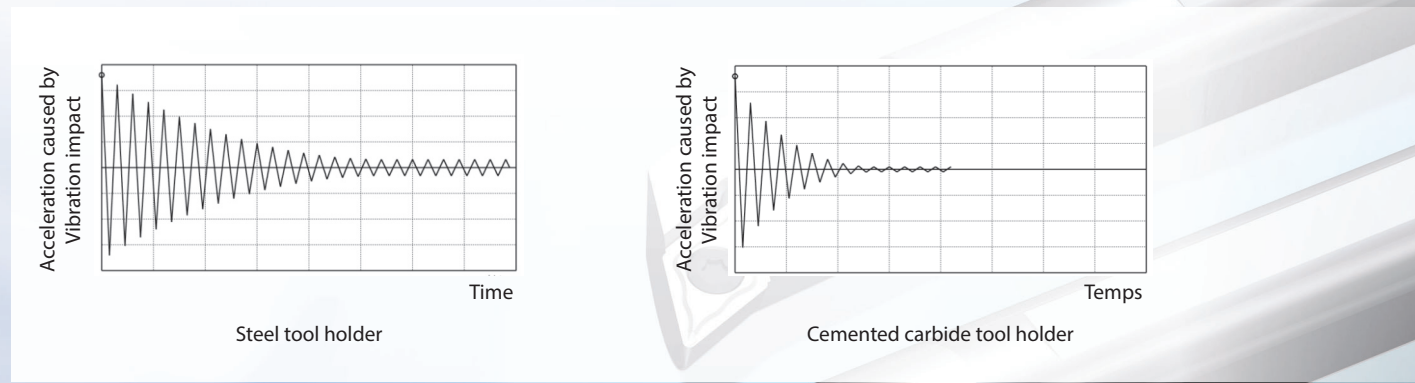


Anti Vibration Boring Bar

By increasing the rigidity of the tool materials the vibration will be reduced. The carbide tool holder performs much better than steel tool holders (steel tool holder approx. $L \leq 3 \times D$, carbide tool holder is approx. $L \leq 6 \times D$). The cutting data can be increased and the shank overhang extended. Therefore you achieve better surface and higher workpiece precision.

Vibration amplitude (under same machining conditions)



Turning insert, negative

	Material group	Composition / structure / heat treatment		Brinell hardness HB	Machining group	Starting values for cutting speed v_c [m/min]									
						HC (CVD)									
						YB6315			YBC152			YBC252			
						Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			
						0,1	0,2	0,6	0,1	0,2	0,6	0,1	0,4	0,8	
P	Unalloyed steel	approx. 0,15 % C	annealed	125	1	500	400	270	500	400	270	480	370	230	
		approx. 0,45 % C	annealed	190	2	420	340	230	420	340	230	400	310	190	
		approx. 0,45 % C	tempered	250	3	330	280	200	330	280	200	310	250	160	
		approx. 0,75 % C	annealed	270	4	320	270	190	320	270	190	300	240	150	
		approx. 0,75 % C	tempered	300	5	280	240	170	280	240	170	260	210	130	
	Low-alloyed steel			annealed	180	6	400	300	180	400	300	180	380	290	170
				tempered	275	7	280	230	150	280	230	150	260	210	140
				tempered	300	8	260	220	150	260	220	150	240	200	140
				tempered	350	9	230	190	120	230	190	120	220	180	110
		High-alloyed steel and high-alloyed tool steel			annealed	200	10	360	290	190	360	290	190	310	250
			hardened and tempered	325	11	190	160	130	190	160	130	150	130	100	
M	Stainless steel	ferritic/martensitic	annealed	200	12										
			martensitic	tempered	240	13									
			austenitic	quench hardened	180	14									
			austenitic-ferritic		230	15									
K	Grey cast iron	perlitic/ferritic		180	16										
		perlitic (martensitic)		260	17										
	Cast iron with spheroidal graphite	ferritic		160	18										
		perlitic		250	19										
	Malleable cast iron	ferritic		130	20										
		perlitic		230	21										
N	Aluminium wrought alloys	cannot be hardened		60	22										
		hardenable	hardened	100	23										
	Cast aluminium alloys	$\leq 12\%$ Si, cannot be hardened		75	24										
		$\leq 12\%$ 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										
			hardened and tempered	60 HRC	38										
	Hard cast iron		cast	400	39										
	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.
