End mill – UM/HPC/VSM series

Material group		Composition / structure / heat treatment		Brinell hardness HB	Machining group	Starting values for cutting speed v_c [m/min]							
						5501R38414GM (-R) 5502R38414GM (-R) 5602R38414GM (-R)				UM-4E UM-4E-W UM-4R			
						Slot milling		Shoulder milling		Slot milling		Shoulder milling	
						Ø [mm]	$a_{p\,max}$	Ø [mm]	$a_{e\,max}$	Ø [mm]	$a_{p\,max}$	Ø [mm]	$a_{e\,max}$
						0<x<3	0,3xD	0<x<3	0.15xD	0<x<3	0,3xD	0<x<3	0.15xD
						3≤x<12	0,7xD	3≤x<20	0,3xD	3≤x<12	0,7xD	3≤x<20	0,3xD
						12≤x≤20	1,5xD			12≤x≤20	1,5xD		
						KMG405				KMG405			
						a_e / D				a_e / D			
						1/1	1/2	1/10	f-group	1/1	1/2	1/10	f-group
P	Unalloyed steel	ca. 0,15 % C	annealed	125	1	250	300	380	9	250	300	380	9
		ca. 0,45 % C	annealed	190	2	240	285	365	9	240	285	365	9
		ca. 0,45 % C	tempered	250	3	175	210	270	9	175	210	270	9
		ca. 0,75 % C	annealed	270	4	150	180	230	9	150	180	230	9
		ca. 0,75 % C	tempered	300	5	140	165	210	9	140	165	210	9
	Low-alloyed steel		annealed	180	6	190	225	285	9	190	225	285	9
			tempered	275	7	150	180	230	9	150	180	230	9
			tempered	300	8	140	165	210	9	140	165	210	9
			tempered	350	9	130	160	200	9	130	160	200	9
	High-alloyed steel and high-alloyed tool steel		annealed	200	10	175	210	270	9	175	210	270	9
			hardened and tempered	325	11	135	160	205	9	135	160	205	9
M	Stainless steel	ferritic/martensitic	annealed	200	12	80	100	125	9	80	100	125	9
		martensitic	tempered	240	13	70	85	110	9	70	85	110	9
		austenitic	quench hardened	180	14	85	105	130	9	85	105	130	9
		austenitic-ferritic		230	15	70	85	110	9	70	85	110	9
K	Grey cast iron	perlitic/ferritic		180	16	185	220	280	9	185	220	280	9
		perlitic (martensitic)		260	17	150	180	230	9	150	180	230	9
	Cast iron with spheroidal graphite	ferritic		160	18	225	270	345	9	225	270	345	9
		perlitic		250	19	175	210	270	9	175	210	270	9
	Malleable cast iron	ferritic		130	20	250	300	380	9	250	300	380	9
		perlitic		230	21	200	240	305	9	200	240	305	9
N	Aluminium wrought alloys	cannot be hardened		60	22								
		hardenable	hardened	100	23								
	Cast aluminium alloys	≤ 12 % Si, cannot be hardened		75	24								
		≤ 12 % Si, hardenable	hardened	90	25								
		> 12 % Si, cannot be hardened		130	26								
	Copper and copper alloys (bronze/brass)	machining steel, PB> 1%		110	27								
		CuZn, CuSnZn		90	28								
		CuSn, Pb-free copper, electrolytic copper		100	29								
S	Heat-resistant alloys	Fe-based alloys	annealed	200	30								
			hardened	280	31								
		Ni or Co bass	annealed	250	32								
			hardened	350	33								
			cast	320	34								
	Titanium alloys	pure titanium		R_m 400	35								
		α and β alloys	hardened	R_m 1050	36								
H	Hardened steel		hardened and tempered	55 HRC	37	115	140	175	9	115	140	175	9
			hardened and tempered	60 HRC	38								
	Hard cast iron		cast	400	39	135	165	205	9	135	165	205	9
	Hardened cast iron		hardened and tempered	55 HRC	40								
X	Non-metallic materials	Thermoplasts			41								
		Thermosetting plastics			42								
		Plastic, glass-fibre reinforced GFRP			43								
		Plastic, carbon fibre reinforced CFRP			44								
		Graphite			45								
		Wood			46								

Note: The given cutting values are guide values, which were determined under ideal conditions.
The values have to be adapted in individual cases.
Feed rate recommendations on page B240.
For examples of material for cutting tool groups view page D22.

	Starting values for cutting speed v_c [m/min]												
	UM-4EL UM-4EL-W UM-4ELP UM-4EFP				UM-4RL UM-4RFP				VSM-4E VSM-4R				
	Slot milling		Shoulder milling		Slot milling		Shoulder milling		Slot milling		Shoulder milling		
	Ø [mm]	$a_{p\ max}$	Ø [mm]	$a_{e\ max}$	Ø [mm]	$a_{p\ max}$	Ø [mm]	$a_{e\ max}$	Ø [mm]	$a_{p\ max}$	Ø [mm]	$a_{e\ max}$	
	0<x<3	0,3xD	0<x<3	0.15xD	0<x<3	0,3xD	0<x<3	0.15xD	0<x<3	0,3xD	0<x<3	0.15xD	
	3≤x<12	0,7xD	3≤x<20	0,3xD	3≤x<12	0,7xD	3≤x<20	0,3xD	3≤x<12	0,7xD	3≤x<20	0,3xD	
	12≤x≤20	1,5xD			12≤x≤20	1,5xD			12≤x≤20	1,5xD			
	KMG405				KMG405				KMG405				
	a_e / D				a_e / D				a_e / D				
	1/1	1/2	1/10	f-group	1/1	1/2	1/10	f-group	1/1	1/2	1/10	f-group	
	150	180	230	9	150	180	230	9	145	180	250	10	
	145	175	220	9	145	175	220	9	140	175	240	10	
	105	130	165	9	105	130	165	9	105	130	175	10	
	90	110	140	9	90	110	140	9	90	110	150	10	
	85	100	130	9	85	100	130	9	80	100	140	10	
	115	135	175	9	115	135	175	9	110	135	190	10	
	90	110	140	9	90	110	140	9	90	110	150	10	
	85	100	130	9	85	100	130	9	80	100	140	10	
	80	95	120	9	80	95	120	9	80	95	130	10	
	105	130	165	9	105	130	165	9	105	130	175	10	
	80	100	125	9	80	100	125	9	80	100	135	10	
	50	60	75	9	50	60	75	9	50	60	80	10	
	45	55	65	9	45	55	65	9	45	55	70	10	
	55	65	80	9	55	65	80	9	50	65	85	10	
	45	55	65	9	45	55	65	9	45	55	70	10	
	110	135	170	9	110	135	170	9					
	90	110	140	9	90	110	140	9					
	135	165	210	9	135	165	210	9					
	105	130	165	9	105	130	165	9					
	150	180	230	9	150	180	230	9					
	120	145	185	9	120	145	185	9					
									45	55	85	10	
									25	30	45	10	
									45	55	85	10	
									25	30	45	10	
									25	30	45	10	
									75	90	135	10	
									45	55	85	10	
	70	85	110	9	70	85	110	9					
	85	100	130	9	85	100	130	9					