NKO

2013 / 14

Hochleistungs-Vollhartmetall-Werkzeuge

Passion for excellence

Class / Kategorie

Hard-max

High-performance end mills for HSC of tempered and hardened steels 48 - 68 HRc.
Hochleistungs-Schaftfräser für die HSC von gehärtetem und vergütetem Stählen mit Härten von 48 - 68 HRc

Hard-cut

High-performance end mills for HSC of tool steels, hard cast materials, tempered and hardened steels 45 - 65 HRc
Hochleistungs-Schaftfräser für die HSC von Werkzeugstählen, harten Gusswerkstoffen, gehärtetem und vergütetem Stählen mit Härten von 45 - 65 HRc

Wide-cut

High-performance end mills for HSC / HPC of steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc.
Hochleistungs-Schaftfräser für HSC / HPC von Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc.

Eco-cut

Universal end mills for milling of steels, stainless steels and hardened steels up to 50 HRc.
Universal-Schaftfräser für Bearbeitung von Stählen, rostfreie Stählen und vergüteten Stählen bis 50 HRc.

Alu-cut

High-performance end mills for machining of aluminum, magnesium, copper alloys and plastic.
Hochleistungs-Schaftfräser für Bearbeitung von Aluminium, Magnesium, Kupfer und Kunststoff.

Copper

High-performance end mills with CrN coating for HSC of copper electrode.
Hochleistungs-Schaftfräser mit CrN Beschichtung für die HSC von Kupfer-Elektrode.

Graphite

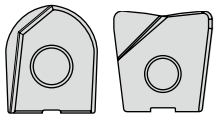
High-performance end mills with CVD diamond coating for HSC of graphite.
Hochleistungs-Schaftfräser mit CVD-Diamant Beschichtung für die HSC von Graphit.

Drills

High-performance solid carbide drills with through coolant holes for HPC of steels, tools steels, austenitic stainless steels and cast irons.
Hochleistungs-vollhartmetall-bohrer mit innenkühlung für HPC von Stählen, Werkzeuge Stählen, austenitische rostfreie Stählen und Gusseisen.

Inserts

High-performance carbide inserts for HSC of steels, stainless steels, titanium alloy, cast iron and hardened steels up to 58 HRc.
Hochleistungs-Hartmetalleinsatz für HSC von Stählen, Nichtros-tende Stählen, Titan, Gusseisen und gehärteten Stählen bis 58 HRc.



CAUTION !! Attention on safety

1) Be very careful with the sharp edges when removing the cutting tool from its cases. Direct contact could result in injury.
2) Use safety cover, safety glasses and safety shoes during operation.
3) The cutting edge of the tools may chip or fragment during use.
4) The cutting edge may break or shatter if improperly used.
5) Stop cutting when the tool becomes dull.
6) Stop cutting immediately if you hear any strange cutting sounds.
7) Make sure the dimension of cutting tools and work piece as well as direction of rotation in advance.
8) The list of recommended milling conditions should be referred as a rough idea.

VORSICHT!! Aufmerksamkeit auf die Sicherheit

1) Geben Sie sehr mit den scharfen Rändern acht, wenn Sie das Ausschnittwerkzeug von seinen Fällen entfernen. Direkter Kontakt konnte Verletzung ergeben.
2) Benutzen Sie Sicherheitsabdeckung, Sicherheitsgläser und Sicherheit Schuhe während des Betriebes.
3) Die Schneide der Werkzeuge kann chip oder fragment während des Gebrauchs.
4) Die Schneide kann brechen oder zerbrechen, wenn nicht korrekt verwendet.
5) Schneiden aufhören, wenn das Werkzeug stumpf wird.
6) Stoppen Sie sofort schneiden, wenn Sie seltsamen schneiden-Töne zu hören.
7) Sicherstellen Sie, dass die Dimension der Schneidwerkzeuge und arbeiten Sie Stück sowie die Drehrichtung im voraus.
8) Die Liste der empfohlenen Fräsen Bedingungen sollten als eine ungefähre Vorstellung verwiesen werden.

Legend to the product page / Legende zur Produktseite

Tool material / Schneidstoffe

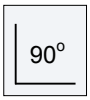
VHM K05-K20	Ultrafine-grain carbide. 8 - 10% Co. WC grain size 0.2 - 0.4 µm. Ultrafeinstkorn-Hartmetall. Co-Gehalt 8-10%. WC-Korngröße 0.2 - 0.4 µm.
VHM K10-K30	Ultrafine-grain carbide. 10 - 12% Co. WC grain size 0.4 - 0.5 µm. Ultrafeinstkorn-Hartmetall. Co-Gehalt 10-12%. WC-Korngröße 0.4 - 0.5 µm.
VHM K20-K40	Fine grain carbide . 10 - 12% Co. WC grain size 0.5 - 0.6 µm. Feinstkorn-Hartmetall. Co-Gehalt 10-12%. WC-Korngröße 0.5 - 0.6 µm.

Coating / Beschichtung

AlSi-X Coating	Nanocrystalline Si-based PVD coating. Hardness 4500 HV, Maximum temperature up to 1200°C. Nanocrystalline Si-basierte PVD-Beschichtung. Härte 4500 HV, Einsatztemperatur bis 1200° C.
AlCr-X Coating	Nanocrystalline multilayer, dual structure TiAlN / AlCrN-based coating. Hardness 3300 HV, Maximum temperature > 1100°C. Nanocrystalline mehrlagig, dualer Schichtaufbau TiAlN / AlCrN-basierte PVD-Beschichtung. Härte 3300 HV, Einsatztemperatur > 1100° C.
AlCrN Coating	Monolayer AlCrN-based coating. Hardness 3200 HV, Maximum temperature up to 1100°C. Monolayer AlCrN-basierte PVD-Beschichtung. Härte 3200 HV, Einsatztemperatur bis 1100° C.
Al-X Coating	Multilayer AlTiN / CrN PVD coating. Hardness 3600 HV, Maximum temperature up to 850°C. Mehrlagig AlTiN / CrN PVD-Beschichtung. Härte 3600 HV, Einsatztemperatur bis 850° C.
AlTiN Coating	A unique concept of AlTiN PVD coating. Hardness 3800 HV, Maximum temperature up to 900°C. Ein einzigartiges Konzept von AlTiN PVD-Beschichtung. Härte 3800 HV, Einsatztemperatur bis 900° C.
TiSi-X Coating	Nanocrystalline Si-based PVD coating. Hardness 4000 HV, Maximum temperature up to 900°C. Nanocrystalline Si-basierte PVD-Beschichtung. Härte 4000 HV, Einsatztemperatur bis 900° C.
CrN Coating	A unique concept of CrN PVD coating. Hardness 1800 HV, Maximum temperature up to 700°C. Ein einzigartiges Konzept von CrN PVD-Beschichtung. Härte 1800 HV, Einsatztemperatur bis 700° C.
DIA Coating	Oerlikon Balzers BALINIT® diamond coating. Microhardness (HV 0.05) 10,000 HV Oerlikon Balzers BALINIT ® Diamant-Beschichtung. Mikrohärte(HV 0.05) 10000 HV.

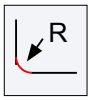
Legend to the product page / Legende zur Produktseite

Form of the corner of the cutting edges / Form der Ecken der Schneiden



The corner between front cutting edge and circumferential cutting edge is executed sharp-edged.
Die Ecke zwischen Stirnschneide und Umfangsschneide ist scharfkantig ausgeführt.

Ball nose tool.
Kugelkopfwerkzeug.



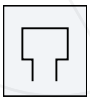
The tool is furnished with a corner radius.
Das Werkzeug besitzt einen Eckradius.

Taper end mill.
Konus Schaftfräser.

Shape of the tools / Form der Werkzeuge

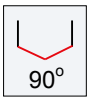
Ball nose end mills with reduced neck.
Kugelkopffräser mit reduzierten Hals.

Corner radius end mills with reduced neck.
Eckradiusfräser mit reduzierten Hals.

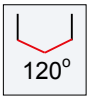


End mills with reduced neck.
Schaftfräser mit reduzierten Hals.

Point angle / Spitzenwinkel



The point angle is 90 degree.
Der Spitzenwinkel ist 90° .



The point angle is 120 degree.
Der Spitzenwinkel ist 120° .

The point angle of the drill is 140 degree.
Der Spitzenwinkel des Bohrers ist 140° .

Helix angle / Drallwinkel

The helix angle is variable from 42 - 45 degree.
Kennzeichnet den Drallwinkel 42° – 45° .

Legend to the product page / Legende zur Produktseite

Machining strategies / Bearbeitungsstrategie

HSC	High speed cutting. Hochgeschwindigkeitsbearbeitung.
HPC	High performance cutting. Hochleistungsbearbeitung.
GM	General machining, normal cutting speed. Konventionelle Bearbeitung, normale Schnittgeschwindigkeiten.

Hard milling / Hartfräsen

HRc 68	These tools are suitable for hard milling. The maximum hardness of the material to be machined is indicated in Rockwell (HRc). Diese Werkzeuge sind zum Hartfräsen geeignet. Angegeben ist die maximale Härte des zu bearbeitenden Materials in Rockwell (HRc).

Application suitability / Bearbeitungseignung

◎	Main application. Hauptanwendung.
○	Minor application. Restricted (can be used, restricted tool function) Nebenanwendung. Bedingt (kann verwendet werden, eingeschränkte Werkzeug-Funktion)

Availability / Verfügbarkeit

●	Stock item, subject to confirmation. Aus Vorrat lieferbar,freibleibend.
◇	On request. Auf Anfrage lieferbar.

Quickfinder

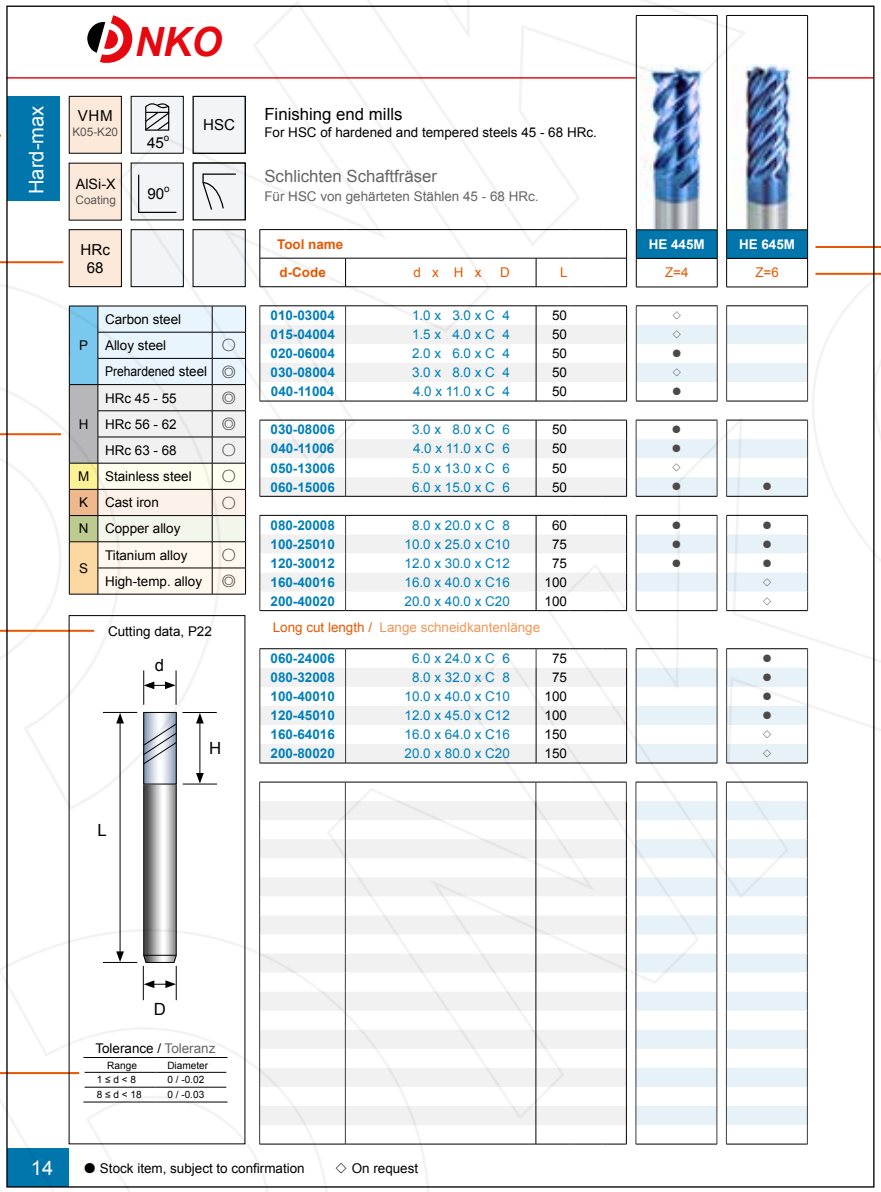
Application suitability / Bearbeitungseignung

Pictograms / Piktogramm

Class / Kategorie

Number of cutting edges
Anzahl der Schneiden

Tool code / Werkzeugcode



NKO

Hard-max

VHM K05-K20 | 45° | HSC

AlSi-X Coating | 90°

HRc 68

Finishing end mills
For HSC of hardened and tempered steels 45 - 68 HRc.

Schlichten Schaftfräser
Für HSC von gehärteten Stählen 45 - 68 HRc.

