

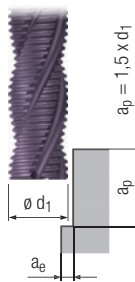
- Product Finder
- NR
- NF
- N
- HR
- H
- WR
- WF
- W
- $V_c / f_z$



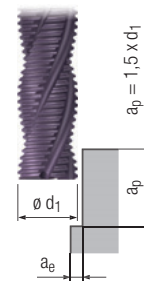
## HSS-Schafffräser – lange und extra lange Ausführung HSS end mills – long and extra long design

**NR HR WR**

lange Ausführung  
long design



extra lange Ausführung  
extra long design



Gültig für · Valid for

1046	1346C	1594
1046C	1349	1594C
1058	1349C	1595
1058A	1358	1595C
1058C	1358A	1646
1346	1358C	

**FRANKEN**  
TOP-CUT

1059	1359
1059C	1359C
1086	1386
1086C	1386C

		$a_e = 0,25 \times d_1$				$a_e = 0,1 \times d_1$				TICN	Unbesch. Uncoated					
		$f_z$ [mm]		$f_z$ [mm]		$f_z$ [mm]		$f_z$ [mm]								
	$V_c$ [m/min]	$d_1 < 32$ mm		$d_1 \geq 32$ mm		$d_1 < 32$ mm		$d_1 \geq 32$ mm								
	Unbeschichtet Uncoated	TICN														
<b>P</b>	1.1	21	35	0,0038 x d <sub>1</sub>	0,0030 x d <sub>1</sub>	0,0048 x d <sub>1</sub>	0,0037 x d <sub>1</sub>	14	24	0,0031 x d <sub>1</sub>	0,0025 x d <sub>1</sub>			■		
	2.1	18	33	0,0035 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	0,0044 x d <sub>1</sub>	0,0034 x d <sub>1</sub>	12	22	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>			■		
	3.1	15	15	0,0032 x d <sub>1</sub>	0,0025 x d <sub>1</sub>	0,0040 x d <sub>1</sub>	0,0031 x d <sub>1</sub>	10	16	0,0026 x d <sub>1</sub>	0,0021 x d <sub>1</sub>			■		
	4.1	12	15	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>	0,0036 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	10	15	0,0023 x d <sub>1</sub>	0,0019 x d <sub>1</sub>			■		
	5.1		15	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>	0,0036 x d <sub>1</sub>	0,0028 x d <sub>1</sub>		12	0,0023 x d <sub>1</sub>	0,0019 x d <sub>1</sub>			■		
<b>M</b>	1.1	14	15	0,0032 x d <sub>1</sub>	0,0025 x d <sub>1</sub>	0,0040 x d <sub>1</sub>	0,0031 x d <sub>1</sub>	10	11	0,0026 x d <sub>1</sub>	0,0021 x d <sub>1</sub>			■		
	2.1	10	14	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>	0,0036 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	10	10	0,0023 x d <sub>1</sub>	0,0019 x d <sub>1</sub>			■		
	3.1		12	0,0026 x d <sub>1</sub>	0,0020 x d <sub>1</sub>	0,0032 x d <sub>1</sub>	0,0025 x d <sub>1</sub>		10	0,0021 x d <sub>1</sub>	0,0017 x d <sub>1</sub>			■		
	4.1		11	0,0022 x d <sub>1</sub>	0,0018 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	0,0022 x d <sub>1</sub>		10	0,0018 x d <sub>1</sub>	0,0015 x d <sub>1</sub>			■		
<b>K</b>	1.1	15	29	0,0038 x d <sub>1</sub>	0,0030 x d <sub>1</sub>	0,0048 x d <sub>1</sub>	0,0037 x d <sub>1</sub>	10	19	0,0031 x d <sub>1</sub>	0,0025 x d <sub>1</sub>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	
