Cutting data for turning inserts – Negative basic shape Carbide grades

= Cutting data for wet machining
= Dry machining is possible

Material group	Overview of the main material groups and code letters			Brinell hardness HB	Tensile strength R_m N/mm²	Machining group [1]			Cutting material grades		
									Starting values for cutting speed v_c [m/min]		
									HE		
									WEP10C		
									f [mm/rev]		
									0,10	0,20	0,30
P	Non-alloyed steel	C ≤ 0,25 %	Annealed	125	430	P1	●●	●	490	440	400
		C > 0,25... ≤ 0,55 %	Annealed	190	640	P2	●●	●	390	360	320
		C > 0,25... ≤ 0,55 %	Heat-treated	210	710	P3	●●	●	290	260	250
		C > 0,55 %	Annealed	190	640	P4	●●	●	350	330	310
		C > 0,55 %	Heat-treated	300	1010	P5	●●	●	220	180	150
		Free-machining steel (short-chipping)	Annealed	220	750	P6	●●	●	450	420	400
	Low-alloy steel	Annealed		175	590	P7	●●	●	360	330	320
		Heat-treated		285	960	P8	●●	●	200	170	160
		Heat-treated		380	1280	P9	●●	●	120	100	90
		Heat-treated		430	1480	P10	●●	●			
	High-alloy steel and high-alloy tool steel	Annealed		200	680	P11	●●	●	340	310	300
		Hardened and tempered		300	1010	P12	●●	●	200	180	160
		Hardened and tempered		380	1280	P13	●●	●	70	60	
	Stainless steel	Ferritic/martensitic, annealed		200	680	P14	●●	●	280	250	230
		Martensitic, heat-treated		330	1110	P15	●●	●	120	100	90
M	Stainless steel	Austenitic, quench hardened		200	680	M1	●●	●	210	190	160
		Austenitic, precipitation hardened (PH)		300	1010	M2	●●	●	150	130	110
		Austenitic/ferritic, duplex		230	780	M3	●●	●	160	140	110
K	Malleable cast iron	Ferritic		200	400	K1	●●	●	220	200	180
		Pearlitic		260	700	K2	●●	●	190	170	150
	Grey cast iron	Low strength		180	200	K3	●●	●	420	390	360
		High strength/austenitic		245	350	K4	●●	●	220	200	180
	Cast iron with spheroidal graphite	Ferritic		155	400	K5	●●	●	240	220	200
		Pearlitic		265	700	K6	●●	●	170	140	130
	CGI			230	400	K7	●●	●	220	180	170
N	Wrought aluminium alloys	Not hardenable		30	–	N1					
		Hardenable, hardened		100	340	N2					
	Cast aluminium alloys	≤ 12% Si, not hardenable		75	260	N3					
		≤ 12% Si, hardenable, hardened		90	310	N4					
		> 12% Si, not hardenable		130	450	N5					
	Magnesium-based alloys			70	250	N6					
	Copper and copper alloys (bronze/brass)	Non-alloyed, electrolytic copper		100	340	N7					
		Brass, bronze, red brass		90	310	N8					
		Copper alloys, short-chipping		110	380	N9					
		High tensile, Ampco		300	1010	N10					
S	Heat-resistant alloys	Fe-based	Annealed	200	680	S1	●●	●			
			Hardened	280	940	S2	●●	●			
		Ni- or Co-based	Annealed	250	840	S3	●●	●			
			Hardened	350	1180	S4	●●	●			
			Cast	320	1080	S5	●●	●			
	Titanium alloys	Pure titanium		200	680	S6	●●	●			
		α and β alloys, hardened		375	1260	S7	●●	●			
		β alloys		410	1400	S8	●●	●			
	Tungsten alloys			300	1010	S9					
	Molybdenum alloys			300	1010	S10					
H	Hardened steel	Hardened and tempered		50 HRC		H1	●●	●			
		Hardened and tempered		55 HRC		H2	●●	●			
		Hardened and tempered		60 HRC		H3	●●	●			
	Hardened cast iron	Hardened and tempered		55 HRC		H4	●●	●			
O	Thermoplastics	Without abrasive fillers				O1					
	Thermosetting plastics	Without abrasive fillers				O2					
	Plastic, glass-fibre reinforced	GFRP				O3					
	Plastic, carbon-fibre reinforced	CFRP				O4					
	Plastic, aramid-fibre reinforced	AFRP				O5					
	Graphite (technical)			80 Shore		O6					