P	Carbon steel	
	Alloy steel	○
	Prehardened steel	◎
H	HRc 45 - 55	◎
	HRc 56 - 62	◎
	HRc 63 - 68	○
M	Stainless steel	○
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temp. alloy	◎

Cutting data, P22

Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Tool name			HE 445M	HE 645M
d-Code	d x H x D	L	Z=4	Z=6
010-03004	1.0 x 3.0 x C 4	50	◇	
015-04004	1.5 x 4.0 x C 4	50	◇	
020-06004	2.0 x 6.0 x C 4	50	●	
030-08004	3.0 x 8.0 x C 4	50	◇	
040-11004	4.0 x 11.0 x C 4	50	●	
030-08006	3.0 x 8.0 x C 6	50	●	
040-11006	4.0 x 11.0 x C 6	50	●	
050-13006	5.0 x 13.0 x C 6	50	◇	
060-15006	6.0 x 15.0 x C 6	50	●	●
080-20008	8.0 x 20.0 x C 8	60	●	●
100-25010	10.0 x 25.0 x C10	75	●	●
120-30012	12.0 x 30.0 x C12	75	●	●
160-40016	16.0 x 40.0 x C16	100		◇
200-40020	20.0 x 40.0 x C20	100		◇

Long cut length / Lange schneidkantenlänge

060-24006	6.0 x 24.0 x C 6	75		●
080-32008	8.0 x 32.0 x C 8	75		●
100-40010	10.0 x 40.0 x C10	100		●
120-45010	12.0 x 45.0 x C12	100		●
160-64016	16.0 x 64.0 x C16	150		◇
200-80020	20.0 x 80.0 x C20	150		◇

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● Stock item, subject to confirmation ◇ On request

Availability / Verfügbarkeit

Page / Seite

Tolerance / Toleranz

Recommended cutting data, page/ Schnittwertempfehlung, Seite

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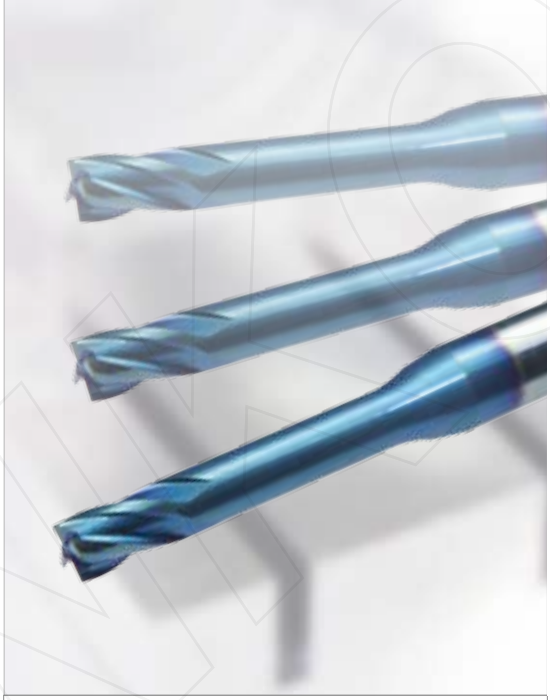


Passion for excellence

Hard-max

High-performance end mills for HSC of tempered and hardened steels 48 - 68 HRc

Hochleistungs-Schaftfräser für die HSC von gehärtetem und vergütetem Stählen mit Härten von 48 - 68 HRc

11 - 26







		HE 445M	HE 645M	HB 235M	HBLS 235M	HBLN 235M	HR 430M	HRLS 430M
Tool code		HE 445M	HE 645M	HB 235M	HBLS 235M	HBLN 235M	HR 430M	HRLS 430M
Number of teeth		Z=4	Z=6	Z=2	Z=2	Z=2	Z=4	Z=4
Page		14	14	15	16	17	18	19
		VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20
		AlSi-X Coating	AlSi-X Coating	AlSi-X Coating	AlSi-X Coating	AlSi-X Coating	AlSi-X Coating	AlSi-X Coating
		HRc 68	HRc 68	HRc 68	HRc 68	HRc 68	HRc 68	HRc 68
		45°	45°	35°	35°	35°	30°	30°
		90°	90°				R	R
		HSC	HSC	HSC	HSC	HSC	HSC	HSC
P	HRc < 24							
P	HRc 24 - 35	○	○	○	○	○	○	○
P	HRc > 35	◎	◎	◎	◎	◎	◎	◎
H	HRc 45 - 55	◎	◎	◎	◎	◎	◎	◎
H	HRc 56 - 60	◎	◎	◎	◎	◎	◎	◎
H	HRc > 60	◎	◎	◎	◎	◎	◎	◎
M	Stainless steel	○	○			○		
K	Cast iron							
N	Copper alloy							
S	Titanium alloy	○	○			○		
S	High-temperature alloy							

		New	New		New	New		
								
Tool code		HRN 430M	HRLN 230M	HRLN 430M	HRTN2309M	HRTN4309M		
Number of teeth		Z=4	Z=2	Z=4	Z=2	Z=4		
Page		20	21	21	22	22		
		VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20		
		AlSi-X Coating	AlSi-X Coating	AlSi-X Coating	AlSi-X Coating	AlSi-X Coating		
		HRc 68	HRc 68	HRc 68	HRc 68	HRc 68		
		30°	30°	30°	30°	30°		
		R	R	R	R	R		
		HSC	HSC	HSC	HSC	HSC		
P	HRc < 24							
	HRc 24 - 35	○	○	○	○	○		
	HRc > 35	◎	◎	◎	◎	◎		
H	HRc 45 - 55	◎	◎	◎	◎	◎		
	HRc 56 - 60	◎	◎	◎	◎	◎		
	HRc > 60	◎	◎	◎	◎	◎		
M	Stainless steel		○	○	○	○		
K	Cast iron							
N	Copper alloy							
S	Titanium alloy		○	○	○	○		
	High-temperature alloy							

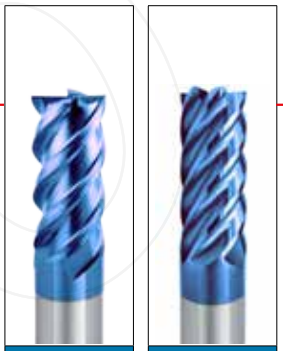
VHM K05-K20	45°	HSC
AlSi-X Coating	90°	
HRc 68		

Finishing end mills

For HSC of tempered and hardened steels 48 - 68 HRc

Schlichten Schaftfräser

Für die HSC von gehärtetem und vergütetem Stählen mit Härten von 48 - 68 HRc



P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	◎
M	Stainless steel	○
K	Cast iron	
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	

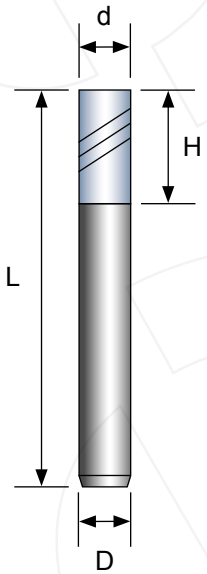
Example: Order code HE 445M 010-03004

d-Code	d x H x D	L	HE 445M Z=4	HE 645M Z=6
010-03004	1.0 x 3.0 x C 4	50	◇	
015-04004	1.5 x 4.0 x C 4	50	◇	
020-06004	2.0 x 6.0 x C 4	50	●	
030-08004	3.0 x 8.0 x C 4	50	●	
030-08006	3.0 x 8.0 x C 6	50	◇	
040-11004	4.0 x 11.0 x C 4	50	●	
040-11006	4.0 x 11.0 x C 6	50	◇	
060-15006	6.0 x 15.0 x C 6	50	●	●
080-20008	8.0 x 20.0 x C 8	60	●	●
100-25010	10.0 x 25.0 x C10	75	●	●
120-30012	12.0 x 30.0 x C12	75	●	●
160-40016	16.0 x 40.0 x C16	100		◇
200-40020	20.0 x 40.0 x C20	100		◇

Long cut length / Lange schneidkantenlänge

060-24006	6.0 x 24.0 x C 6	75		●
080-32008	8.0 x 32.0 x C 8	75		●
100-40010	10.0 x 40.0 x C10	100		●
120-45012	12.0 x 45.0 x C12	100		●
160-64016	16.0 x 64.0 x C16	150		◇
200-80020	20.0 x 80.0 x C20	150		◇

Cutting data, P23



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

● Stock item, subject to confirmation ◇ On request

VHM K05-K20	35°	HSC
AlSi-X Coating		
HRc 68		

Ball nose end mills

For HSC of tempered and hardened steels 48 - 68 HRc

Kugelkopffräser

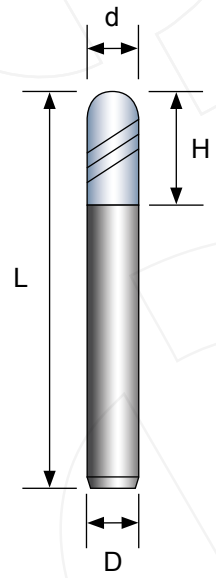
Für die HSC von gehärtetem und vergütetem Stählen mit Härten von 48 - 68 HRc

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	◎
M	Stainless steel	
K	Cast iron	
N	Copper alloy	
S	Titanium alloy	
	High-temperature alloy	

Example: Order code HB 235M 010-02004

d-Code	d x H x D	L	HB 235M Z=2	
010-02004	R0.5 x 2.0 x C 4	50	●	
015-03004	R0.75 x 3.0 x C 4	50	●	
020-04004	R1.0 x 4.0 x C 4	50	●	
020-04006	R1.0 x 4.0 x C 6	50	◇	
030-06003	R1.5 x 6.0 x C 3	50	◇	
030-06004	R1.5 x 6.0 x C 4	50	●	
030-06006	R1.5 x 6.0 x C 6	50	●	
040-08004	R2.0 x 8.0 x C 4	50	●	
040-08006	R2.0 x 8.0 x C 6	50	●	
050-10006	R2.5 x 10.0 x C 6	50	◇	
060-12006	R3.0 x 12.0 x C 6	50	●	
080-16008	R4.0 x 16.0 x C 8	60	●	
100-20010	R5.0 x 20.0 x C10	75	●	
120-24012	R6.0 x 24.0 x C12	75	◇	

Cutting data, P23



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

VHM K05-K20	35°	HSC
AlSi-X Coating		
HRc 68		

Ball nose end mills, long shank

For HSC of tempered and hardened steels 48 - 68 HRc

Kugelkopffräser, langer schaft

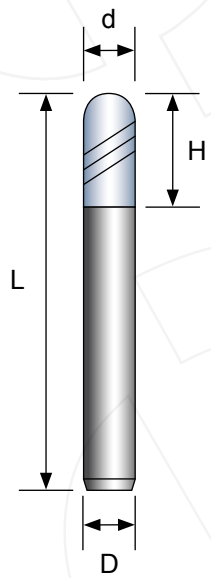
Für die HSC von gehärtetem und vergütetem Stählen mit Härten von 48 - 68 HRc

Example: Order code HBLS 235M 020-04104

d-Code	d x L x D	H	HBLS 235M Z=2	
020-04104	R1.0 x L 75 x C 4	4.0	◇	
020-04106	R1.0 x L 75 x C 6	4.0	●	
030-06106	R1.5 x L 75 x C 6	6.0	●	
040-08104	R2.0 x L 75 x C 4	8.0	●	
040-08106	R2.0 x L 75 x C 6	8.0	●	
050-10106	R2.5 x L 75 x C 6	10.0	◇	
060-12106	R3.0 x L 75 x C 6	12.0	●	
060-12306	R3.0 x L100 x C 6	12.0	●	
080-16308	R4.0 x L100 x C 8	16.0	●	
100-20310	R5.0 x L100 x C10	20.0	●	
120-24312	R6.0 x L100 x C12	24.0	◇	

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	◎
M	Stainless steel	
K	Cast iron	
N	Copper alloy	
S	Titanium alloy	
	High-temperature alloy	

Cutting data, P23



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

● Stock item, subject to confirmation ◇ On request

VHM K05-K20	35°	HSC
AlSi-X Coating		
HRc 68		

Ball nose end mills, long neck

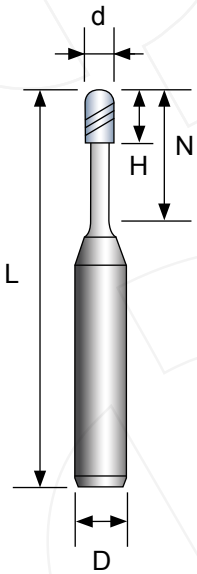
For HSC of tempered and hardened steels 48 - 68 HRc

Kugelkopffräser, überlaufhals

Für die HSC von gehärtetem und vergütetem Stählen mit Härten von 48 - 68 HRc

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	◎
M	Stainless steel	○
K	Cast iron	
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	

Cutting data, P24



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

Example: Order code HBLN 235M 010-04004

d-Code	d x N x D	H	L	HBLN 235M Z=2	
010-04004	R0.5 x N 4 x C 4	1.0	50	●	
010-06004	R0.5 x N 6 x C 4	1.0	50	●	
010-08004	R0.5 x N 8 x C 4	1.0	50	●	
010-10004	R0.5 x N 10 x C 4	1.0	50	◇	
010-12004	R0.5 x N 12 x C 4	1.0	50	◇	
015-06004	R0.75 x N 6 x C 4	1.5	50	●	
015-08004	R0.75 x N 8 x C 4	1.5	50	●	
015-12004	R0.75 x N 12 x C 4	1.5	50	●	
015-16004	R0.75 x N 16 x C 4	1.5	60	◇	
015-20004	R0.75 x N 20 x C 4	1.5	60	◇	
020-06004	R1.0 x N 6 x C 4	2.0	50	●	
020-08004	R1.0 x N 8 x C 4	2.0	50	●	
020-12004	R1.0 x N 12 x C 4	2.0	50	●	
020-16004	R1.0 x N 16 x C 4	2.0	60	◇	
020-20004	R1.0 x N 20 x C 4	2.0	60	◇	
030-12006	R1.5 x N 12 x C 6	3.0	60	●	
030-16006	R1.5 x N 16 x C 6	3.0	60	●	
030-20006	R1.5 x N 20 x C 6	3.0	60	●	
030-25006	R1.5 x N 25 x C 6	3.0	60	◇	
030-30006	R1.5 x N 30 x C 6	3.0	75	◇	
040-16006	R2.0 x N 16 x C 6	4.0	60	●	
040-20006	R2.0 x N 20 x C 6	4.0	60	●	
040-30006	R2.0 x N 30 x C 6	4.0	75	◇	

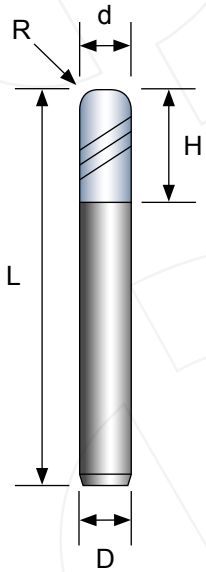
VHM K05-K20	30°	HSC
AlSi-X Coating	R	
HRc 68		

Corner radius end mills
For HSC of tempered and hardened steels 48 - 68 HRc

Eckradiusfräser
Für die HSC von gehärtetem und vergütetem Stählen mit Härten von 48 - 68 HRc

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	◎
M	Stainless steel	
K	Cast iron	
N	Copper alloy	
S	Titanium alloy	
	High-temperature alloy	

Cutting data, P25



Tolerance

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Example: Order code HR 430M 010-02004

d-Code	d x R x H x D	L	HR 430M Z=4	
010-02004	1.0 x R0.2 x 2.0 x C 4	50	◇	
015-02004	1.5 x R0.2 x 3.0 x C 4	50	◇	
020-02004	2.0 x R0.2 x 4.0 x C 4	50	●	
020-05004	2.0 x R0.5 x 4.0 x C 4	50	●	
025-02004	2.5 x R0.2 x 5.0 x C 4	50	●	
025-05004	2.5 x R0.5 x 5.0 x C 4	50	●	
030-02004	3.0 x R0.2 x 6.0 x C 4	50	●	
030-05004	3.0 x R0.5 x 6.0 x C 4	50	●	
030-10004	3.0 x R1.0 x 6.0 x C 4	50	●	
040-02004	4.0 x R0.2 x 8.0 x C 4	50	●	
040-05004	4.0 x R0.5 x 8.0 x C 4	50	●	
040-10004	4.0 x R1.0 x 8.0 x C 4	50	●	
060-05006	6.0 x R0.5 x 12.0 x C 6	50	●	
060-10006	6.0 x R1.0 x 12.0 x C 6	50	●	
080-05008	8.0 x R0.5 x 16.0 x C 8	60	●	
080-10008	8.0 x R1.0 x 16.0 x C 8	60	●	
100-05010	10.0 x R0.5 x 20.0 x C10	75	●	
100-10010	10.0 x R1.0 x 20.0 x C10	75	●	
120-05012	12.0 x R0.5 x 24.0 x C12	75	◇	
120-10012	12.0 x R1.0 x 24.0 x C12	75	◇	