	1.2	13	25	0,0035 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	0,0044 x d <sub>1</sub>	0,0034 x d <sub>1</sub>	10	17	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	
	2.1	12	23	0,0035 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	0,0044 x d <sub>1</sub>	0,0034 x d <sub>1</sub>	10	15	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	
	2.2	11	15	0,0032 x d <sub>1</sub>	0,0025 x d <sub>1</sub>	0,0040 x d <sub>1</sub>	0,0031 x d <sub>1</sub>	10	14	0,0026 x d <sub>1</sub>	0,0021 x d <sub>1</sub>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	
	3.1	10	15	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>	0,0036 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	10	11	0,0023 x d <sub>1</sub>	0,0019 x d <sub>1</sub>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	
	3.2	10	15	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>	0,0036 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	10	10	0,0023 x d <sub>1</sub>	0,0019 x d <sub>1</sub>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	
	4.1	13	24	0,0035 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	0,0044 x d <sub>1</sub>	0,0034 x d <sub>1</sub>	10	16	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	
	4.2	10	15	0,0032 x d <sub>1</sub>	0,0025 x d <sub>1</sub>	0,0040 x d <sub>1</sub>	0,0031 x d <sub>1</sub>	10	11	0,0026 x d <sub>1</sub>	0,0021 x d <sub>1</sub>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	
<b>N</b>	1.1	50	50	0,0051 x d <sub>1</sub>	0,0040 x d <sub>1</sub>	0,0064 x d <sub>1</sub>	0,0050 x d <sub>1</sub>	38		0,0042 x d <sub>1</sub>	0,0034 x d <sub>1</sub>				■	
	1.2	50	50	0,0048 x d <sub>1</sub>	0,0038 x d <sub>1</sub>	0,0060 x d <sub>1</sub>	0,0047 x d <sub>1</sub>	34		0,0039 x d <sub>1</sub>	0,0032 x d <sub>1</sub>				■	
	1.3	40	45	0,0045 x d <sub>1</sub>	0,0035 x d <sub>1</sub>	0,0056 x d <sub>1</sub>	0,0043 x d <sub>1</sub>	30		0,0036 x d <sub>1</sub>	0,0029 x d <sub>1</sub>				■	
	1.4	50	50	0,0042 x d <sub>1</sub>	0,0033 x d <sub>1</sub>	0,0052 x d <sub>1</sub>	0,0040 x d <sub>1</sub>	26		0,0034 x d <sub>1</sub>	0,0027 x d <sub>1</sub>				■	
	1.5		40	0,0038 x d <sub>1</sub>	0,0030 x d <sub>1</sub>	0,0048 x d <sub>1</sub>	0,0037 x d <sub>1</sub>								■	
	1.6															■
	2.1	14	26	0,0038 x d <sub>1</sub>	0,0030 x d <sub>1</sub>	0,0048 x d <sub>1</sub>	0,0037 x d <sub>1</sub>	10	17	0,0031 x d <sub>1</sub>	0,0025 x d <sub>1</sub>				■	
	2.2	15	28	0,0035 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	0,0044 x d <sub>1</sub>	0,0034 x d <sub>1</sub>	10	19	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>				■	
	2.3	28	40	0,0038 x d <sub>1</sub>	0,0030 x d <sub>1</sub>	0,0048 x d <sub>1</sub>	0,0037 x d <sub>1</sub>	19	20	0,0031 x d <sub>1</sub>	0,0025 x d <sub>1</sub>	<input type="checkbox"/>			■	