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Starting values for cutting speed v_c [m/min]																							
HC (CVD)																							
YBC251			YBC352			YBM153			YBM253			YBD052			YBD102			YB7315			YBD152		
Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]		
0,1	0,4	0,8	0,2	0,5	1	0,2	0,4	0,6	0,2	0,4	0,6	0,1	0,3	0,4	0,1	0,3	0,4	0,1	0,3	0,5	0,1	0,3	0,5
430	320	180	430	330	220																		
350	260	140	350	270	180																		
260	190	110	260	210	150																		
250	180	100	250	200	140																		
210	160	80	210	170	120																		
330	230	120	320	240	150																		
210	170	110	200	170	120																		
190	150	100	180	160	120																		
170	140	90	150	130	90																		
260	190	120	220	180	130																		
100	75	50	-	-	-																		
						380	295	210	350	265	180												
						190	155	120	150	110	65												
						250	200	150	200	140	80												
						200	160	130	160	115	70												
												620	420	230	530	380	220	600	410	220	540	375	210
												300	220	150	240	200	150	330	240	150	280	210	140
												310	220	150	300	210	145	340	250	160	290	215	140
												230	160	110	220	150	105	260	190	120	210	155	100
												350	275	230	330	265	220	370	300	230	320	265	210
												250	160	105	230	155	100	280	200	120	230	165	100

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	Material group	Composition / structure / heat treatment		Brinell hardness HB	Machining group	Starting values for cutting speed v_c [m/min]										
						HC (CVD)			HC (PVD)							
						YBD152C			YBG101			YBG105				
						Feed rate [mm]			Feed rate [mm]			Feed rate [mm]				
					0,1	0,3	0,5	0,1	0,3	0,6	0,1	0,3	0,6			
P	Unalloyed steel	approx. 0,15 % C	annealed	125	1											
		approx. 0,45 % C	annealed	190	2											
		approx. 0,45 % C	tempered	250	3											
		approx. 0,75 % C	annealed	270	4											
		approx. 0,75 % C	tempered	300	5											
	Low-alloyed steel			annealed	180	6										
			tempered	275	7											
			tempered	300	8											
			tempered	350	9											
High-alloyed steel and high-alloyed tool steel			annealed	200	10											
			hardened and tempered	325	11											
M	Stainless steel	ferritic/martensitic	annealed	200	12							360	290	200		
			martensitic	tempered	240	13							180	150	110	
			austenitic	quench hardened	180	14								240	190	140
			austenitic-ferritic		230	15								190	150	110
K	Grey cast iron	perlitic/ferritic		180	16	570	395	220								
			perlitic (martensitic)		260	17	310	230	150							
	Cast iron with spheroidal graphite	ferritic		160	18	310	230	150								
			perlitic		250	19	230	170	110							
	Malleable cast iron	ferritic		130	20	340	280	220								
			perlitic		230	21	250	180	110							
N	Aluminium wrought alloys	cannot be hardened		60	22				2000	1200	-					
			hardenable	hardened	100	23				610	420	-				
	Cast aluminium alloys	$\leq 12\% \text{ Si}$, cannot be hardened		75	24					550	300	-				
			$\leq 12\% \text{ Si}$, hardenable	hardened	90	25				360	190	-				
			$> 12\% \text{ Si}$, cannot be hardened		130	26				320	170	-				
	Copper and copper alloys (bronze/brass)	machining steel, PB > 1%		110	27					730	350	-				
		CuZn, CuSnZn		90	28				370	330	-					
		CuSn, Pb-free copper, electrolytic copper		100	29				270	200	-					
S	Heat-resistant alloys	Fe-based alloys	annealed	200	30							65	45	-		
				hardened	280	31							60	40	-	
		Ni or Co base	annealed	250	32								60	40	-	
				hardened	350	33							55	35	-	
		cast	320	34								55	35	-		
Titanium alloys	pure titanium		R _m 400	35								100	60	-		
		α and β alloys	hardened	R _m 1050	36							80	40	-		
H	Hardened steel		hardened and tempered	55 HRC	37											
			hardened and tempered	60 HRC	38											
	Hard cast iron		cast	400	39											
	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.