● Stock item, subject to confirmation ◇ On request

VHM K05-K20	30°	HSC
AlSi-X Coating	R	
HRc 68		

Corner radius end mills, long shank

For HSC of tempered and hardened steels 48 - 68 HRc

Eckradiusfräser, langer schaft

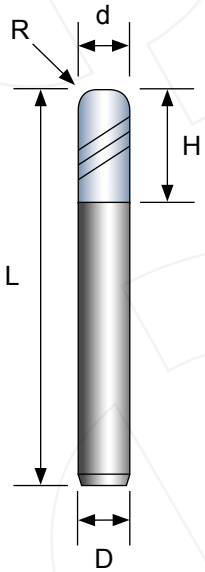
Für die HSC von gehärtetem und vergütetem Stählen mit Härten von 48 - 68 HRc

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	◎
M	Stainless steel	
K	Cast iron	
N	Copper alloy	
S	Titanium alloy	
	High-temperature alloy	

Example: Order code HRLS 430M 040-05104

d-Code	d x R x L x D	H	HRLS 430M Z=4	
040-05104	4.0 x R0.5 x L 75 x C 4	8.0	●	
040-10104	4.0 x R1.0 x L 75 x C 4	8.0	●	
060-05106	6.0 x R0.5 x L 75 x C 6	12.0	●	
060-10106	6.0 x R1.0 x L 75 x C 6	12.0	●	
080-05308	8.0 x R0.5 x L100 x C 8	16.0	●	
080-10308	8.0 x R1.0 x L100 x C 8	16.0	●	
100-05310	10.0 x R0.5 x L100 x C10	20.0	●	
100-10310	10.0 x R1.0 x L100 x C10	20.0	●	
120-05312	12.0 x R0.5 x L100 x C10	24.0	◇	
120-10312	12.0 x R1.0 x L100 x C10	24.0	●	

Cutting data, P25



Tolerance

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

VHM K05-K20	30°	HSC
AlSi-X Coating	R	
HRc 68		

Corner radius end mills, with working depth
For HSC of tempered and hardened steels 48 - 68 HRc

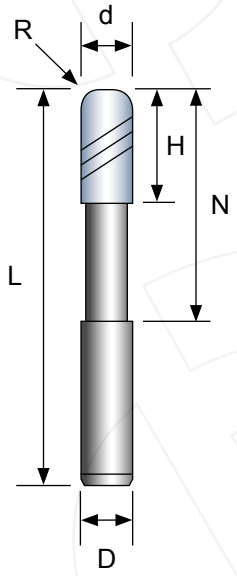
Eckradiusfräser, mit Arbeitstiefen
Für die HSC von gehärtetem und vergütetem Stählen mit Härten von 48 - 68 HRc

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	◎
M	Stainless steel	
K	Cast iron	
N	Copper alloy	
S	Titanium alloy	
	High-temperature alloy	

Example: Order code HRN 430M 060-05301

d-Code	d x R x N x D	H	L	HRN 430M Z=4	
060-05301	6.0 x R0.5 x N 30 x C 6	9.0	75	●	
060-10301	6.0 x R1.0 x N 30 x C 6	9.0	75	●	
080-05403	8.0 x R0.5 x N 40 x C 8	12.0	100	●	
080-10403	8.0 x R1.0 x N 40 x C 8	12.0	100	●	
100-05503	10.0 x R0.5 x N 50 x C10	15.0	100	●	
100-10503	10.0 x R1.0 x N 50 x C10	15.0	100	●	
120-05603	12.0 x R0.5 x N 60 x C12	18.0	100	◇	
120-10603	12.0 x R1.0 x N 60 x C12	18.0	100	●	

Cutting data, P25



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

● Stock item, subject to confirmation ◇ On request

DNKO

VHM K05-K20	30°	HSC
AlSi-X Coating	R	
HRc 68		

Corner radius end mills, long neck

For HSC of tempered and hardened steels 48 - 68 HRc

Eckradiusfräser, überlaufhals

Für die HSC von gehärtetem und vergütetem Stählen mit Härten von 48 - 68 HRc

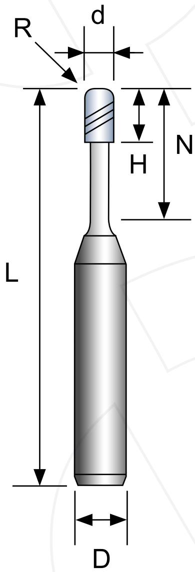
Hard-max

Example: Order code HRLN 230M 010-01044

d-Code	d x R x N x D	H	L	HRLN 230M Z=2	HRLN 430M Z=4
010-01044	1.0 x R0.1 x N 4 x C 4	1.2	50	●	
010-01064	1.0 x R0.1 x N 6 x C 4	1.2	50	●	
010-01084	1.0 x R0.1 x N 8 x C 4	1.2	50	◇	
010-02044	1.0 x R0.2 x N 4 x C 4	1.2	50	●	
010-02064	1.0 x R0.2 x N 6 x C 4	1.2	50	●	
010-02084	1.0 x R0.2 x N 8 x C 4	1.2	50	●	
010-02104	1.0 x R0.2 x N 10 x C 4	1.2	50	◇	
010-02124	1.0 x R0.2 x N 12 x C 4	1.2	50	◇	
015-02064	1.5 x R0.2 x N 6 x C 4	1.8	50	●	
015-02124	1.5 x R0.2 x N 12 x C 4	1.8	50	●	
015-02184	1.5 x R0.2 x N 18 x C 4	1.8	60	◇	
015-03064	1.5 x R0.3 x N 6 x C 4	1.8	50	●	
015-03124	1.5 x R0.3 x N 12 x C 4	1.8	50	●	
015-03184	1.5 x R0.3 x N 18 x C 4	1.8	60	◇	
020-02084	2.0 x R0.2 x N 8 x C 4	2.4	50	●	●
020-02124	2.0 x R0.2 x N 12 x C 4	2.4	50	●	●
020-02164	2.0 x R0.2 x N 16 x C 4	2.4	60	●	●
020-02204	2.0 x R0.2 x N 20 x C 4	2.4	60	◇	◇
020-05084	2.0 x R0.5 x N 8 x C 4	2.4	50	●	●
020-05124	2.0 x R0.5 x N 12 x C 4	2.4	50	●	●
020-05164	2.0 x R0.5 x N 16 x C 4	2.4	60	●	●
020-05204	2.0 x R0.5 x N 20 x C 4	2.4	60	◇	◇
030-02126	3.0 x R0.2 x N 12 x C 6	3.6	60	●	●
030-02186	3.0 x R0.2 x N 18 x C 6	3.6	60	●	●
030-02246	3.0 x R0.2 x N 24 x C 6	3.6	75	●	●
030-03126	3.0 x R0.3 x N 12 x C 6	3.6	60	◇	◇
030-03186	3.0 x R0.3 x N 18 x C 6	3.6	60	◇	◇
030-03246	3.0 x R0.3 x N 24 x C 6	3.6	75	◇	◇
030-05126	3.0 x R0.5 x N 12 x C 6	3.6	60	●	●
030-05186	3.0 x R0.5 x N 18 x C 6	3.6	60	●	●
030-05246	3.0 x R0.5 x N 24 x C 6	3.6	75	●	●
040-02166	4.0 x R0.2 x N 16 x C 6	4.8	60	●	●
040-02246	4.0 x R0.2 x N 24 x C 6	4.8	75	●	●
040-02326	4.0 x R0.2 x N 32 x C 6	4.8	75	●	●
040-03166	4.0 x R0.3 x N 16 x C 6	4.8	60	◇	◇
040-03246	4.0 x R0.3 x N 24 x C 6	4.8	75	◇	◇
040-03326	4.0 x R0.3 x N 32 x C 6	4.8	75	◇	◇
040-05166	4.0 x R0.5 x N 16 x C 6	4.8	60	●	●
040-05246	4.0 x R0.5 x N 24 x C 6	4.8	75	●	●
040-05326	4.0 x R0.5 x N 32 x C 6	4.8	75	●	●

P	HRc < 24	
P	HRc 24 - 35	○
P	HRc > 35	◎
H	HRc 45 - 55	◎
H	HRc 56 - 60	◎
H	HRc > 60	◎
M	Stainless steel	○
K	Cast iron	
N	Copper alloy	
S	Titanium alloy	○
S	High-temperature alloy	

Cutting data, P26



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

VHM K05-K20	30°	HSC
AlSi-X Coating	R	
HRc 68		

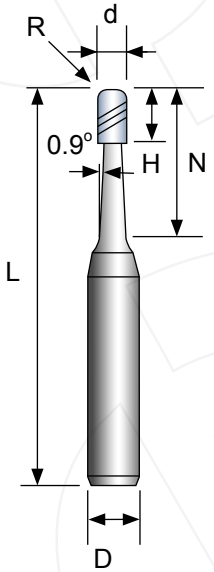
Corner radius end mills, conic neck 0.9°

For HSC of hardened and tempered steels 48 - 68 HRc

Eckradiusfräser, 0.9° konisch zum Schaft

Für die HSC von gehärtetem und vergütetem Stählen mit Härten von 48 - 68 HRc

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	◎
M	Stainless steel	○
K	Cast iron	
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

New

HRTN2309M

Z=2

New

HRTN4309M

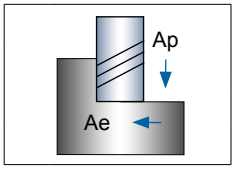
Z=4

Example: Order code HRTN 2309M 010-02104

d-Code	d x R x N x D	H	L	HRTN2309M Z=2	HRTN4309M Z=4
010-02104	1.0 x R0.2 x N 10 x C 4	1.2	50	◇	
010-02124	1.0 x R0.2 x N 12 x C 4	1.2	50	◇	
010-02154	1.0 x R0.2 x N 15 x C 4	1.2	50	◇	
015-02154	1.5 x R0.2 x N 15 x C 4	1.8	75	◇	
015-02204	1.5 x R0.2 x N 20 x C 4	1.8	75	◇	
015-02254	1.5 x R0.2 x N 25 x C 4	1.8	75	◇	
020-02204	2.0 x R0.2 x N 20 x C 4	2.4	75	◇	
020-02254	2.0 x R0.2 x N 25 x C 4	2.4	75	◇	
020-02304	2.0 x R0.2 x N 30 x C 4	2.4	75	◇	
020-05204	2.0 x R0.5 x N 20 x C 4	2.4	75	◇	
020-05254	2.0 x R0.5 x N 25 x C 4	2.4	75	◇	
020-05304	2.0 x R0.5 x N 30 x C 4	2.4	75	◇	
030-02306	3.0 x R0.2 x N 30 x C 6	3.6	75	◇	
030-02406	3.0 x R0.2 x N 40 x C 6	3.6	75	◇	
030-02506	3.0 x R0.2 x N 50 x C 6	3.6	100	◇	
030-05306	3.0 x R0.5 x N 30 x C 6	3.6	75	◇	◇
030-05406	3.0 x R0.5 x N 40 x C 6	3.6	75	◇	◇
030-05506	3.0 x R0.5 x N 50 x C 6	3.6	100	◇	◇

● Stock item, subject to confirmation ◇ On request

Hard-max — Side milling / Finishing (HSC)

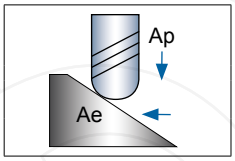


Ap = 1.0 x d
Ae = 0.02 x d

HE 445M, HE 645M

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			2	3	4	6	8	10	12	16	20
P	HRc > 35	145 - 185	0.018	0.022	0.031	0.050	0.059	0.078	0.093	0.013	0.017
H	HRc < 52	125 - 165	0.016	0.020	0.028	0.045	0.054	0.070	0.084	0.011	0.015
	HRc 52 - 55	105 - 135	0.014	0.017	0.025	0.039	0.046	0.061	0.073	0.010	0.014
	HRc 56 - 60	70 - 95	0.012	0.015	0.021	0.033	0.039	0.052	0.061	0.008	0.011

Hard-max — Copy milling / Finishing (HSC)



HB 235M, HBLS 235M(#1)

	P	H			
	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60	HRc < 65
Ap [mm]	0.02 x d	0.02 x d	0.02 x d	0.02 x d	0.02 x d
Ae [mm]	0.015 x d	0.015 x d	0.015 x d	0.015 x d	0.015 x d

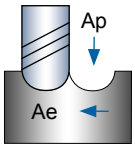
d [mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
R0.2	30000	360	30000	360	30000	360	30000	360	30000	360
R0.25	30000	450	30000	450	30000	450	30000	450	30000	450
R0.3	30000	540	30000	540	30000	540	30000	540	30000	540
R0.4	30000	720	30000	720	30000	720	27700	670	21800	520
R0.5	30000	900	30000	900	26700	801	22300	669	17500	525
R0.75	30000	1350	30000	1350	25600	1152	21400	963	17500	788
R1.0	30000	1800	27400	1644	22400	1344	18700	1122	17500	1050
R1.5	29700	2673	24400	2196	20100	1809	14800	1332	11600	1044
R2.0	22200	2664	18300	2196	15100	1812	11100	1332	8700	1044
R2.5	17800	2670	14600	2190	12100	1815	8900	1335	7000	1050
R3.0	14800	2664	12200	2196	10000	1800	7400	1332	5800	1044
R4.0	11100	2664	9100	2184	7500	1800	5500	1320	4300	1032
R5.0	8900	2670	7300	2190	6000	1800	4400	1320	3500	1050
R6.0	7400	2664	6100	2196	5000	1800	3700	1332	2900	1044

Notes

#1 For HBLS 235M: Adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

- ▶ All cutting data are target values. Please adjust conditions based on machining shape and machining path.
- ▶ Use a rigid and precise machine and holder.
- ▶ Recommend to use MQL (Minimum Quantity Lubrication / mist coolant) or air blow for machining hardened steel.
- ▶ Recommend to apply herical or ramping for approaching into axial direction.
- ▶ When the available RPM are insufficient, please reduce the RPM and feed rates in proportion.