	2.4	15	27	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>	0,0036 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	10	18	0,0023 x d <sub>1</sub>	0,0019 x d <sub>1</sub>				■	
	2.5	22	40	0,0032 x d <sub>1</sub>	0,0025 x d <sub>1</sub>	0,0040 x d <sub>1</sub>	0,0031 x d <sub>1</sub>	15	20	0,0026 x d <sub>1</sub>	0,0021 x d <sub>1</sub>	<input type="checkbox"/>			■	
	2.6	26	40	0,0038 x d <sub>1</sub>	0,0030 x d <sub>1</sub>	0,0048 x d <sub>1</sub>	0,0037 x d <sub>1</sub>	17	20	0,0031 x d <sub>1</sub>	0,0025 x d <sub>1</sub>				■	
	2.7	13	23	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>	0,0036 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	10	18	0,0023 x d <sub>1</sub>	0,0019 x d <sub>1</sub>				■	
	2.8															■
	3.1	50	60	0,0042 x d <sub>1</sub>	0,0033 x d <sub>1</sub>	0,0052 x d <sub>1</sub>	0,0040 x d <sub>1</sub>	32		0,0034 x d <sub>1</sub>	0,0027 x d <sub>1</sub>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	■
	3.2	40	60	0,0048 x d <sub>1</sub>	0,0038 x d <sub>1</sub>	0,0060 x d <sub>1</sub>	0,0047 x d <sub>1</sub>	27		0,0039 x d <sub>1</sub>	0,0032 x d <sub>1</sub>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	■
4.1	60		0,0064 x d <sub>1</sub>	0,0050 x d <sub>1</sub>	0,0080 x d <sub>1</sub>	0,0062 x d <sub>1</sub>	50		0,0052 x d <sub>1</sub>	0,0042 x d <sub>1</sub>				■		
4.2	90		0,0064 x d <sub>1</sub>	0,0050 x d <sub>1</sub>	0,0080 x d <sub>1</sub>	0,0062 x d <sub>1</sub>	70		0,0052 x d <sub>1</sub>	0,0042 x d <sub>1</sub>				■		
4.3															■	
4.4															■	
5.1															■	
5.2		17	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>	0,0036 x d <sub>1</sub>	0,0028 x d <sub>1</sub>		11	0,0023 x d <sub>1</sub>	0,0019 x d <sub>1</sub>				■		
5.3															■	
<b>S</b>	1.1	15	15	0,0032 x d <sub>1</sub>	0,0025 x d <sub>1</sub>	0,0040 x d <sub>1</sub>	0,0031 x d <sub>1</sub>	10	15	0,0026 x d <sub>1</sub>	0,0021 x d <sub>1</sub>				■	
	1.2	11	15	0,0029 x d <sub>1</sub>	0,0023 x d <sub>1</sub>	0,0036 x d <sub>1</sub>	0,0028 x d <sub>1</sub>	10	14	0,0023 x d <sub>1</sub>	0,0019 x d <sub>1</sub>				■	
	1.3		12	0,0026 x d <sub>1</sub>	0,0020 x d <sub>1</sub>	0,0032 x d <sub>1</sub>	0,0025 x d <sub>1</sub>								■	
	2.1	11	15	0,0032 x d <sub>1</sub>	0,0025 x d <sub>1</sub>	0,0040 x d <sub>1</sub>	0,0031 x d <sub>1</sub>	7	15	0,0026 x d <sub>1</sub>	0,0021 x d <sub>1</sub>				■	
	2.2		10	0,0026 x d <sub>1</sub>	0,0020 x d <sub>1</sub>	0,0032 x d <sub>1</sub>	0,0025 x d <sub>1</sub>								■	
	2.3															■
2.4															■	
2.5															■	
2.6															■	
<b>H</b>	1.1															
	1.2															
	1.3															
	1.4															
	1.5															