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Starting values for cutting speed v_c [m/min]																							
HC (PVD)						HC ₁			HT						HW			BL					
YB9320			YBG205			YNG151C			YNG151			YNT251			YD101			YD201			YCB111		
Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]		
0,1	0,3	0,6	0,1	0,3	0,6	0,1	0,2	0,4	0,1	0,2	0,4	0,1	0,2	0,4	0,05	0,2	0,35	0,1	0,2	0,3	0,1	0,2	0,3
						510	350	-	510	350	-	510	350	-									
						430	270	-	430	270	-	430	270	-									
						330	220	-	330	220	-	330	220	-									
						320	200	-	320	200	-	320	200	-									
						280	170	-	280	170	-	280	170	-									
						400	240	-	400	240	-	400	240	-									
						290	180	-	290	180	-	290	180	-									
						240	170	-	240	170	-	240	170	-									
						220	150	-	220	150	-	220	150	-									
						340	220	-	340	220	-	340	220	-									
						180	110	-	180	110	-	180	110	-									
	360	290	200	320	250	160																	
	190	155	110	170	150	110																	
	250	210	150	230	190	140																	
	200	165	120	180	150	110																	
							430	365	280	430	365	280	430	365	280								
							390	340	270	390	340	270	390	340	270								
							360	300	220	360	300	220	360	300	220								
							340	295	230	340	295	230	340	295	230								
							310	260	190	310	260	190	310	260	190								
							250	210	150	250	210	150	250	210	150								
																1750	1200	800	1750	1200	800		
																510	380	250	510	380	250		
																460	320	175	460	320	175		
																300	205	110	300	205	110		
																270	185	100	270	185	100		
																610	410	205	610	410	205		
																310	250	195	310	250	195		
																225	170	115	225	170	115		
	55	35	-	55	-	-	65	45	-	65	45	-	65	45	-								
	50	30	-	50	-	-	60	40	-	60	40	-	60	40	-								
	50	30	-	50	-	-	60	40	-	60	40	-	60	40	-								
	45	25	-	45	-	-	55	35	-	55	35	-	55	35	-								
	45	25	-	45	-	-	55	35	-	55	35	-	55	35	-								
	80	60	-	70	-	-	90	60	-	90	60	-	90	60	-								
	60	40	-	50	-	-	80	40	-	80	40	-	80	40	-								
																					240	180	140
																					220	180	140
																					250	150	100
																					200	150	100

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	Material group	Composition / structure / heat treatment		Brinell hardness HB	Machining group	Starting values for cutting speed v_c [m/min]									
						BL						BH			
						YCB121			YCB131			YCB211			
						Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			
					0,1	0,2	0,3	0,1	0,3	0,5	0,1	0,3	0,5		
P	Unalloyed steel	approx. 0,15 % C	annealed	125	1										
		approx. 0,45 % C	annealed	190	2										
		approx. 0,45 % C	tempered	250	3										
		approx. 0,75 % C	annealed	270	4										
		approx. 0,75 % C	tempered	300	5										
	Low-alloyed steel		annealed	180	6										
			tempered	275	7										
			tempered	300	8										
			tempered	350	9										
	High-alloyed steel and high-alloyed tool steel		annealed	200	10										
			hardened and tempered	325	11										
M	Stainless steel	ferritic/martensitic	annealed	200	12										
		martensitic	tempered	240	13										
		austenitic	quench hardened	180	14										
		austenitic-ferritic		230	15										
K	Grey cast iron	perlitic/ferritic		180	16							1500	980	400	
		perlitic (martensitic)		260	17							1250	800	320	
	Cast iron with spheroidal graphite	ferritic		160	18							-	-	-	
		perlitic		250	19							300	200	100	
	Malleable cast iron	ferritic		130	20							-	-	-	
		perlitic		230	21							300	200	100	
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 base	annealed	250	32										
			hardened	350	33										
	Titanium alloys		cast	320	34										
		pure titanium		R _m 400	35										
	α and β alloys	hardened	R _m 1050	36											
H	Hardened steel		hardened and tempered	55 HRC	37	220	170	130	160	120	100				
			hardened and tempered	60 HRC	38	200	160	120	150	120	100				
	Hard cast iron		cast	400	39	200	150	100	180	120	100				
	Hardened cast iron		hardened and tempered	55 HRC	40	200	150	100	150	120	100				
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. For examples of material for cutting tool groups view page D22.