Hard-max | **Contour line / Roughing (HSC)**



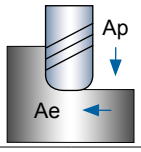
HBLN 235M

R [mm]	N [mm]	H HRc < 52 n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]	HRc 52 - 55 n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]	HRc 56 - 60 n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]
R0.5	4	28000	1460	0.035	0.105	24600	1180	0.032	0.096	19700	750	0.025	0.075
	6	25200	1310	0.020	0.060	22100	1060	0.018	0.054	17700	670	0.014	0.042
	8	25200	1310	0.015	0.045	22100	1060	0.014	0.042	17700	670	0.011	0.033
	10	22400	1030	0.012	0.036	19700	830	0.011	0.033	15800	540	0.009	0.027
	12	20100	840	0.010	0.030	17700	670	0.009	0.027	14200	430	0.007	0.021
R0.75	6	21000	1510	0.053	0.159	18500	1220	0.048	0.144	14800	800	0.038	0.114
	8	18900	1360	0.030	0.090	16700	1100	0.027	0.081	13300	720	0.022	0.066
	12	18900	1360	0.023	0.069	16700	1100	0.021	0.063	13300	720	0.017	0.051
	16	15100	880	0.015	0.045	13300	720	0.014	0.042	10600	470	0.011	0.033
	20	14500	750	0.014	0.042	12700	610	0.012	0.036	10200	390	0.010	0.030
R1.0	6	17600	1690	0.120	0.360	15500	1360	0.100	0.300	12400	890	0.072	0.216
	8	17600	1690	0.085	0.255	15500	1360	0.071	0.213	12400	890	0.051	0.153
	12	15800	1520	0.048	0.144	14000	1230	0.040	0.120	11200	810	0.029	0.087
	16	15800	1520	0.037	0.111	14000	1230	0.031	0.093	11200	810	0.022	0.066
	20	14100	1210	0.030	0.090	12400	970	0.025	0.075	9900	630	0.018	0.054
R1.5	12	15400	2220	0.149	0.447	13600	1800	0.117	0.351	10800	1170	0.085	0.255
	16	13900	2000	0.084	0.252	12200	1610	0.066	0.198	9700	1050	0.048	0.144
	20	13900	2000	0.065	0.195	12200	1610	0.051	0.153	9700	1050	0.037	0.111
	25	12300	1570	0.052	0.156	10900	1290	0.041	0.123	8600	830	0.030	0.090
	30	12300	1249	0.052	0.156	10900	1030	0.041	0.123	8600	660	0.030	0.090
R2.0	16	12000	2300	0.198	0.594	10600	1870	0.170	0.510	8400	1210	0.127	0.381
	20	10800	2070	0.112	0.336	9500	1670	0.096	0.288	7600	1090	0.072	0.216
	30	10800	2070	0.086	0.258	9500	1670	0.074	0.222	7600	1090	0.055	0.165

Notes

- ► These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
- ► Recommend to use MQL (Minimum Quantity Lubrication / mist coolant) or air blow for machining hardened steel.
- ► Recommend to apply herical or ramping for approaching into axial direction.
- ► Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

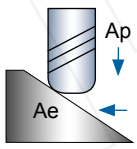
Hard-max — Contour line / Roughing (HSC)



HR 430M, HRLS 430M (#1), HRN 430M (#1)

		H											
		HRc < 52				HRc 52 - 55				HRc 56 - 62			
d [mm]	R [mm]	n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]	n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]	n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]
1	0.2	26500	1780	0.04	0.13	23300	1420	0.04	0.12	18600	900	0.03	0.09
1.5	0.2	19800	1810	0.06	0.2	17400	1420	0.06	0.18	14000	940	0.04	0.14
2	0.2,0.5	16600	1860	0.09	0.27	14600	1580	0.08	0.25	11700	980	0.06	0.19
2.5	0.2,0.5	15300	2080	0.11	0.34	13700	1740	0.1	0.31	10900	1090	0.08	0.24
3	0.2,0.5	13900	2130	0.13	0.41	12200	1760	0.12	0.37	9800	1130	0.09	0.28
4	0.2,0.5	10800	1940	0.18	0.54	9500	1580	0.16	0.49	7600	970	0.12	0.38
5	0.5,1.0	8640	1940	0.23	0.68	7600	1580	0.2	0.62	6080	970	0.16	0.48
6	0.5,1.0	7200	1940	0.27	0.81	6330	1580	0.24	0.74	5060	970	0.19	0.58
8	0.5,1.0	5400	1940	0.36	1.08	4740	1580	0.33	0.98	3800	970	0.26	0.76
10	1.0,2.0	4320	1940	0.45	1.35	3800	1580	0.41	1.23	3040	970	0.32	0.96
12	1.0,2.0	3450	1940	0.54	1.62	3160	1580	0.49	1.47	2530	970	0.38	1.15

Hard-max — Inclined surface milling / Finishing (HSC)



HR 430M, HRLS 430M (#1), HRN 430M (#1)

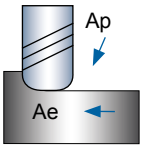
		H											
		HRc < 52				HRc 52 - 55				HRc 56 - 62			
d [mm]	R [mm]	n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]	n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]	n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]
1	0.2	27000	1810	0.03	0.03	23800	1450	0.02	0.03	18900	920	0.02	0.03
1.5	0.2	27000	2460	0.04	0.04	23800	1940	0.03	0.04	18900	1270	0.03	0.04
2	0.2,0.5	27000	3100	0.06	0.06	23800	2590	0.04	0.06	17400	1360	0.04	0.06
2.5	0.2,0.5	26000	3540	0.07	0.07	20800	2660	0.05	0.07	13900	1400	0.05	0.07
3	0.2,0.5	25100	3860	0.09	0.09	20100	2900	0.06	0.09	13500	1550	0.06	0.09
4	0.2,0.5	18700	3340	0.12	0.12	15100	2510	0.08	0.12	10100	1300	0.08	0.12
5	0.5,1.0	15100	3380	0.15	0.15	12100	2510	0.10	0.15	8100	1300	0.10	0.15
6	0.5,1.0	12500	3360	0.18	0.18	10100	2530	0.12	0.18	6700	1280	0.12	0.18
8	0.5,1.0	9400	3380	0.24	0.24	7600	2530	0.16	0.24	5100	1310	0.16	0.24
10	1.0,2.0	7500	3360	0.30	0.30	6100	2540	0.20	0.30	4000	1280	0.20	0.30
12	1.0,2.0	6200	3330	0.36	0.36	5100	2540	0.24	0.36	3300	1260	0.24	0.36

Notes

#1 For HRLS 430M and HRN 430M : Adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

- ► Recommend to use MQL (Minimum Quantity Lubrication / mist coolant) or air blow for machining hardened steel.
- ► Recommend to apply herical or ramping for approaching into axial direction.
- ► Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

Hard-max | **Contour line / Semi-roughing (HSC)**



HRLN 230M, HRLN 430M (※1)

		H											
		HRc < 52				HRc 52 - 55				HRc 56 - 60			
d, R [mm]	N [mm]	n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]	n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]	n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]
1.0 R0.2	6	20200	850	0.018	0.054	17800	680	0.016	0.048	14200	430	0.013	0.039
	8	18100	760	0.012	0.036	16000	610	0.011	0.033	12700	380	0.009	0.027
	10	15900	600	0.011	0.033	14000	480	0.010	0.030	11200	290	0.008	0.024
	12	14200	480	0.009	0.027	12500	380	0.008	0.024	10000	240	0.006	0.018
1.5 R0.2	6	17000	990	0.048	0.144	14900	770	0.044	0.132	12000	500	0.034	0.102
	12	13600	790	0.019	0.057	11900	620	0.017	0.051	9600	400	0.013	0.039
	18	10600	490	0.014	0.042	9300	390	0.012	0.036	7500	260	0.010	0.030
2.0 R0.2 R0.5	8	14200	1020	0.064	0.192	12500	850	0.058	0.174	10000	520	0.045	0.135
	12	12600	910	0.036	0.108	11100	750	0.033	0.099	8900	460	0.026	0.078
	16	11400	820	0.025	0.075	10000	680	0.023	0.069	8000	420	0.018	0.054
	20	10000	640	0.022	0.066	8800	530	0.020	0.060	7000	320	0.016	0.048
D3 R0.2 R0.5	12	11100	1070	0.096	0.288	9800	880	0.087	0.261	7800	560	0.068	0.204
	18	10000	960	0.054	0.162	8800	790	0.049	0.147	7000	500	0.038	0.114
	24	8800	840	0.037	0.111	7700	690	0.034	0.102	6200	450	0.027	0.081
D4 R0.2 R0.5	16	8600	960	0.127	0.381	7600	790	0.116	0.348	6100	490	0.091	0.273
	24	7800	870	0.072	0.216	6800	710	0.066	0.198	5500	440	0.051	0.153
	32	6800	760	0.050	0.150	6000	620	0.045	0.135	4800	380	0.035	0.105

Notes

#1 For HRLN 430M : Adjust feed rate (Vf) 60% higher.

- ► These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
- ► Recommend to use oil mist coolant for machining hardened steel.
- ► Recommend to apply herical or ramping for approaching into axial direction.
- ► Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

Hard-cut

High-performance end mills for HSC of tool steels, hard cast materials, tempered and hardened steels 45 - 65 HRc

Hochleistungs-Schaftfräser für die HSC von Werkzeugstählen, harten Gusswerkstoffen, gehärtetem und vergütetem Stählen mit Härten von 45 - 65 HRc

								
	Tool code	**HE 235**	**HE 445**	**HELS 435**	**HELN 235**	**HELN 435**	**HB 235**	**HB 435**
	Number of teeth	Z=2	Z=4	Z=4	Z=2	Z=4	Z=2	Z=4
	Page	30	31	32	33	33	34	34
		VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20
		New Al-X Coating	*New* Al-X Coating	*New* Al-X Coating	*New* AlCr-X Coating	*New* AlCr-X Coating	AlTiN Coating	AlTiN Coating
		HRc 62	HRc 62	HRc 62	HRc 65	HRc 65	HRc 65	HRc 65
		35°	45°	35°	35°	35°	35°	35°
		90°	90°	90°	90°	90°		
		HSC	HSC	HSC	HSC	HSC	HSC	HSC
P	HRc < 24				○	○		
P	HRc 24 - 35	○	○	○	◎	◎	○	○
P	HRc > 35	◎	◎	◎	◎	◎	◎	◎
H	HRc 45 - 55	◎	◎	◎	◎	◎	◎	◎
H	HRc 56 - 60	◎	◎	◎	◎	◎	◎	◎
H	HRc > 60	○	○	○	○	○	○	○
M	Stainless steel	○	○		◎	◎		
K	Cast iron	○	○	○	○	○	○	○
N	Copper alloy				○	○		
S	Titanium alloy	○	○		◎	◎		
S	High-temperature alloy				○	○		

								
Tool code		HBLS 235	HBLS 435	HBLN 2359	HBTN 2359	HR 230	HR 430	HRLS 430
Number of teeth		Z=2	Z=4	Z=2	Z=2	Z=2	Z=4	Z=4
Page		35	35	36	37	38	38	39
		VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20	VHM K05-K20
		AlTiN Coating	AlTiN Coating	New AlCr-X Coating	New AlCr-X Coating	AlTiN Coating	AlTiN Coating	AlTiN Coating
		HRc 65	HRc 65	HRc 65	HRc 65	HRc 65	HRc 65	HRc 65
		35°	35°	35°	35°	30°	30°	30°
						R	R	R
		HSC	HSC	HSC	HSC	HSC	HSC	HSC
P	HRc < 24			○	○			
P	HRc 24 - 35	○	○	◎	◎	○	○	○
P	HRc > 35	◎	◎	◎	◎	◎	◎	◎
H	HRc 45 - 55	◎	◎	◎	◎	◎	◎	◎
H	HRc 56 - 60	◎	◎	◎	◎	◎	◎	◎
H	HRc > 60	○	○	◎	◎	○	○	○
M	Stainless steel			◎	◎			
K	Cast iron	○	○	○	○	○	○	○
N	Copper alloy			○	○			
S	Titanium alloy			◎	◎			
S	High-temperature alloy			○	○			

VHM K05-K20	35°	HSC
New Al-X Coating	90°	
HRc 62		

End mills

For HSC of tool steels, hard cast materials, tempered and hardened steels 45 - 62 HRc

Schaftfräser

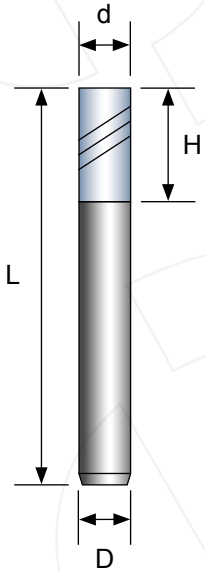
Für die HSC von Werkzeugstählen, harten Gusswerkstoffen, gehärtetem und vergütetem Stählen mit Härten von 45 – 62 HRc

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	○
M	Stainless steel	○
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	

Example: Order code HE 235 002-00404

d-Code	d x H x D	L	HE 235 Z=2	
002-00404	0.2 x 0.4 x C 4	50	●	
003-00604	0.3 x 0.6 x C 4	50	●	
004-00804	0.4 x 0.8 x C 4	50	●	
005-01004	0.5 x 1.0 x C 4	50	●	
006-01204	0.6 x 1.2 x C 4	50	●	
007-01404	0.7 x 1.4 x C 4	50	◇	
008-01604	0.8 x 1.6 x C 4	50	●	
009-01804	0.9 x 1.8 x C 4	50	◇	
010-03004	1.0 x 3.0 x C 4	50	●	
015-04004	1.5 x 4.0 x C 4	50	●	
020-06004	2.0 x 6.0 x C 4	50	●	
025-07004	2.5 x 7.0 x C 4	50	●	
030-08004	3.0 x 8.0 x C 4	50	●	
030-08006	3.0 x 8.0 x C 6	50	◇	
040-11004	4.0 x 11.0 x C 4	50	●	
040-11006	4.0 x 11.0 x C 6	50	◇	
050-13006	5.0 x 13.0 x C 6	50	◇	
060-15006	6.0 x 15.0 x C 6	50	●	
080-20008	8.0 x 20.0 x C 8	60	●	
100-25010	10.0 x 25.0 x C10	75	●	
120-30012	12.0 x 30.0 x C12	75	◇	

Cutting data, P40 - P41



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

● Stock item, subject to confirmation ◇ On request

VHM K05-K20	45°	HSC
New Al-X Coating	90°	
HRc 62		

End mills

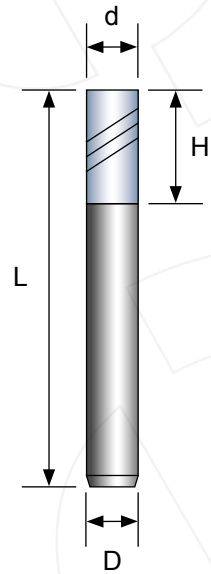
For HSC of tool steels, hard cast materials, tempered and hardened steels 45 - 62 HRc

Schaftfräser

Für die HSC von Werkzeugstählen, harten Gusswerkstoffen, gehärtetem und vergütetem Stählen mit Härten von 45 - 62 HRc

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	○
M	Stainless steel	○
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	

Cutting data, P40 - P41



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Example: Order code HE 445 010-03004

d-Code	d x H x D	L	HE 445 Z=4	
010-03004	1.0 x 3.0 x C 4	50	●	
015-04004	1.5 x 4.0 x C 4	50	●	
020-06004	2.0 x 6.0 x C 4	50	●	
025-07004	2.5 x 7.0 x C 4	50	●	
030-08004	3.0 x 8.0 x C 4	50	●	
030-08006	3.0 x 8.0 x C 6	50	◇	
040-11004	4.0 x 11.0 x C 4	50	●	
040-11006	4.0 x 11.0 x C 6	50	◇	
050-13006	5.0 x 13.0 x C 6	50	●	
060-15006	6.0 x 15.0 x C 6	50	●	
080-20008	8.0 x 20.0 x C 8	60	●	
100-25010	10.0 x 25.0 x C10	75	●	
120-30012	12.0 x 30.0 x C12	75	●	
160-40016	16.0 x 40.0 x C16	100	◇	
200-40020	20.0 x 40.0 x C20	100	◇	

Long cut length / Lange schneidkantenlänge

060-24006	6.0 x 24.0 x C 6	75	●	
080-32008	8.0 x 32.0 x C 8	75	●	
100-40010	10.0 x 40.0 x C10	100	●	
120-45010	12.0 x 45.0 x C12	100	●	

VHM K05-K20 | 35° | HSC

New Al-X Coating | 90°

HRc 62

End mills, long shank

For HSC of tool steels, hard cast materials, tempered and hardened steels 45 - 62 HRc