- Product Finder
- NR
- NF
- N
- HF
- H
- WR
- WF
- W
- $v_c / f_z$

## Wegweiser

### Bitte beachten:

Die Eignung der Hartmetall-Schaft- und Langlochfräser ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

Die zugehörigen Schnittwerte sind auf den Seiten 70 - 91 zu finden.

## Product finder

### Please note:

The suitability of the solid carbide end mills and slot drills is indicated as follows:

- = very suitable
- = suitable

Please find the cutting conditions on pages 70 - 91.



		Einsatzgebiete – Material Applications – material		Material-Beispiele Material examples	Material-Nummern Material numbers
P	<b>Stahlwerkstoffe</b>		<b>Steel materials</b>		
	1.1	Kaltfließpressstähle, Baustähle, Automatenstähle, u.a.	Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	≤ 600 N/mm <sup>2</sup>	Cq15 1.1132 S235JR (St37-2) 1.0037 10SPb20 1.0722 E360 (St70-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218
	2.1	Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	≤ 800 N/mm <sup>2</sup>	20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067 50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515
	3.1	Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	≤ 1000 N/mm <sup>2</sup>	X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344
	4.1	Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 1200 N/mm <sup>2</sup>	
5.1	Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 1400 N/mm <sup>2</sup>		
M	<b>Nichtrostende Stahlwerkstoffe</b>		<b>Stainless steel materials</b>		
	1.1	Ferritisch, martensitisch	Ferritic, martensitic	≤ 950 N/mm <sup>2</sup>	X2CrTi12 1.4512
	2.1	Austenitisch	Austenitic	≤ 950 N/mm <sup>2</sup>	X6CrNiMoTi17-12-2 1.4571
	3.1	Austenitisch-ferritisch (Duplex)	Austenitic-ferritic (Duplex)	≤ 1100 N/mm <sup>2</sup>	X2CrNiMoN22-5-3 1.4462
4.1	Austenitisch-ferritisch hitzebeständig (Super Duplex)	Austenitic-ferritic heat-resistant (Super Duplex)	≤ 1250 N/mm <sup>2</sup>	X2CrNiMoN25-7-4 1.4410	
K	<b>Gusswerkstoffe</b>		<b>Cast materials</b>		
	1.1	Gusseisen mit Lamellengrafit (GJL)	Cast iron with lamellar graphite (GJL)	100-250 N/mm <sup>2</sup>	EN-GJL-200 (GG20) EN-JL-1030
	1.2	Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	250-450 N/mm <sup>2</sup>	EN-GJL-300 (GG30) EN-JL-1050
	2.1	Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	350-500 N/mm <sup>2</sup>	EN-GJS-400-15 (GGG40) EN-JS-1030
	2.2	Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	500-900 N/mm <sup>2</sup>	EN-GJS-700-2 (GGG70) EN-JS-1070
	3.1	Gusseisen mit Vermiculargrafit (GJV)	Cast iron with vermicular graphite (GJV)	300-400 N/mm <sup>2</sup>	GJV 300
	3.2	Gusseisen mit Vermiculargrafit (GJV)	Cast iron with vermicular graphite (GJV)	400-500 N/mm <sup>2</sup>	GJV 450
4.1	Temperguss (GTMW, GTMB)	Malleable cast iron (GTMW, GTMB)	250-500 N/mm <sup>2</sup>	EN-GJMW-350-4 (GTW-35) EN-JM-1010	
4.2	Temperguss (GTMW, GTMB)	Malleable cast iron (GTMW, GTMB)	500-800 N/mm <sup>2</sup>	EN-GJMB-450-6 (GTS-45) EN-JM-1140	
N	<b>Nichteisenwerkstoffe</b>		<b>Non-ferrous materials</b>		
	<b>Aluminium-Legierungen</b>		<b>Aluminium alloys</b>		
	1.1	Aluminium-Knetlegierungen	Wrought aluminium alloys	≤ 200 N/mm <sup>2</sup>	EN AW-ALMn1 EN AW-3103
	1.2	Aluminium-Knetlegierungen	Wrought aluminium alloys	≤ 350 N/mm <sup>2</sup>	EN AW-ALMgSi EN AW-6060
	1.3	Aluminium-Knetlegierungen	Wrought aluminium alloys	≤ 550 N/mm <sup>2</sup>	EN AW-AlZn5Mg3Cu EN AW-7022
	1.4	Aluminium-Knetlegierungen	Wrought aluminium alloys	Si ≤ 7%	EN AC-ALMg5 EN AC-51300
	1.5	Aluminium-Gusslegierungen	Aluminium cast alloys	7% < Si ≤ 12%	EN AC-AISi9Cu3 EN AC-46500