●● Recommended application (the specified cutting data is regarded as starting values for the recommended application)
● Possible application

Note:
If dry machining is possible, the tool life is reduced by 20–30% on average.

[1] The assignment of the machining groups can be found in the "General" section of the Technical Compendium, page F 7.



Cutting material grades																									
Starting values for cutting speed v_c [m/min]																									
	HC															HW			HC					
	WKP01G			WPP05G			WPP10G			WPP20G			WPP30G WKP30S			WS10			WSM01			WSM10S		
	f [mm/rev]			f [mm/rev]			f [mm/rev]			f [mm/rev]			f [mm/rev]			f [mm/rev]			f [mm/rev]			f [mm/rev]		
	0,10	0,20	0,40	0,10	0,40	0,60	0,10	0,40	0,60	0,10	0,40	0,60	0,10	0,40	0,60	0,10	0,30	0,50	0,10	0,30	0,50	0,10	0,30	0,50
	560	500	420	560	420	330	530	400	310	450	330	270	380	260	220				240	230		270	250	
	440	390	320	440	320	250	420	300	240	350	250	190	300	200	160				190	160		210	190	
	340	300	260	340	260	220	320	250	210	260	210	170	220	180	130				160	130		180	160	
	370	320	260	370	260	210	350	250	200	300	210	160	250	160	130				150	130		180	160	
	280	250	210	280	210	200	270	200	190	220	160	150	180	120	100				140	100				
	510	450	370	510	370	290	490	350	280	410	290	220	350	230	180				210	190		240	220	
	400	360	290	400	290	250	380	280	240	320	240	190	260	190	170				150	130		170	150	
	240	220	190	240	190	170	230	180	160	190	140	120	150	100	80				130	80				
	190	170	150	190	150	110	180	140	100	140	100	80	100	70	50				100	70				
	130	120	110	130	110		120	100											80	60				
	360	310	250	360	250	170	340	240	160	290	200	120	220	160	90				140	120		170	150	
	250	210	150	250	150	130	240	140	120	190	120	90	120	90	70				120	90				
	130	120	110	130	110		120	100											70	50				
	290	270	230	290	230	210	280	220	200	230	190	150	180	150	110				200	180		200	180	150
	210	180	150	210	150	130	200	140	120	160	110	80	120	80	70				150	120		170	120	110
													260	210	130				250	190	120	260	210	130
													160	140					150	130		160	140	
													170	150	110				160	140	100	170	150	110
	320	270	210	320	210	160	300	200	150	270	170	130	240	160	130									
	270	230	170	270	170	120	260	160	110	230	140	100	200	120	90									
	600	520	400	600	400	290	570	380	280	490	350	240	490	300	210									
	320	270	220	320	220	150	300	210	140	270	170	130	230	170	110									
	340	300	240	340	240	180	320	230	170	290	200	150	250	180	130									
	240	210	180	240	180	150	230	170	140	200	150	120	180	130	110									
	320	260	200	320	200																			
																			3000	2400	1800			
																			900	720	360			
																			960	540	360			
																			600	360	240			
																			720	480	320			
																			480	360	300			
																			340	240	160			
																90			100	70		100	65	
																70			80	60		80	55	
																70			80	60		80	55	
																60			70	50		70	45	
																50			60	40		60	35	
																200	180	140						
																90	55	45	70	50				
																55	35	30	50	40				
																			50					
																			40					

HC = Coated carbide
HE = Coated cermet
HW = Uncoated carbide

The specified cutting data are average standard values.
For specific applications, adjustment is recommended.