Schaftfräser, langer schaft

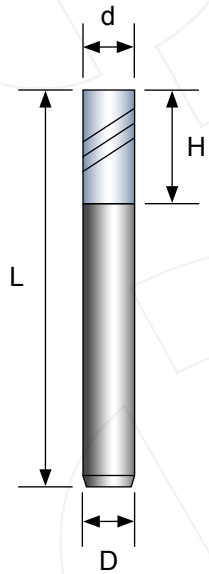
Für die HSC von Werkzeugstählen, harten Gusswerkstoffen, gehärtetem und vergütetem Stählen mit Härten von 45 - 62 HRc

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	○
M	Stainless steel	
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	
	High-temperature alloy	

Example: Order code HELS 435 020-05104

d-Code	d x L x D	H	HELS 435 Z=4	
020-05104	2.0 x L 75 x C 4	5.0	◇	
030-08104	3.0 x L 75 x C 4	8.0	◇	
040-11104	4.0 x L 75 x C 4	11.0	●	
060-15106	6.0 x L 75 x C 6	15.0	●	
060-15306	6.0 x L100 x C 6	15.0	●	
080-20108	8.0 x L 75 x C 8	20.0	◇	
080-20308	8.0 x L100 x C 8	20.0	●	
100-25310	10.0 x L100 x C10	25.0	●	
100-25510	10.0 x L150 x C10	25.0	◇	
120-30312	12.0 x L100 x C12	30.0	●	
120-30512	12.0 x L150 x C12	30.0	◇	

Cutting data, P40 - P41



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

● Stock item, subject to confirmation ◇ On request

VHM K05-K20	35°	HSC
New AlCr-X Coating	90°	
HRc 65		

End mills, long neck

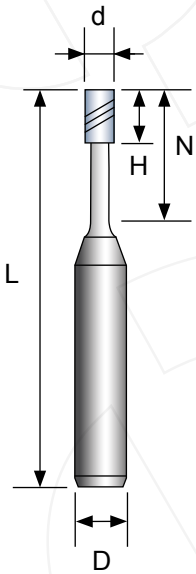
For HSC of steels, stainless steels, titanium alloys, heat-treated and hardened steels 45 - 65 HRc

Schaftfräser, überlaufhals

Für die HSC von Werkzeugstählen, harten Gusswerkstoffen, gehärtetem und vergütetem Stählen mit Härten von 45 - 65 HRc

P	HRc < 24	○
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	○
M	Stainless steel	◎
K	Cast iron	○
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P42



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02

Example: Order code HELN 235 003-01004

d-Code	d x N x D	H L	HELN 235 Z=2	HELN 435 Z=4
003-01004	0.3 x N 1 x C 4	0.4 50	◇	
003-02004	0.3 x N 2 x C 4	0.4 50	◇	
003-03004	0.3 x N 3 x C 4	0.4 50	◇	
004-02004	0.4 x N 2 x C 4	0.6 50	◇	
004-04004	0.4 x N 4 x C 4	0.6 50	◇	
005-02004	0.5 x N 2 x C 4	0.7 50	●	
005-04004	0.5 x N 4 x C 4	0.7 50	●	
005-06004	0.5 x N 6 x C 4	0.7 50	◇	
006-04004	0.6 x N 4 x C 4	0.9 50	●	
006-06004	0.6 x N 6 x C 4	0.9 50	●	
008-04004	0.8 x N 4 x C 4	1.2 50	●	
008-06004	0.8 x N 6 x C 4	1.2 50	●	
008-08004	0.8 x N 8 x C 4	1.2 50	◇	
010-04004	1.0 x N 4 x C 4	1.5 50	●	●
010-06004	1.0 x N 6 x C 4	1.5 50	●	●
010-08004	1.0 x N 8 x C 4	1.5 50	●	●
010-10004	1.0 x N 10 x C 4	1.5 50	◇	◇
010-12004	1.0 x N 12 x C 4	1.5 50	◇	◇
015-06004	1.5 x N 6 x C 4	2.3 50	●	●
015-08004	1.5 x N 8 x C 4	2.3 50	●	●
015-12004	1.5 x N 12 x C 4	2.3 50	●	●
015-16004	1.5 x N 16 x C 4	2.3 60	◇	◇
020-08004	2.0 x N 8 x C 4	3.0 50	●	●
020-10004	2.0 x N 10 x C 4	3.0 50	◇	◇
020-12004	2.0 x N 12 x C 4	3.0 50	●	●
020-16004	2.0 x N 16 x C 4	3.0 60	●	●
020-20004	2.0 x N 20 x C 4	3.0 60	◇	◇
030-12006	3.0 x N 12 x C 6	4.5 50		●
030-16006	3.0 x N 16 x C 6	4.5 60		●
030-20006	3.0 x N 20 x C 6	4.5 60		●
030-25006	3.0 x N 25 x C 6	4.5 60		◇
040-12006	4.0 x N 12 x C 6	6.0 50		●
040-16006	4.0 x N 16 x C 6	6.0 60		●
040-20006	4.0 x N 20 x C 6	6.0 60		●
040-25006	4.0 x N 25 x C 6	6.0 60		◇

VHM K05-K20	35°	HSC
AlTiN Coating		
HRc 65		

Ball nose end mills

For HSC of tool steels, hard cast materials, tempered and hardened steels 45 - 65 HRc

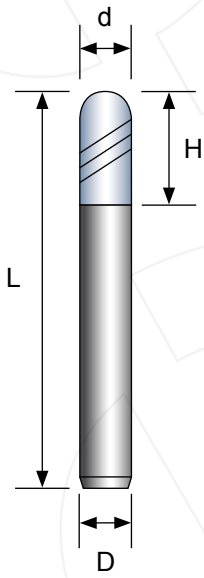
Kugelkopffräser

Für die HSC von Werkzeugstählen, harten Gusswerkstoffen, gehärtetem und vergütetem Stählen mit Härten von 45 - 65 HRc

Example: Order code HB 235 010-02004

			HB 235	HB 435
	d-Code	d x H x D	L	Z=2	Z=4
P	HRc < 24	002-00404	R0.1 x 0.4 x C 4	50	●	
		003-00604	R0.15 x 0.6 x C 4	50	●	
		004-00804	R0.2 x 0.8 x C 4	50	●	
		005-01004	R0.25 x 1.0 x C 4	50	●	
		006-01204	R0.3 x 1.2 x C 4	50	●	
		008-01604	R0.4 x 1.6 x C 4	50	●	
P	HRc 24 - 35	010-02003	R0.5 x 2.0 x C 3	50	◇	
		010-02004	R0.5 x 2.0 x C 4	50	●	
		010-02006	R0.5 x 2.0 x C 6	50	◇	
P	HRc > 35	015-03003	R0.75 x 3.0 x C 3	50	◇	
		015-03004	R0.75 x 3.0 x C 4	50	●	
		015-03006	R0.75 x 3.0 x C 6	50	◇	
H	HRc 45 - 55	020-04003	R1.0 x 4.0 x C 3	50	◇	
		020-04004	R1.0 x 4.0 x C 4	50	●	
		020-04006	R1.0 x 4.0 x C 6	50	◇	
H	HRc 56 - 60	025-05004	R1.25 x 5.0 x C 4	50	◇	
		030-06003	R1.5 x 6.0 x C 3	50	◇	
		030-06004	R1.5 x 6.0 x C 4	50	●	◇
		030-06006	R1.5 x 6.0 x C 6	50	●	◇
H	HRc > 60	040-08004	R2.0 x 8.0 x C 4	50	●	◇
		040-08006	R2.0 x 8.0 x C 6	50	●	◇
M	Stainless steel	050-10006	R2.5 x 10.0 x C 6	50	●	◇
		060-12006	R3.0 x 12.0 x C 6	50	●	●
		080-16008	R4.0 x 16.0 x C 8	60	●	●
		100-20010	R5.0 x 20.0 x C10	75	●	●
		120-24012	R6.0 x 24.0 x C12	75	●	●
		160-30016	R8.0 x 30.0 x C16	100	◇	◇
K	Cast iron					
N	Copper alloy					
S	Titanium alloy					
	High-temperature alloy					

Cutting data, P43 -P 44



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

● Stock item, subject to confirmation ◇ On request

VHM K05-K20	35°	HSC
AlTiN Coating		
HRc 65		

Ball nose end mills, long shank

For HSC of tool steels, hard cast materials, tempered and hardened steels 45 - 65 HRc

Kugelkopffräser, langer schaft

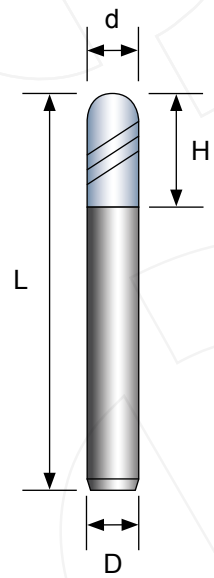
Für die HSC von Werkzeugstählen, harten Gusswerkstoffen, gehärtetem und vergütetem Stählen mit Härten von 45 - 65 HRc

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	○
M	Stainless steel	
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	
	High-temperature alloy	

Example: Order code HBLS 235 010-02104

d-Code	d x L x D	H	HBLS 235 Z=2	HBLS 435 Z=4
010-02104	R0.5 x L 75 x C 4	2.0	◇	
015-03104	R0.75 x L 75 x C 4	3.0	◇	
020-04106	R1.0 x L 75 x C 6	4.0	●	
020-04306	R1.0 x L100 x C 6	4.0	◇	
030-06106	R1.5 x L 75 x C 6	6.0	●	
030-06306	R1.5 x L100 x C 6	6.0	◇	
040-08104	R2.0 x L 75 x C 4	8.0	●	
040-08306	R2.0 x L100 x C 6	8.0	●	
050-10106	R2.5 x L 75 x C 6	10.0	●	
050-10306	R2.5 x L100 x C 6	10.0	●	
060-12106	R3.0 x L 75 x C 6	12.0	●	●
060-12306	R3.0 x L100 x C 6	12.0	●	●
060-12506	R3.0 x L150 x C 6	12.0	◇	◇
080-16108	R4.0 x L 75 x C 8	16.0	●	◇
080-16308	R4.0 x L100 x C 8	16.0	●	●
080-16508	R4.0 x L150 x C 8	16.0	◇	◇
100-20310	R5.0 x L100 x C10	20.0	●	●
100-20510	R5.0 x L150 x C10	20.0	◇	◇
120-24312	R6.0 x L100 x C12	24.0	●	●
120-24512	R6.0 x L150 x C12	24.0	◇	◇

Cutting data, P43 - P44



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

VHM K05-K20 | 35° | HSC

New AlCr-X Coating

HRc 65

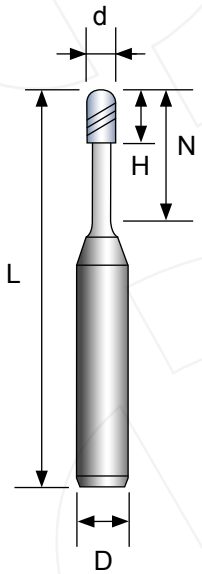
Ball nose end mills, long neck

For HSC of tool steels, hard cast materials, tempered and hardened steels 45 - 65 HRc

Kugelkopffräser, überlaufhals

Für die HSC von Werkzeugstählen, harten Gusswerkstoffen, gehärtetem und vergütetem Stählen mit Härten von 45 - 65 HRc

P	HRc < 24	○
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	◎
M	Stainless steel	◎
K	Cast iron	○
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02

Example: Order code HBLN 235 004-02004

d-Code	d x N x D	H	L	HBLN 235 Z=2	
004-02004	R0.2 x N 2 x C 4	0.4	50	●	
004-03004	R0.2 x N 3 x C 4	0.4	50	●	
004-04004	R0.2 x N 4 x C 4	0.4	50	◇	
005-02004	R0.25 x N 2 x C 4	0.5	50	●	
005-04004	R0.25 x N 4 x C 4	0.5	50	●	
005-06004	R0.25 x N 6 x C 4	0.5	50	◇	
006-02004	R0.3 x N 2 x C 4	0.6	50	●	
006-04004	R0.3 x N 4 x C 4	0.6	50	●	
006-06004	R0.3 x N 6 x C 4	0.6	50	◇	
008-04004	R0.4 x N 4 x C 4	0.8	50	●	
008-06004	R0.4 x N 6 x C 4	0.8	50	●	
008-08004	R0.4 x N 8 x C 4	0.8	50	◇	
010-04004	R0.5 x N 4 x C 4	1.0	50	●	
010-06004	R0.5 x N 6 x C 4	1.0	50	●	
010-08004	R0.5 x N 8 x C 4	1.0	50	●	
010-10004	R0.5 x N 10 x C 4	1.0	50	◇	
010-12004	R0.5 x N 12 x C 4	1.0	50	●	
015-06004	R0.75 x N 6 x C 4	1.5	50	●	
015-08004	R0.75 x N 8 x C 4	1.5	50	●	
015-12004	R0.75 x N 12 x C 4	1.5	50	●	
015-16004	R0.75 x N 16 x C 4	1.5	60	◇	
015-20004	R0.75 x N 20 x C 4	1.5	60	◇	
020-06004	R1.0 x N 6 x C 4	2.0	50	●	
020-08004	R1.0 x N 8 x C 4	2.0	50	●	
020-10004	R1.0 x N 10 x C 4	2.0	50	●	
020-12004	R1.0 x N 12 x C 4	2.0	50	●	
020-16004	R1.0 x N 16 x C 4	2.0	60	◇	
020-20004	R1.0 x N 20 x C 4	2.0	60	◇	
030-16006	R1.5 x N 16 x C 6	3.0	60	●	
030-20006	R1.5 x N 20 x C 6	3.0	60	●	
030-25006	R1.5 x N 25 x C 6	3.0	60	◇	
030-30006	R1.5 x N 30 x C 6	3.0	75	◇	
040-16006	R2.0 x N 16 x C 6	4.0	60	●	
040-20006	R2.0 x N 20 x C 6	4.0	60	●	
040-25006	R2.0 x N 25 x C 6	4.0	60	◇	
040-30006	R2.0 x N 30 x C 6	4.0	75	◇	

● Stock item, subject to confirmation ◇ On request

VHM K05-K20	35°	HSC
New AlCr-X Coating		
HRc 65		

Ball nose end mills, conic neck 0.9°

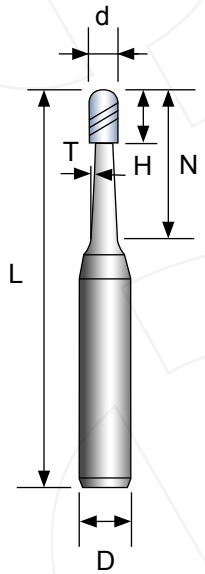
For HSC of tool steels, hard cast materials, tempered and hardened steels 45 - 65 HRc

Kugelkopffräser, 0.9° konisch zum Schaft

Für die HSC von Werkzeugstählen, harten Gusswerkstoffen, gehärtetem und vergütetem Stählen mit Härten von 45 - 65 HRc