	1.6	Aluminium-Gusslegierungen	Aluminium cast alloys	12% < Si ≤ 17%	GD-AISI17Cu4FeMg
	<b>Kupfer-Legierungen</b>		<b>Copper alloys</b>		
	2.1	Reinkupfer, niedriglegiertes Kupfer	Pure copper, low-alloyed copper	≤ 400 N/mm <sup>2</sup>	E-Cu 57 EN CW 004 A
	2.2	Kupfer-Zink-Legierungen (Messing, langspanend)	Copper-zinc alloys (brass, long-chipping)	≤ 550 N/mm <sup>2</sup>	CuZn37 (Ms63) EN CW 508 L
	2.3	Kupfer-Zink-Legierungen (Messing, kurzspanend)	Copper-zinc alloys (brass, short-chipping)	≤ 550 N/mm <sup>2</sup>	CuZn36Pb3 (Ms58) EN CW 603 N
	2.4	Kupfer-Aluminium-Legierungen (Alubronze, langspanend)	Copper-aluminium alloys (alu bronze, long-chipping)	≤ 800 N/mm <sup>2</sup>	CuAl10Ni5Fe4 EN CW 307 G
	2.5	Kupfer-Zinn-Legierungen (Zinnbronze, langspanend)	Copper-tin alloys (tin bronze, long-chipping)	≤ 700 N/mm <sup>2</sup>	CuSn8P EN CW 459 K
	2.6	Kupfer-Zinn-Legierungen (Zinnbronze, kurzspanend)	Copper-tin alloys (tin bronze, short-chipping)	≤ 400 N/mm <sup>2</sup>	CuSn7 ZnPb (Rg7) 2.1090
	2.7	Kupfer-Sonderlegierungen	Special copper alloys	≤ 600 N/mm <sup>2</sup>	(Ampco 8)
2.8	Kupfer-Sonderlegierungen	Special copper alloys	≤ 1400 N/mm <sup>2</sup>	(Ampco 45)	
<b>Magnesium-Legierungen</b>		<b>Magnesium alloys</b>			
3.1	Magnesium-Knetlegierungen	Magnesium wrought alloys	≤ 500 N/mm <sup>2</sup>	MgAl6Zn 3.5612	
3.2	Magnesium-Gusslegierungen	Magnesium cast alloys	≤ 500 N/mm <sup>2</sup>	EN-MCMgAl9Zn1 EN-MC21120	
<b>Kunststoffe</b>		<b>Synthetics</b>			
4.1	Duroplaste (kurzspanend)	Duroplastics (short-chipping)		Bakelit, Pertinax	
4.2	Thermoplaste (langspanend)	Thermoplastics (long-chipping)		PMMA, POM, PVC	
4.3	Faserverstärkte Kunststoffe (Faseranteil ≤ 30%)	Fibre-reinforced synthetics (fibre content ≤ 30%)		GFK, CFK, AFK	
4.4	Faserverstärkte Kunststoffe (Faseranteil > 30%)	Fibre-reinforced synthetics (fibre content > 30%)		GFK, CFK, AFK	
<b>Besondere Werkstoffe</b>		<b>Special materials</b>			
5.1	Grafit	Graphite		C 8000	
5.2	Wolfram-Kupfer-Legierungen	Tungsten-copper alloys		W-Cu 80/20	
5.3	Verbundwerkstoffe	Composite materials		Hyllite, Alucobond	
S	<b>Spezialwerkstoffe</b>		<b>Special materials</b>		
	<b>Titan-Legierungen</b>		<b>Titanium alloys</b>		
	1.1	Reintitan	Pure titanium	≤ 450 N/mm <sup>2</sup>	Ti1 3.7025
	1.2	Titan-Legierungen	Titanium alloys	≤ 900 N/mm <sup>2</sup>	TiAl6V4 3.7165
	1.3	Titan-Legierungen	Titanium alloys	≤ 1250 N/mm <sup>2</sup>	TiAl4Mo4Sn2 3.7185
	<b>Nickel-, Kobalt- und Eisen-Legierungen</b>		<b>Nickel alloys, cobalt alloys and iron alloys</b>		
	2.1	Reinnickel	Pure nickel	≤ 600 N/mm <sup>2</sup>	Ni 99.6 2.4060
	2.2	Nickel-Basis-Legierungen	Nickel-base alloys	≤ 1000 N/mm <sup>2</sup>	Monel 400 2.4360
	2.3	Nickel-Basis-Legierungen	Nickel-base alloys	≤ 1600 N/mm <sup>2</sup>	Inconel 718 2.4668
	2.4	Nickel-Basis-Legierungen	Nickel-base alloys	≤ 1000 N/mm <sup>2</sup>	Udimet 605
2.5	Kobalt-Basis-Legierungen	Cobalt-base alloys	≤ 1600 N/mm <sup>2</sup>	Haynes 25 2.4964	
2.6	Eisen-Basis-Legierungen	Iron-base alloys	≤ 1500 N/mm <sup>2</sup>	Incoloy 800 1.4958	
H	<b>Harte Werkstoffe</b>		<b>Hard materials</b>		
	1.1	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	44 - 50 HRC	Weldox 1100
	1.2	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	50 - 55 HRC	Hardox 550
	1.3	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	55 - 60 HRC	Armax 600T
	1.4	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	60 - 63 HRC	Ferro-Titanit
1.5	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	63 - 66 HRC	HSSE	