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	Material group	Composition / structure / heat treatment		Brinell hardness HB	Machining group	Starting values for cutting speed v_c [m/min]									
						HC (CVD)									
						YB6315			YBC152			YBC252			
						Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			
						0,1	0,2	0,4	0,1	0,2	0,4	0,1	0,3	0,6	
P	Unalloyed steel	approx. 0,15 % C	annealed	125	1	450	390	270	450	390	270	430	350	230	
		approx. 0,45 % C	annealed	190	2	380	330	230	380	330	230	360	295	190	
		approx. 0,45 % C	tempered	250	3	300	265	200	300	265	200	280	235	160	
		approx. 0,75 % C	annealed	270	4	290	255	190	290	255	190	270	225	150	
		approx. 0,75 % C	tempered	300	5	250	225	170	250	225	170	235	195	130	
	Low-alloyed steel			annealed	180	6	360	300	180	360	300	180	340	270	170
				tempered	275	7	250	210	150	250	210	150	235	195	140
				tempered	300	8	230	200	150	230	200	150	220	180	140
				tempered	350	9	200	170	120	200	170	120	190	155	110
		High-alloyed steel and high-alloyed tool steel			annealed	200	10	320	275	190	320	275	190	280	230
			hardened and tempered	325	11	160	150	130	160	150	130	130	115	100	
M	Stainless steel	ferritic/martensitic	annealed	200	12										
			martensitic	tempered	240	13									
			austenitic	quench hardened	180	14									
			austenitic-ferritic		230	15									
K	Grey cast iron	perlitic/ferritic		180	16										
		perlitic (martensitic)		260	17										
	Cast iron with spheroidal graphite	ferritic		160	18										
		perlitic		250	19										
	Malleable cast iron	ferritic		130	20										
		perlitic		230	21										
N	Aluminium wrought alloys	cannot be hardened		60	22										
		hardenable	hardened	100	23										
	Cast aluminium alloys	$\leq 12\%$ Si, cannot be hardened		75	24										
		$\leq 12\%$ 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 base	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										
			hardened and tempered	60 HRC	38										
	Hard cast iron		cast	400	39										
	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.