Example: Order code HBTN 2359 006-06094

								d-Code	d x N x T x D	H	L	HBTN 2359 Z=2	
P	HRc < 24	○						006-06094	R0.3 x N 6 x T0.9 x C 4	0.6	50	◇	
	HRc 24 - 35	◎						006-08094	R0.3 x N 8 x T0.9 x C 4	0.6	50	◇	
	HRc > 35	◎						008-08094	R0.4 x N 8 x T0.9 x C 4	0.8	50	◇	
H	HRc 45 - 55	◎						008-12094	R0.4 x N12 x T0.9 x C 4	0.8	50	◇	
	HRc 56 - 60	◎						010-10094	R0.5 x N10 x T0.9 x C 4	1.0	50	◇	
	HRc > 60	◎						010-15094	R0.5 x N15 x T0.9 x C 4	1.0	50	◇	
M	Stainless steel	◎						015-15094	R0.75 x N15 x T0.9 x C 4	2.0	60	◇	
K	Cast iron	○						015-20094	R0.75 x N20 x T0.9 x C 4	2.0	60	◇	
N	Copper alloy	○						020-20096	R1.0 x N20 x T0.9 x C 6	3.0	75	◇	
S	Titanium alloy	◎						020-25096	R1.0 x N25 x T0.9 x C 6	3.0	75	◇	
	High-temperature alloy	○						020-30096	R1.0 x N30 x T0.9 x C 6	3.0	75	◇	
								030-30096	R1.5 x N30 x T0.9 x C 6	5.0	75	◇	
								030-40096	R1.5 x N40 x T0.9 x C 6	5.0	75	◇	
								030-50096	R1.5 x N50 x T0.9 x C 6	5.0	100	◇	



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02

VHM K05-K20	30°	HSC
AlTiN Coating	R	
HRc 65		

Corner radius end mills

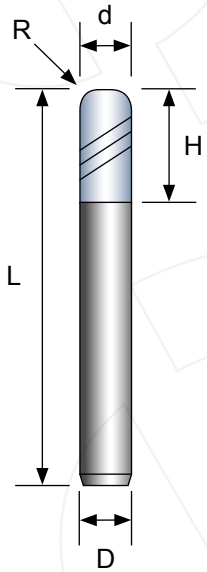
For HSC of tool steels, hard cast materials, tempered and hardened steels 45 - 65 HRc

Eckradiusfräser

Für die HSC von Werkzeugstählen, harten Gusswerkstoffen, gehärtetem und vergütetem Stählen mit Härten von 45 - 65 HRc

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	○
M	Stainless steel	
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	
	High-temperature alloy	

Cutting data, P45 - P46



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Example: Order code HR 230 010-02004

d-Code	d x R x H x D	L	HR 230 Z=2	HR 430 Z=4
010-02004	1.0 x R0.2 x 2.0 x C 4	50	●	●
015-02004	1.5 x R0.2 x 3.0 x C 4	50	●	●
015-05004	1.5 x R0.5 x 3.0 x C 4	50	◇	◇
020-02004	2.0 x R0.2 x 4.0 x C 4	50	●	●
020-05004	2.0 x R0.5 x 4.0 x C 4	50	●	●
025-02004	2.5 x R0.2 x 5.0 x C 4	50	◇	◇
025-05004	2.5 x R0.5 x 5.0 x C 4	50	◇	◇
030-02003	3.0 x R0.2 x 6.0 x C 3	50	◇	◇
030-05003	3.0 x R0.5 x 6.0 x C 3	50	◇	◇
030-02004	3.0 x R0.2 x 6.0 x C 4	50	●	●
030-05004	3.0 x R0.5 x 6.0 x C 4	50	●	●
030-10004	3.0 x R1.0 x 6.0 x C 4	50	◇	◇
040-02004	4.0 x R0.2 x 8.0 x C 4	50	◇	◇
040-05004	4.0 x R0.5 x 8.0 x C 4	50	●	●
040-10004	4.0 x R1.0 x 8.0 x C 4	50	◇	◇
050-05006	5.0 x R0.5 x 10.0 x C 6	50	◇	●
050-10006	5.0 x R1.0 x 10.0 x C 6	50	◇	●
060-02006	6.0 x R0.2 x 12.0 x C 6	50	◇	◇
060-05006	6.0 x R0.5 x 12.0 x C 6	50	●	●
060-10006	6.0 x R1.0 x 12.0 x C 6	50	●	●
080-05008	8.0 x R0.5 x 16.0 x C 8	60	◇	●
080-10008	8.0 x R1.0 x 16.0 x C 8	60	◇	●
100-05010	10.0 x R0.5 x 20.0 x C10	75	◇	●
100-10010	10.0 x R1.0 x 20.0 x C10	75	◇	●
100-20010	10.0 x R2.0 x 20.0 x C10	75	◇	◇
120-05012	12.0 x R0.5 x 24.0 x C12	75	◇	◇
120-10012	12.0 x R1.0 x 24.0 x C12	75	◇	●
120-20012	12.0 x R2.0 x 24.0 x C12	75	◇	◇

● Stock item, subject to confirmation ◇ On request

VHM K05-K20	30°	HSC
AlTiN Coating	R	
HRc 65		

Corner radius end mills, long shank

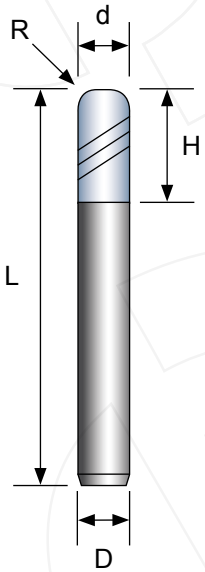
For HSC of tool steels, hard cast materials, tempered and hardened steels 45 - 65 HRc

Eckradiusfräser, langer schaft

Für die HSC von Werkzeugstählen, harten Gusswerkstoffen, gehärtetem und vergütetem Stählen mit Härten von 45 - 65 HRc

P	HRc < 24	
	HRc 24 - 35	○
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	◎
	HRc > 60	○
M	Stainless steel	
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	
	High-temperature alloy	

Cutting data, P46



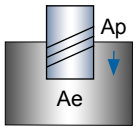
Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Example: Order code HRLS 430 020-02104

d-Code	d x R x L x D	H	HRLS 430 Z=4	
020-02104	2.0 x R0.2 x L 75 x C 4	4.0	◇	
020-05104	2.0 x R0.5 x L 75 x C 4	4.0	◇	
040-05104	4.0 x R0.5 x L 75 x C 4	8.0	●	
040-10104	4.0 x R1.0 x L 75 x C 4	8.0	●	
060-05106	6.0 x R0.5 x L 75 x C 6	12.0	●	
060-05306	6.0 x R0.5 x L100 x C 6	12.0	●	
060-10106	6.0 x R1.0 x L 75 x C 6	12.0	●	
060-10306	6.0 x R1.0 x L100 x C 6	12.0	●	
080-05308	8.0 x R0.5 x L100 x C 8	16.0	●	
080-10308	8.0 x R1.0 x L100 x C 8	16.0	●	
100-05310	10.0 x R0.5 x L100 x C10	20.0	◇	
100-10310	10.0 x R1.0 x L100 x C10	20.0	●	
100-20310	10.0 x R2.0 x L100 x C10	20.0	◇	
120-05312	12.0 x R0.5 x L100 x C12	24.0	◇	
120-10312	12.0 x R1.0 x L100 x C12	24.0	●	
120-20312	12.0 x R2.0 x L100 x C12	24.0	◇	

Hard-cut — Slotting / Finishing (General milling)

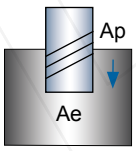


HE 235

	P		H		
	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]	0.05 x d	0.04 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]	1 x d	1 x d	1 x d	1 x d	1 x d
Vc [m / min]	30 - 110	30 - 92	30 - 76	28 - 63	18 - 42

d [mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
0.4	25000	110	25000	104	25000	90	22500	76	15000	44
0.5	25000	138	25000	130	25000	112	22500	94	15000	54
0.6	25000	166	25000	156	25000	136	22500	114	15000	64
0.8	25000	222	24100	202	21700	156	19300	130	12738	74
1.0	25000	276	21500	224	19400	174	17200	144	11352	82
1.5	19000	314	15800	248	13100	176	11500	144	7590	82
2.0	17400	384	14500	302	12100	218	10000	168	6600	96

Hard-cut — Slotting / Finishing (HSC)



Ap = 0.02 x d [mm]
Ae = 1 x d [mm]

HE 235, HE 445
HELS 435 (#1)

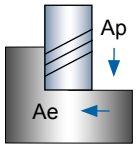
		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc 24 - 35	135 - 175	0.007	0.014	0.021	0.029	0.046	0.055	0.072	0.086	0.114
	HRc > 35	110 - 150	0.006	0.013	0.019	0.026	0.042	0.049	0.065	0.077	0.102
H	HRc < 52	100 - 130	0.006	0.012	0.017	0.024	0.038	0.045	0.059	0.070	0.093
	HRc 52 - 55	80 - 105	0.005	0.010	0.015	0.021	0.033	0.039	0.051	0.060	0.080
	HRc 56 - 60	55 - 75	0.004	0.008	0.012	0.017	0.028	0.033	0.043	0.051	0.068
M	Stainless steels	70 - 90	0.006	0.012	0.018	0.025	0.040	0.047	0.062	0.073	0.097
K	Cast iron	100 - 150	0.007	0.015	0.022	0.032	0.050	0.060	0.078	0.093	0.123
N	Copper alloy	150 - 180	0.007	0.015	0.022	0.032	0.050	0.060	0.078	0.093	0.123
S	Titanium alloy	50 - 80	0.006	0.012	0.018	0.025	0.040	0.047	0.062	0.073	0.097
	High-temperature alloy	30 - 50	0.006	0.012	0.018	0.025	0.040	0.047	0.062	0.073	0.097

Notes

#1 For HELS 435, adjust feed (fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

- ► The maxinum spindle speed (n) for diameter 1.0 should be below 30000 rpm.
- ► These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
- ► Reduce both spindle speed and feed rate at same rate for chattering and also for insufficient spindle speed of a machine.

Hard-cut — Side milling / Pre-finishing (HSC)

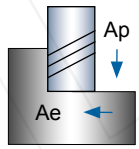


Ap = 1 x d [mm]
Ae = 0.1 x d [mm]

HE 235, HE 445
HELS 435 (#1)

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc 24 - 35	140 - 185	0.007	0.011	0.016	0.023	0.037	0.044	0.057	0.068	0.082
	HRc > 35	120 - 155	0.006	0.010	0.015	0.021	0.033	0.040	0.052	0.062	0.074
H	HRc < 52	105 - 135	0.006	0.008	0.013	0.019	0.030	0.036	0.047	0.056	0.067
	HRc 52 - 55	85 - 110	0.005	0.007	0.012	0.016	0.026	0.031	0.041	0.048	0.058
M	Stainless steels	85 - 110	0.006	0.009	0.014	0.020	0.032	0.038	0.049	0.059	0.071
K	Cast iron	150 - 195	0.007	0.012	0.018	0.025	0.040	0.048	0.062	0.074	0.089
N	Copper alloy	190 - 250	0.007	0.012	0.018	0.025	0.040	0.048	0.062	0.074	0.089
S	Titanium alloy	70 - 90	0.006	0.009	0.014	0.020	0.032	0.038	0.049	0.059	0.071
	High-temperature alloy	30 - 50	0.006	0.009	0.014	0.020	0.032	0.038	0.049	0.059	0.071

Hard-cut — Side milling / Finishing (HSC)



Ap = 1 x d [mm]
Ae = 0.02 x d [mm]

HE 235, HE 445
HELS 435 (#1)

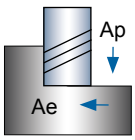
		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc 24 - 35	190 - 250	0.008	0.016	0.025	0.035	0.055	0.066	0.086	0.103	0.123
	HRc > 35	165 - 215	0.007	0.015	0.022	0.031	0.050	0.059	0.078	0.093	0.111
H	HRc < 52	145 - 190	0.006	0.013	0.020	0.028	0.045	0.054	0.070	0.084	0.100
	HRc 52 - 55	120 - 155	0.006	0.011	0.017	0.025	0.039	0.046	0.061	0.073	0.087
	HRc 56 - 60	80 - 110	0.005	0.010	0.015	0.021	0.033	0.039	0.052	0.061	0.074
M	Stainless steels	100 - 130	0.007	0.014	0.021	0.030	0.048	0.056	0.074	0.088	0.106
K	Cast iron	200 - 260	0.009	0.018	0.027	0.038	0.060	0.071	0.094	0.112	0.134
N	Copper alloy	250 - 320	0.009	0.018	0.027	0.038	0.060	0.071	0.094	0.112	0.134
S	Titanium alloy	90 - 110	0.007	0.014	0.021	0.030	0.048	0.056	0.074	0.088	0.106
	High-temperature alloy	30 - 60	0.007	0.014	0.021	0.030	0.048	0.056	0.074	0.088	0.106

Notes

#1 For HELS 435, adjust feed (fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

- ► The maxinum spindle speed (n) for diameter 1.0 should be below 30000 rpm.
- ► These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
- ► Reduce both spindle speed and feed rate at same rate for chattering and also for insufficient spindle speed of a machine.

Hard-cut | **Side milling**



HELN 235 (#1), HELN 435 (#1 and #2)

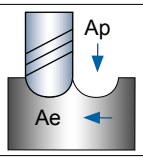
	P	H		N
	HRc > 35	HRc < 56	HRc 56 - 60	Copper alloy
Ae [mm]	0.6 x d	0.5 x d	0.4 x d	0.8 x d

Diameter d [mm]	Effective length N [mm]	P Spindle speed n [min^{-1}]	P Feed rate Vf [mm/min]	P Radial depth Ap [mm]	H HRc < 56 Spindle speed n [min^{-1}]	H HRc < 56 Feed rate Vf [mm/min]	H HRc < 56 Radial depth Ap [mm]	H HRc 56 - 60 Spindle speed n [min^{-1}]	H HRc 56 - 60 Feed rate Vf [mm/min]	H HRc 56 - 60 Radial depth Ap [mm]	N Spindle speed n [min^{-1}]	N Feed rate Vf [mm/min]	N Radial depth Ap [mm]
0.5	2	30000	520	0.021	25000	420	0.014	16800	250	0.011	30000	600	0.035
	4	25000	380	0.012	25000	280	0.008	16800	160	0.006	26000	500	0.020
	6	22000	190	0.008	22000	170	0.005	14700	90	0.004	24000	200	0.013
0.6	4	25000	420	0.014	25000	350	0.010	16800	170	0.007	30000	600	0.024
	6	20000	200	0.009	20000	160	0.006	13400	80	0.005	26700	300	0.015
0.8	4	25000	800	0.034	25000	700	0.022	16800	400	0.017	30000	1100	0.056
	6	20000	620	0.019	20000	550	0.013	13400	300	0.010	26700	1000	0.032
	8	16000	500	0.012	16000	400	0.008	10700	200	0.006	21300	800	0.020
1.0	4	25000	1000	0.042	23000	900	0.028	15400	540	0.021	30000	1400	0.070
	6	20000	800	0.024	18000	700	0.016	12100	400	0.012	26700	1300	0.040
	8	18000	700	0.024	16000	600	0.016	10700	340	0.012	24000	1100	0.040
	10	16000	500	0.015	14000	500	0.010	9400	270	0.008	21300	800	0.025
	12	14200	390	0.012	12000	320	0.008	8000	170	0.006	18900	600	0.025
1.5	6	23000	1000	0.066	20000	800	0.044	13400	470	0.033	30000	1600	0.110
	8	20000	800	0.048	18000	600	0.032	12100	400	0.024	26700	1300	0.060
	12	16000	600	0.036	14000	450	0.024	9400	290	0.018	21300	900	0.060
	16	14000	420	0.022	12000	320	0.014	8200	200	0.011	18600	630	0.036
2.0	8	18000	900	0.084	16000	800	0.056	10700	400	0.042	24000	1400	0.140
	10	16000	800	0.072	14000	700	0.048	9400	340	0.036	21300	1200	0.140
	12	14000	700	0.048	12000	600	0.032	8000	340	0.024	18700	1100	0.080
	16	12000	600	0.036	10000	500	0.024	6700	270	0.018	16000	900	0.080
3.0	12	14000	900	0.126	12000	800	0.084	8000	470	0.063	18700	1400	0.210
	16	12000	800	0.072	10000	700	0.048	6700	400	0.036	16000	1200	0.120
	20	10000	800	0.072	9000	700	0.048	6000	400	0.036	13300	1300	0.120
	25	9000	700	0.060	8200	600	0.040	5500	340	0.030	12000	1100	0.080
4.0	12	12000	1000	0.240	9500	1000	0.160	6400	540	0.120	16000	1600	0.400
	16	10000	1000	0.168	8000	900	0.112	5400	470	0.084	13300	1600	0.280
	20	8500	900	0.132	7000	800	0.088	4700	400	0.066	11300	1400	0.280
	25	8000	800	0.096	6000	700	0.064	4000	400	0.048	10700	1300	0.160

Notes

#1 For slotting, adjust feed rate(Vf) and radial depth (Ap) 50% lower.
#2 For HELN 435, adjust feed rate(Vf) 60% higher for side milling.
► These cutting conditions should be adjusted according to milling shape and machine type.
► Recommend to apply herical or ramping for approaching into axial direction.
► Adjust feed rate Vf 50% lower and cutting depth Ap 30% lower for milling deep wall area.

