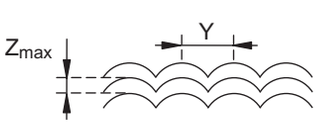
d_1 [mm]	X [mm]	B [mm]
32 - 100	d_1-(2 x B)	8,3

Engagement data when plunge milling

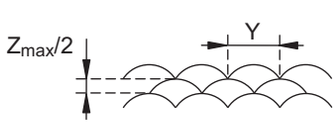


Z_{max} [mm]	f_z initial [mm]	f_z min [mm]	f_z max [mm]	Y_{max} [mm]
10	0,15	0,10	0,20	< 0,7 x d_1

Tool offset with optimum overlap



Tool offset for unstable conditions



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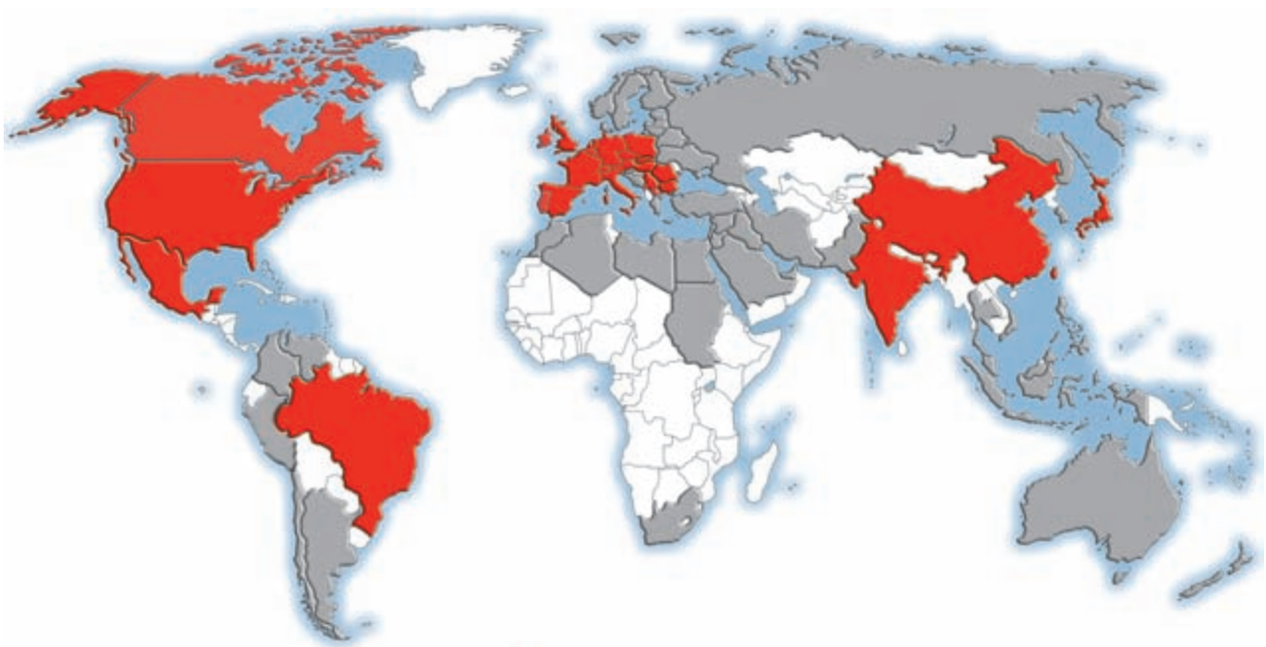

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