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Starting values for cutting speed v_c [m/min]																							
HC (CVD)																							
YBC251			YBC352			YBM153			YBM253			YBD052			YBD102			YB7315			YBD152		
Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]		
0,1	0,3	0,6	0,2	0,4	0,6	0,1	0,2	0,4	0,1	0,2	0,4	0,1	0,2	0,4	0,1	0,2	0,4	0,1	0,2	0,4	0,1	0,2	0,4
390	310	180	390	310	230																		
315	245	140	315	250	190																		
235	185	110	230	195	160																		
225	175	100	220	185	150																		
190	150	80	185	155	120																		
300	230	120	290	225	150																		
190	160	110	170	150	130																		
170	140	100	150	140	130																		
145	120	90	130	110	90																		
230	185	120	180	160	140																		
90	75	50	-	-	-																		
						360	340	260	330	300	230												
						180	170	140	150	130	95												
						240	220	170	195	170	115												
						190	175	140	160	140	100												
												560	380	210	480	345	200	540	370	200	490	340	190
												270	200	140	220	180	135	300	220	135	250	190	130
												280	220	135	270	210	130	300	230	145	260	200	125
												210	160	100	200	150	95	230	180	110	190	140	90
												290	250	190	275	240	180	310	260	190	265	230	170
												210	160	90	190	145	85	230	170	100	190	140	90

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	Material group	Composition / structure / heat treatment		Brinell hardness HB	Machining group	Starting values for cutting speed v_c [m/min]								
						HC (CVD)			HC (PVD)					
						YBD152C			YBG101			YBG105		
						Feed rate [mm]			Feed rate [mm]			Feed rate [mm]		
0,1 0,2 0,4			0,1 0,2 0,4			0,1 0,2 0,4								
P	Unalloyed steel	approx. 0,15 % C	annealed	125	1									
		approx. 0,45 % C	annealed	190	2									
		approx. 0,45 % C	tempered	250	3									
		approx. 0,75 % C	annealed	270	4									
		approx. 0,75 % C	tempered	300	5									
	Low-alloyed steel		annealed	180	6									
			tempered	275	7									
			tempered	300	8									
			tempered	350	9									
	High-alloyed steel and high-alloyed tool steel		annealed	200	10									
			hardened and tempered	325	11									
M	Stainless steel	ferritic/martensitic	annealed	200	12						305	245	205	
		martensitic	tempered	240	13						150	125	100	
		austenitic	quench hardened	180	14						200	165	145	
		austenitic-ferritic		230	15						160	130	115	
K	Grey cast iron	perlitic/ferritic		180	16	520	360	200						
		perlitic (martensitic)		260	17	280	210	135						
	Cast iron with spheroidal graphite	ferritic		160	18	280	220	135						
		perlitic		250	19	210	160	100						
	Malleable cast iron	ferritic		130	20	280	245	180						
		perlitic		230	21	210	160	100						
N	Aluminium wrought alloys	cannot be hardened		60	22				1800	880	-			
		hardenable	hardened	100	23				540	380	-			
	Cast aluminium alloys	$\leq 12\%$ Si, cannot be hardened		75	24				500	270	-			
		$\leq 12\%$ Si, hardenable	hardened	90	25				320	170	-			
		$> 12\%$ Si, cannot be hardened		130	26				290	150	-			
	Copper and copper alloys (bronze/brass)	machining steel, PB > 1%			110	27				660	320	-		
		CuZn, CuSnZn			90	28				330	300	-		
		CuSn, Pb-free copper, electrolytic copper			100	29				220	175	-		
S	Heat-resistant alloys	Fe-based alloys	annealed	200	30				50	35	-	60	45	-
			hardened	280	31				45	30	-	55	40	-
		Ni or Co base	annealed	250	32				45	30	-	55	40	-
			hardened	350	33				40	-	-	50	35	-
	cast	320	34				40	-	-	50	35	-		
Titanium alloys	pure titanium		R _m 400	35				85	60	-	95	60	-	
α and β alloys	hardened		R _m 1050	36				65	40	-	75	40	-	
H	Hardened steel		hardened and tempered	55 HRC	37									
			hardened and tempered	60 HRC	38									
	Hard cast iron		cast	400	39									
	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.