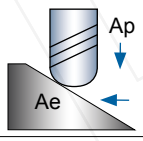
Hard-cut — Contour line / Roughing (HSC)



HB 235

	H											
	HRc < 52				HRc 52 - 55				HRc 56 - 60			
R [mm]	n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]	n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]	n [min^{-1}]	Vf [mm/min]	Ap [mm]	Ae [mm]
R0.5	28000	1898	0.050	0.18	24600	1534	0.045	0.17	19700	975	0.036	0.15
R0.75	21000	1963	0.075	0.27	18500	1586	0.068	0.26	14800	1040	0.054	0.23
R1.0	17600	2197	0.120	0.39	15500	1768	0.100	0.36	12400	1157	0.072	0.30
R1.5	23400	2798	0.210	0.45	17700	2025	0.165	0.56	13100	1329	0.108	0.45
R2.0	17500	2821	0.280	0.85	13300	2005	0.240	0.78	11100	1500	0.144	0.60
R2.5	15900	3102	0.350	1.06	12100	2202	0.300	0.98	8900	1388	0.180	0.76
R3.0	13300	3250	0.420	1.27	10100	2311	0.360	1.18	7400	1443	0.216	0.91
R4.0	10000	2938	0.560	1.69	7600	2075	0.480	1.57	5600	1310	0.288	1.21
R5.0	8000	2662	0.700	2.12	6100	1888	0.600	1.96	4500	1193	0.360	1.52
R6.0	6600	2506	0.840	2.54	5000	1781	0.720	2.35	3700	1126	0.432	1.82

Hard-cut — Copy milling / Pre-Finishing (HSC)



HB 235, HB 435 (#1), HBLS 235 (#2), HBLS 435 (#3)

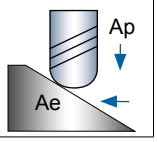
	P		H		
	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]	0.10 x d	0.10 x d	0.08 x d	0.06 x d	0.05 x d
Ae [mm]	0.10 x d	0.10 x d	0.08 x d	0.06 x d	0.05 x d
Vc [m / min]	94 - 210	94 - 180	80 - 150	60 - 110	50 - 80

	P				H					
	HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
R [mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
R0.5	30000	960	30000	840	25400	650	19100	460	15900	360
R0.75	30000	1440	25700	1080	21400	850	15700	560	11400	380
R1.0	26400	1690	22600	1260	18800	990	13800	660	10000	450
R1.5	22300	2140	19100	1610	15900	1260	11700	870	8500	570
R2.0	16700	2610	14300	1990	11900	1570	8800	1100	6400	710
R2.5	13400	2350	11500	1770	9600	1410	7000	970	5100	620
R3.0	11100	2100	9600	1610	8000	1270	5800	880	4200	560
R4.0	8400	1860	7200	1400	6000	1110	4400	770	3200	500
R5.0	6700	1620	5700	1220	4800	980	3500	670	2500	430
R6.0	5600	1600	4800	1200	4000	950	2900	660	2100	420

Notes

#1 For HB435, adjust feed rate (Vf) 60% higher .
#2 For HBLS235, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
#3 For HBLS435, adjust feed rate (Vf) 60% higher then adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Hard-cut | **Copy milling / Finishing (HSC)**



HB 235, HB 435 (#1), HBLS 235 (#2), HBLS 435 (#3)

	P				H					
	HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
Ap [mm]	0.02 x d		0.02 x d		0.02 x d		0.02 x d		0.02 x d	
Ae [mm]	0.015 x d		0.015 x d		0.015 x d		0.015 x d		0.015 x d	
Vc [m / min]	94 - 315		94 - 280		94 - 220		84 - 180		56 - 120	
R [mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
R0.2	30000	360	30000	360	30000	360	30000	360	30000	360
R0.25	30000	450	30000	450	30000	450	30000	450	30000	450
R0.3	30000	540	30000	540	30000	540	30000	540	30000	540
R0.4	30000	720	30000	720	30000	720	27800	670	21800	520
R0.5	30000	900	30000	900	30000	900	26700	801	17800	534
R0.75	30000	1350	30000	1350	30000	1350	25600	1152	17000	765
R1.0	30000	1800	30000	1800	27400	1644	22400	1344	14900	894
R1.5	30000	2700	29700	2673	23400	2106	19100	1719	12700	1143
R2.0	24700	2964	22300	2676	17500	2100	14300	1716	9600	1152
R2.5	19700	2955	17800	2670	14000	2100	11500	1725	7600	1140
R3.0	16500	2970	14900	2682	11700	2106	9600	1728	6400	1152
R4.0	12300	2952	11100	2664	8800	2112	7200	1728	4800	1152
R5.0	9900	2970	8900	2670	7000	2100	5700	1710	3800	1140
R6.0	8200	2952	7400	2664	5800	2088	4800	1728	3200	1152

Notes

#1 For HB435, adjust feed rate (Vf) 60% higher .

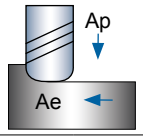
#2 For HBLS235, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

#3 For HBLS435, adjust feed rate (Vf) 60% higher then adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

► These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.

► Reduce both spindle speed and feed rate at same rate for chattering and also for insufficient spindle speed of a machine.

Hard-cut — Contour line / Roughing (HSC)

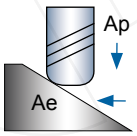


HR 230

	P		H		
	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]	0.05 x d	0.04 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]	0.20 x d	0.20 x d	0.20 x d	0.20 x d	0.20 x d
Vc [m / min]	94 - 190	85 - 150	68 - 120	60 - 102	48 - 78

d	R	P				H					
		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
[mm]	[mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
1	0.2	30000	882	27100	790	21600	490	19100	410	15200	270
1.5	0.2	25800	1270	20400	890	16300	550	14300	460	11400	310
2	0.2,0.5	21600	1410	17000	990	13700	620	12000	510	9600	340
3	0.2,0.5	20200	1980	15900	1400	12700	864	10800	692	8300	448
4	0.2,0.5	15100	1662	11900	1190	9600	748	8100	584	6200	372
5	0.5,1.0	12100	1476	9600	1056	7600	654	6500	520	5000	330
6	0.5,1.0	10100	1516	8000	1072	6400	678	5400	530	4100	336
8	0.5,1.0	7600	1338	6000	960	4800	596	4100	476	3100	298
10	0.5,1.0	6100	1330	4800	950	3800	586	3200	454	2500	300
12	0.5,1.0	5000	1210	4000	880	3200	550	2700	426	2100	278

Hard-cut — Inclined surface milling / Finishing (HSC)

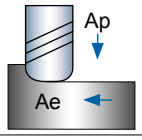


HR 230

	P		H		
	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]	0.03 x d	0.03 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.03 x d
Vc [m / min]	94 - 243	94 - 223	73 - 176	65 - 142	42 - 72

d	R	P				H					
		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
[mm]	[mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
1	0.2	30000	825	30000	750	23400	527	20600	432	13500	243
1.5	0.2	30000	1238	30000	1125	23400	790	20600	649	13500	365
2	0.2,0.5	30000	1650	30000	1500	23400	1054	20600	865	12500	450
3	0.2,0.5	25800	2172	23700	1756	18700	1267	15100	948	10100	544
4	0.2,0.5	19900	2186	17800	1780	14000	1262	11300	946	7600	545
5	0.5,1.0	15900	2100	14300	1713	11300	1216	9000	903	6000	518
6	0.5,1.0	13200	2145	11900	1732	9400	1237	7600	939	5000	528
8	0.5,1.0	9900	2136	8900	1735	7100	1242	5700	931	3800	530
10	0.5,1.0	7900	2105	7100	1713	5600	1219	4600	931	3000	525
12	0.5,1.0	6600	2133	5900	1722	4600	1216	3800	931	2500	525

Hard-cut — Contour line / Roughing (HSC)

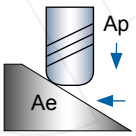


HR 430, HRLS 430 (#1)

	P		H		
	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]	0.05 x d	0.04 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]	0.20 x d	0.20 x d	0.20 x d	0.20 x d	0.20 x d
Vc [m / min]	94 - 190	85 - 150	68 - 120	60 - 102	48 - 78

d	R	P HRc 24 - 35		P HRc > 35		H HRc < 52		H HRc 52 - 55		H HRc 56 - 60	
[mm]	[mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
1	0.2	30000	1410	27100	1330	21600	820	19100	690	15200	450
1.5	0.2	25800	2130	20400	1490	16300	930	14300	770	11400	530
2	0.2,0.5	21600	2370	17000	1660	13700	1040	12000	860	9600	580
3	0.2,0.5	20200	3170	15900	2240	12700	1380	10800	1110	8300	720
4	0.2,0.5	15100	2660	11900	1900	9600	1200	8100	930	6200	600
5	0.5,1.0	12100	2360	9600	1690	7600	1050	6500	830	5000	530
6	0.5,1.0	10100	2430	8000	1720	6400	1080	5400	850	4100	540
8	0.5,1.0	7600	2140	6000	1540	4800	950	4100	760	3100	480
10	0.5,1.0	6100	2130	4800	1520	3800	940	3200	730	2500	480
12	0.5,1.0	5000	1940	4000	1410	3200	880	2700	680	2100	440

Hard-cut — Inclined surface milling / Finishing (HSC)



HR 430, HRLS 430 (#1)

	P		H		
	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]	0.03 x d	0.03 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.03 x d
Vc [m / min]	94 - 243	94 - 223	73 - 176	65 - 142	42 - 72

d	R	P HRc 24 - 35		P HRc > 35		H HRc < 52		H HRc 52 - 55		H HRc 56 - 60	
[mm]	[mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
1	0.2	30000	1320	30000	1200	23400	843	20600	691	13500	389
1.5	0.2	30000	1981	30000	1800	23400	1264	20600	1038	13500	584
2	0.2,0.5	30000	2640	30000	2400	23400	1686	20600	1384	12500	720
3	0.2,0.5	25800	4042	23700	3267	18700	2357	15100	1763	10100	1011
4	0.2,0.5	19900	4067	17800	3312	14000	2349	11300	1760	7600	1014
5	0.5,1.0	15900	3907	14300	3187	11300	2262	9000	1680	6000	963
6	0.5,1.0	13200	3990	11900	3222	9400	2301	7600	1747	5000	982
8	0.5,1.0	9900	3974	8900	3229	7100	2310	5700	1731	3800	986
10	0.5,1.0	7900	3917	7100	3187	5600	2269	4600	1731	3000	976
12	0.5,1.0	6600	3968	5900	3203	4600	2262	3800	1731	2500	976

Notes	
	#1: For HRLS 430, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Wide-cut

High-performance end mills for HSC / HPC of steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc.

Hochleistungs-Schaftfräser für die HSC / HPC von Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc.

47 - 76

								
Tool code		**WE 235**	**WE 435**	**WE 345**	**WE 445**	**WE 645**	**WELS 235**	**WELS 435**
Number of teeth		Z=2	Z=4	Z=3	Z=4	Z=6	Z=2	Z=4
Page		52	52	53	53	54	55	55
		VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30
		Al-X Coating	Al-X Coating	Al-X Coating	Al-X Coating	Al-X Coating	Al-X Coating	Al-X Coating
		HRc 60	HRc 60	HRc 60	HRc 60	HRc 60	HRc 60	HRc 60
		35°	35°	45°	45°	45°	35°	35°
		90°	90°	90°	90°	90°	90°	90°
		HSC	HSC	HSC	HSC	HSC	HSC	HSC
P	HRc < 24	◎	◎	◎	◎	◎	◎	◎
P	HRc 24 - 35	◎	◎	◎	◎	◎	◎	◎
P	HRc > 35	◎	◎	◎	◎	◎	◎	◎
H	HRc 45 - 55	◎	◎	◎	◎	◎	◎	◎
H	HRc 56 - 60	○	○	○	○	○	○	○
H	HRc > 60							
M	Stainless steel	◎	◎	◎	◎	◎	◎	◎
K	Cast iron	◎	◎	◎	◎	◎	◎	◎
N	Copper alloy	○	○	○	○	○	○	○
S	Titanium alloy	◎	◎	◎	◎	◎	◎	◎
S	High-temperature alloy	○	○	○	○	○	○	○

								
Tool code		**WELN 235**	**WE 335 RC**	**WE 435 RC**	**WE 435 RF**	**WE 43X**	**WE 44X**	**WB 235**
Number of teeth		Z=2	Z=3	Z=4	Z=4	Z=4	Z=4	Z=2
Page		56	57	57	58	59	60	61
		VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30
		New AlCrN Coating	Al-X Coating	Al-X Coating	Al-X Coating	New AlCrN Coating	New AlCrN Coating	Al-X Coating
		HRc 55	HRc 60	HRc 60	HRc 60	HRc 55	HRc 55	HRc 60
		35°	35°	35°	35°	35°/38°	42°/45°	35°
		90°	90°	90°	90°	90°	90°	
		HSC	HSC	HSC	HPC	HPC	HPC	HSC
P	HRc < 24	◎	◎	◎	◎	◎	◎	◎
	HRc 24 - 35	◎	◎	◎	◎	◎	◎	◎
	HRc > 35	◎	◎	◎	◎	◎	◎	◎
H	HRc 45 - 55	◎	◎	◎	◎	◎	◎	◎
	HRc 56 - 60		○	○	○			○
	HRc > 60							
M	Stainless steel	◎	◎	◎	◎	◎	◎	◎
K	Cast iron	◎	◎	◎	◎	◎	◎	◎
N	Copper alloy	○	○	○	○	○	○	○
S	Titanium alloy	◎	◎	◎	◎	◎	◎	◎
	High-temperature alloy	○	○	○	○	○	○	○