Cutting data for turning inserts – Negative basic shape Carbide grades (continued)

= Cutting data for wet machining
= Dry machining is possible

Material group	Overview of the main material groups and code letters			Brinell hardness HB	Tensile strength R_m N/mm²	Machining group [1]			Cutting material grades: HC WSM20S — Starting values for cutting speed v_c [m/min] f [mm/rev] 0,10	0,30	0,50
P	Non-alloyed steel	C ≤ 0,25 %	Annealed	125	430	P1	●●	●	230	220	
		C > 0,25... ≤ 0,55 %	Annealed	190	640	P2	●●	●	180	160	
		C > 0,25... ≤ 0,55 %	Heat-treated	210	710	P3	●●	●	150	130	
		C > 0,55 %	Annealed	190	640	P4	●●	●	140	130	
		C > 0,55 %	Heat-treated	300	1010	P5	●●	●			
		Free-machining steel (short-chipping)	Annealed	220	750	P6	●●	●	200	180	
	Low-alloy steel	Annealed		175	590	P7	●●	●	140	120	
		Heat-treated		285	960	P8	●●	●			
		Heat-treated		380	1280	P9	●●	●			
		Heat-treated		430	1480	P10	●●	●			
	High-alloy steel and high-alloy tool steel	Annealed		200	680	P11	●●	●	130	110	
		Hardened and tempered		300	1010	P12	●●	●			
		Hardened and tempered		380	1280	P13	●●	●			
	Stainless steel	Ferritic/martensitic, annealed		200	680	P14	●●	●	190	170	140
		Martensitic, heat-treated		330	1110	P15	●●	●	140	110	100
M	Stainless steel	Austenitic, quench hardened		200	680	M1	●●	●	240	170	110
		Austenitic, precipitation hardened (PH)		300	1010	M2	●●	●	140	120	
		Austenitic/ferritic, duplex		230	780	M3	●●	●	150	130	90
K	Malleable cast iron	Ferritic		200	400	K1	●●	●			
		Pearlitic		260	700	K2	●●	●			
	Grey cast iron	Low strength		180	200	K3	●●	●			
		High strength/austenitic		245	350	K4	●●	●			
	Cast iron with spheroidal graphite	Ferritic		155	400	K5	●●	●			
		Pearlitic		265	700	K6	●●	●			
	CGI			230	400	K7	●●	●			
N	Wrought aluminium alloys	Not hardenable		30	–	N1					
		Hardenable, hardened		100	340	N2					
	Cast aluminium alloys	≤ 12% Si, not hardenable		75	260	N3					
		≤ 12% Si, hardenable, hardened		90	310	N4					
		> 12% Si, not hardenable		130	450	N5					
	Magnesium-based alloys			70	250	N6					
	Copper and copper alloys (bronze/brass)	Non-alloyed, electrolytic copper		100	340	N7					
		Brass, bronze, red brass		90	310	N8					
		Copper alloys, short-chipping		110	380	N9					
		High tensile, Ampco		300	1010	N10					
S	Heat-resistant alloys	Fe-based	Annealed	200	680	S1	●●	●	90	60	
			Hardened	280	940	S2	●●	●	70	50	
		Ni- or Co-based	Annealed	250	840	S3	●●	●	70	50	
			Hardened	350	1180	S4	●●	●	60	40	
			Cast	320	1080	S5	●●	●	50	30	
	Titanium alloys	Pure titanium		200	680	S6	●●	●			
		α and β alloys, hardened		375	1260	S7	●●	●	70	45	40
		β alloys		410	1400	S8	●●	●	40	30	25
	Tungsten alloys			300	1010	S9					
	Molybdenum alloys			300	1010	S10					
H	Hardened steel	Hardened and tempered		50 HRC	–	H1	●●	●			
		Hardened and tempered		55 HRC	–	H2	●●	●			
		Hardened and tempered		60 HRC	–	H3	●●	●			
	Hardened cast iron	Hardened and tempered		55 HRC	–	H4	●●	●			
O	Thermoplastics	Without abrasive fillers				O1					
	Thermosetting plastics	Without abrasive fillers				O2					
	Plastic, glass-fibre reinforced	GFRP				O3					
	Plastic, carbon-fibre reinforced	CFRP				O4					
	Plastic, aramid-fibre reinforced	AFRP				O5					
	Graphite (technical)			80 Shore		O6					