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Starting values for cutting speed v_c [m/min]																								
HC (PVD)						HC ₁			HT						HW						BL			
YB9320			YBG205			YNG151C			YNG151			YNT251			YD101			YD201			YCB111			
Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			
0,1	0,2	0,4	0,1	0,2	0,4	0,1	0,2	0,4	0,1	0,2	0,4	0,1	0,2	0,4	0,05	0,2	0,35	0,1	0,3	0,6	0,1	0,2	0,3	
									470	320	-	470	320	-	470	320	-							
									400	250	-	400	250	-	400	250	-							
									300	200	-	300	200	-	300	200	-							
									290	180	-	290	180	-	290	180	-							
									245	150	-	245	150	-	245	150	-							
									370	220	-	370	220	-	370	220	-							
									255	160	-	255	160	-	255	160	-							
									200	140	-	200	140	-	200	140	-							
									185	130	-	185	130	-	185	130	-							
									285	180	-	285	180	-	285	180	-							
									150	90	-	150	90	-	150	90	-							
	305	245	206	270	205	165																		
	160	130	110	145	125	100																		
	210	180	155	195	165	145																		
	170	140	120	155	130	115																		
							390	330	255	390	330	255	390	330	255									
							355	310	245	355	310	245	355	310	245									
							330	270	200	330	270	200	330	270	200									
							310	270	210	310	270	210	310	270	210									
							260	220	160	260	220	160	260	220	160									
							210	170	120	210	170	120	210	170	120									
																1550	1050	700	1550	1050	700			
																450	320	200	450	320	200			
																400	270	150	400	270	150			
																250	170	95	250	170	95			
																230	150	85	230	150	85			
																550	370	170	550	370	170			
																260	210	160	260	210	160			
																190	145	95	190	145	95			
	50	35	-	50	-	-	60	40	-	60	40	-	60	40	-	55	30	-	55	30	-			
	45	30	-	45	-	-	55	35	-	55	35	-	55	35	-	55	25	-	55	25	-			
	45	30	-	45	-	-	55	35	-	55	35	-	55	35	-	45	25	-	45	25	-			
	40	-	-	40	-	-	50	30	-	50	30	-	50	30	-	35	20	-	35	20	-			
	40	-	-	40	-	-	50	30	-	50	30	-	50	30	-	40	20	-	40	20	-			
	75	60	-	70	-	-	85	55	-	85	55	-	85	55	-	60	40	-	60	40	-			
	55	40	-	45	-	-	75	35	-	75	35	-	75	35	-	30	-	-	30	-	-			
																						240	180	140
																						220	180	140
																						250	150	100
																						200	150	100

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	Material group	Composition / structure / heat treatment		Brinell hardness HB	Machining group	Starting values for cutting speed v_c [m/min]									
						BL						BH			
						YCB121			YCB131			YCB211			
						Feed rate [mm]			Feed rate [mm]			Feed rate [mm]			
					0,1	0,2	0,3	0,1	0,2	0,3	0,1	0,2	0,4		
P	Unalloyed steel	approx. 0,15 % C	annealed	125	1										
		approx. 0,45 % C	annealed	190	2										
		approx. 0,45 % C	tempered	250	3										
		approx. 0,75 % C	annealed	270	4										
		approx. 0,75 % C	tempered	300	5										
	Low-alloyed steel		annealed	180	6										
			tempered	275	7										
			tempered	300	8										
			tempered	350	9										
	High-alloyed steel and high-alloyed tool steel		annealed	200	10										
			hardened and tempered	325	11										
M	Stainless steel	ferritic/martensitic	annealed	200	12										
		martensitic	tempered	240	13										
		austenitic	quench hardened	180	14										
		austenitic-ferritic		230	15										
K	Grey cast iron	perlitic/ferritic		180	16							1330	905	410	
		perlitic (martensitic)		260	17							1100	740	330	
	Cast iron with spheroidal graphite	ferritic		160	18							-	-	-	
		perlitic		250	19							240	180	100	
	Malleable cast iron	ferritic		130	20							-	-	-	
		perlitic		230	21							240	180	100	
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 base			annealed	250	32										
			hardened	350	33										
Titanium alloys				R _m 400	35										
				hardened	R _m 1050	36									
H	Hardened steel		hardened and tempered	55 HRC	37	220	170	130	160	120	100				
			hardened and tempered	60 HRC	38	200	160	120	150	120	100				
	Hard cast iron		cast	400	39	200	150	100	180	120	100				
	Hardened cast iron		hardened and tempered	55 HRC	40	200	150	100	150	120	100				
X	Non-metallic materials	Thermoplasts			41										
		Thermosetting plastics			42										
		Plastic, glass-fibre reinforced GFRP			43										
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