●● Recommended application (the specified cutting data is regarded as starting values for the recommended application)
● Possible application

Note:
If dry machining is possible, the tool life is reduced by 20–30% on average.

[1] The assignment of the machining groups can be found in the "General" section of the Technical Compendium, page F 7.



	Cutting material grades																					
	Starting values for cutting speed v_c [m/min]																					
	HC															HW			HC			
	WSM30S			WMP20G			WMP30G			WKK10S			WKK20S			WN10			WNN10			
	f [mm/rev]			f [mm/rev]			f [mm/rev]			f [mm/rev]			f [mm/rev]			f [mm/rev]			f [mm/rev]			
	0,10	0,30	0,50	0,10	0,30	0,50	0,10	0,30	0,50	0,10	0,40	0,60	0,10	0,40	0,60	0,40	0,10	0,40	0,10	0,20	0,40	
	220	200		290	200	170	230	160	135				530	400	310	200			230	210		
	160	150		230	150	120	185	120	95				420	300	250	150			170	150		
	130	110		170	140	110	135	110	90				320	250	210	140			130	120		
	130	120		190	120	100	150	95	80				360	250	210	120			140	120		
				140	100	80	110	80	65	270	210	200	270	200	190	100						
	180	160		270	180	140	215	145	110										180	160		
	120	100		200	140	130	160	110	105				260	200	180	140			120	100		
				130	80	60	105	65	50	240	190	170	230	180	160	80						
				80	60	40	65	50	30	160	120	100	150	120	100	60						
										80	70		70	60								
	110	90		170	120	80	135	95	65				270	220	170	120			130	100		
				100	70	60	80	55	50	190	150	140	170	140	130	70						
										90	80		80	70								
	170	150	120	210	180	150	170	145	120													
	110	100	80	140	110	100	110	90	80													
	200	140	90	250	190	120	200	150	95							140			200	180		
	110	90		160	140	100	130	110	80							90			140	120		
	130	110	70	170	150	110	135	120	90							110			150	130		
										370	260	180	300	200	150	160			250	220		
										330	220	140	260	160	110	120			210	180		
										650	490	360	570	380	280	300			480	450		
										390	260	180	300	210	140	170			210	180		
										410	300	230	320	230	170	180			230	200		
										300	230	180	230	170	140	130			160	130		
										320	200											
																	2400	1300	3000	2400	1800	
																	750	300	900	720	360	
																	800	300	960	540	360	
																	500	200	600	360	240	
																	600	270	720	480	320	
																	400	250	480	360	300	
																	280	130	340	240	160	
	80	50		90	60		70	50									70		80	60		
	60	40		70	50		55	40									50		60	50		
	60	30		70	50		55	40									50		60	50		
	50	30		60	40		50	30									50		50	40		
	40	20		50	30		40	25									40		40	30		
																	200	140	220	200	160	
				70	45	40	55	35	30								60		70	50		
				40	30	25	30	25	20								40		40	30		
										55												
										45												
										35												
										45												
																			400	400		
																			300	300		
																			600	600		

HC = Coated carbide
HE = Coated cermet
HW = Uncoated carbide

The specified cutting data are average standard values.
For specific applications, adjustment is recommended.