								
Tool code		WB 435	WBLS 235	WBLS 435	WBLN 235	WBTN 2351	WBTN 2352	WR 230
Number of teeth		Z=4	Z=2	Z=4	Z=2	Z=2	Z=2	Z=2
Page		61	62	62	63	64	65	66
		VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30
		Al-X Coating	Al-X Coating	Al-X Coating	New AlCrN Coating	Al-X Coating	Al-X Coating	Al-X Coating
		HRc 60	HRc 60	HRc 60	HRc 55	HRc 60	HRc 60	HRc 60
		35°	35°	35°	35°	35°	35°	30°
								R
P	HRc < 24	◎	◎	◎	◎	◎	◎	◎
P	HRc 24 - 35	◎	◎	◎	◎	◎	◎	◎
P	HRc > 35	◎	◎	◎	◎	◎	◎	◎
H	HRc 45 - 55	◎	◎	◎	◎	◎	◎	◎
H	HRc 56 - 60	○	○	○				○
H	HRc > 60							
M	Stainless steel	◎	◎	◎	◎	◎	◎	◎
K	Cast iron	◎	◎	◎	◎	◎	◎	◎
N	Copper alloy	○	○	○	○	○	○	○
S	Titanium alloy	◎	◎	◎	◎	◎	◎	◎
S	High-temperature alloy	○	○	○	○	○	○	○

								
Tool code		WR 430	WRLS 230	WRLS 430	WRLN 230			
Number of teeth		Z=4	Z=2	Z=4	Z=2			
Page		66	67	67	68			
		VHM K10-K30	VHM K10-K30	VHM K10-K30	VHM K10-K30			
		Al-X Coating	Al-X Coating	Al-X Coating	New AlCrN Coating			
		HRc 60	HRc 60	HRc 60	HRc 55			
		30°	30°	30°	30°			
		R	R	R	R			
		HSC	HSC	HSC	HSC			
P	HRc < 24	◎	◎	◎	◎			
P	HRc 24 - 35	◎	◎	◎	◎			
P	HRc > 35	◎	◎	◎	◎			
H	HRc 45 - 55	◎	◎	◎	◎			
H	HRc 56 - 60	○	○	○				
H	HRc > 60							
M	Stainless steel	◎	◎	◎	◎			
K	Cast iron	◎	◎	◎	◎			
N	Copper alloy	○	○	○	○			
S	Titanium alloy	◎	◎	◎	◎			
S	High-temperature alloy	○	○	○	○			

VHM K10-K30	35°	HSC
Al-X Coating	90°	
HRc 60		

End mills

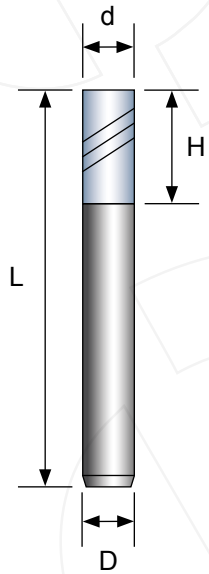
For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Schaftfräser

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P69 - P71



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

Example: Order code WE 235 002-00404

d-Code	d x H x D	L	WE 235 Z=2	WE 435 Z=4
002-00404	0.2 x 0.4 x C 4	50	◇	
003-00604	0.3 x 0.6 x C 4	50	◇	
004-00804	0.4 x 0.8 x C 4	50	◇	
005-01004	0.5 x 1.0 x C 4	50	●	
006-01204	0.6 x 1.2 x C 4	50	●	
007-01404	0.7 x 1.4 x C 4	50	◇	
008-01604	0.8 x 1.6 x C 4	50	●	
009-01804	0.9 x 1.8 x C 4	50	◇	
010-03003	1.0 x 3.0 x C 3	50	◇	◇
010-03004	1.0 x 3.0 x C 4	50	●	●
015-04003	1.5 x 4.0 x C 3	50	◇	◇
015-04004	1.5 x 4.0 x C 4	50	●	●
020-06003	2.0 x 6.0 x C 3	50	◇	◇
020-06004	2.0 x 6.0 x C 4	50	●	●
025-07003	2.5 x 7.0 x C 3	50	◇	◇
025-07004	2.5 x 7.0 x C 4	50	●	●
030-08003	3.0 x 8.0 x C 3	50	◇	◇
030-08004	3.0 x 8.0 x C 4	50	●	●
030-08006	3.0 x 8.0 x C 6	50	◇	◇
040-11004	4.0 x 11.0 x C 4	50	●	●
040-11006	4.0 x 11.0 x C 6	50	◇	◇
050-13006	5.0 x 13.0 x C 6	50	●	●
060-15006	6.0 x 15.0 x C 6	50	●	●
080-20008	8.0 x 20.0 x C 8	60	●	●
100-25010	10.0 x 25.0 x C10	75	●	●
120-30012	12.0 x 30.0 x C12	75	●	●
140-35016	14.0 x 35.0 x C16	100	◇	◇
160-40016	16.0 x 40.0 x C16	100	◇	●
200-40020	20.0 x 40.0 x C20	100	◇	◇

Long cut length / Lange schneidkantenlänge

030-15004	3.0 x 15.0 x C 4	75	◇	◇
040-20004	4.0 x 20.0 x C 4	75	◇	◇
060-25006	6.0 x 25.0 x C 6	75	◇	●
080-30008	8.0 x 30.0 x C 8	75	◇	●
100-40010	10.0 x 40.0 x C10	100	◇	●
120-45012	12.0 x 45.0 x C12	100	◇	●

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	45°	HSC
Al-X Coating	90°	
HRc 60		

End mills

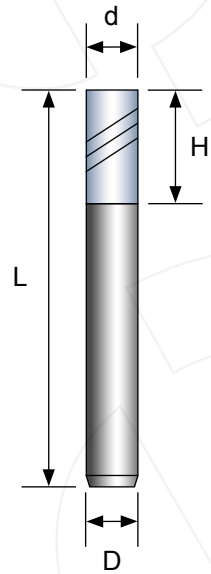
For steels, stainless steels, titanium alloy, tempered steels and hardened steels up to 60 HRc

Schaftfräser

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P69 - P71



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

Example: Order code WE 345 010-03004

d-Code	d x H x D	L	WE 345 Z=3	WE 445 Z=4
010-03004	1.0 x 3.0 x C 4	50	◇	●
015-04004	1.5 x 4.0 x C 4	50	◇	●
020-06004	2.0 x 6.0 x C 4	50	◇	●
025-07004	2.5 x 7.0 x C 4	50	◇	◇
030-08004	3.0 x 8.0 x C 4	50	◇	◇
030-08006	3.0 x 8.0 x C 6	50	●	●
040-11004	4.0 x 11.0 x C 4	50	◇	◇
040-11006	4.0 x 11.0 x C 6	50	●	●
050-13006	5.0 x 13.0 x C 6	50	●	●
060-15006	6.0 x 15.0 x C 6	50	●	●
070-17008	7.0 x 17.0 x C 8	60	◇	◇
080-20008	8.0 x 20.0 x C 8	60	●	●
090-23010	9.0 x 23.0 x C10	75	◇	◇
100-25010	10.0 x 25.0 x C10	75	●	●
120-30012	12.0 x 30.0 x C12	75	●	●
140-35016	14.0 x 35.0 x C16	100	◇	◇
160-40016	16.0 x 40.0 x C16	100	◇	●
180-40020	18.0 x 40.0 x C20	100	◇	◇
200-40020	20.0 x 40.0 x C20	100	◇	●

Long cut length / Lange schneidkantenlänge

030-12006	3.0 x 12.0 x C 6	60		◇
040-16006	4.0 x 16.0 x C 6	60		◇
050-20006	5.0 x 20.0 x C 6	60		◇
060-24006	6.0 x 24.0 x C 6	75		●
080-30008	8.0 x 30.0 x C 8	75		●
100-40010	10.0 x 40.0 x C10	100		●
120-45012	12.0 x 45.0 x C12	100		●
160-64016	16.0 x 64.0 x C16	150		◇
200-72020	20.0 x 72.0 x C20	150		◇

DNKO

VHM K10-K30	45°	HSC
Al-X Coating	90°	
HRc 60		

Finishing end mills

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Schlichten Schaftfräser

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

Example: Order code WE 645 060-15006

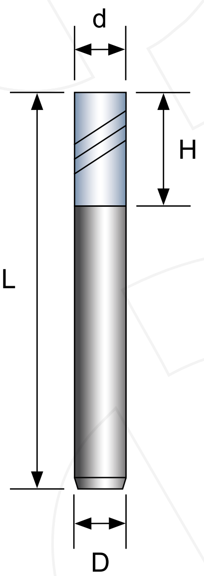
d-Code	d x H x D	L	WE 645 Z=6	
060-15006	6.0 x 15.0 x C 6	50	●	
080-20008	8.0 x 20.0 x C 8	60	●	
100-25010	10.0 x 25.0 x C10	75	●	
120-30012	12.0 x 30.0 x C12	75	●	
160-40016	16.0 x 40.0 x C16	100	●	
200-40020	20.0 x 40.0 x C20	100	◇	

Long cut length / Lange schneidkantenlänge

d-Code	d x H x D	L	WE 645 Z=6	
060-24006	6.0 x 24.0 x C 6	75	◇	
080-30008	8.0 x 30.0 x C 8	75	◇	
100-40010	10.0 x 40.0 x C10	100	◇	
120-45012	12.0 x 45.0 x C12	100	◇	
160-64016	16.0 x 64.0 x C16	150	◇	
200-72020	20.0 x 72.0 x C20	150	◇	

P	HRc < 24	◎
P	HRc 24 - 35	◎
P	HRc > 35	◎
H	HRc 45 - 55	◎
H	HRc 56 - 60	○
H	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
S	High-temperature alloy	○

Cutting data, P70 - P71



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	35°	HSC
Al-X Coating	90°	
HRc 60		

End mills, long shank

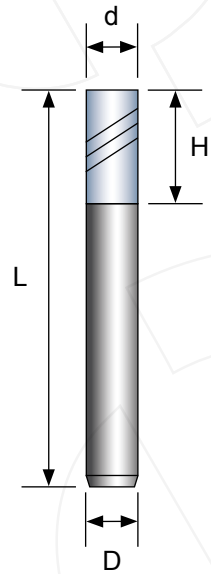
For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Schaftfräser, langer schaft

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P70 - P71



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Example: Order code WELS 235 020-05104

d-Code	d x L x D	H	WELS 235 Z=2	WELS 435 Z=4
020-05104	2.0 x L 75 x C 4	5.0	◇	◇
030-08104	3.0 x L 75 x C 4	8.0	◇	◇
030-08306	3.0 x L100 x C 6	8.0	◇	◇
040-11104	4.0 x L 75 x C 4	11.0	◇	●
040-11306	4.0 x L100 x C 6	11.0	◇	◇
050-13106	5.0 x L 75 x C 6	13.0	◇	◇
050-13306	5.0 x L100 x C 6	13.0	◇	◇
060-15106	6.0 x L 75 x C 6	15.0	◇	●
060-15306	6.0 x L100 x C 6	15.0	◇	●
080-20108	8.0 x L 75 x C 8	20.0	◇	●
080-20308	8.0 x L100 x C 8	20.0	◇	●
080-20508	8.0 x L150 x C 8	20.0	◇	●
100-25310	10.0 x L100 x C10	25.0	◇	●
100-25510	10.0 x L150 x C10	25.0	◇	●
120-30312	12.0 x L100 x C12	30.0	◇	●
120-30512	12.0 x L150 x C12	30.0	◇	●

VHM
K10-K30

35°

HSC

New
AlCrN
Coating

90°

HRc
55

End mills, long neck

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 55 HRc

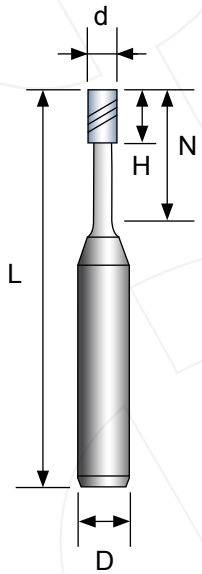
Schaftfräser, überlaufhals

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 55 HRc

Example: Order code WELN 235 005-02004

d-Code	d x N x D	H	L	WELN 235 Z=2		
005-02004	0.5 x N 2 x C 4	0.7	50	●		
005-04004	0.5 x N 4 x C 4	0.7	50	●		
005-06004	0.5 x N 6 x C 4	0.7	50	●		
006-04004	0.6 x N 4 x C 4	0.9	50	●		
006-06004	0.6 x N 6 x C 4	0.9	50	●		
008-04004	0.8 x N 4 x C 4	1.2	50	●		
008-06004	0.8 x N 6 x C 4	1.2	50	●		
008-08004	0.8 x N 8 x C 4	1.2	50	●		
010-06004	1.0 x N 6 x C 4	1.5	50	●		
010-08004	1.0 x N 8 x C 4	1.5	50	●		
010-10004	1.0 x N 10 x C 4	1.5	50	●		
010-12004	1.0 x N 12 x C 4	1.5	50	●		
015-06004	1.5 x N 6 x C 4	2.3	50	●		
015-08004	1.5 x N 8 x C 4	2.3	50	●		
015-12004	1.5 x N 12 x C 4	2.3	50	●		
015-16004	1.5 x N 16 x C 4	2.3	60	●		
020-08004	2.0 x N 8 x C 4	3.0	50	●		
020-12004	2.0 x N 12 x C 4	3.0	50	●		
020-16004	2.0 x N 16 x C 4	3.0	60	●		
020-20004	2.0 x N 20 x C 4	3.0	60	●		
030-16006	3.0 x N 16 x C 6	4.5	60	●		
030-20006	3.0 x N 20 x C 6	4.5	60	◇		
030-25006	3.0 x N 25 x C 6	4.5	60	◇		
040-16006	4.0 x N 16 x C 6	6.0	60	◇		
040-20006	4.0 x N 20 x C 6	6.0	60	●		
040-30006	4.0 x N 30 x C 6	6.0	75	◇		

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02

Wide-cut

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	35°	HSC
Al-X Coating	90°	
HRc 60		

Roughing end mills

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

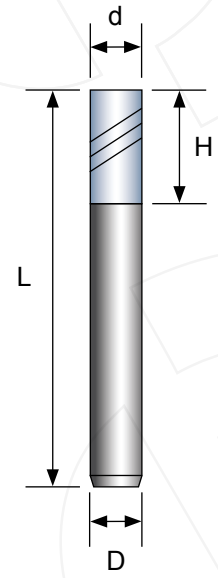
Schruppen Schaftfräser

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

Example: Order code WE 335 RC 060-15006

				WE 335 RC	WE 435 RC
d-Code	d x	H x	D	L	Z=3	Z=4
060-15006	6.0 x 15.0 x C 6			50	●	●
080-20008	8.0 x 20.0 x C 8			60	●	●
100-25010	10.0 x 25.0 x C10			75	●	●
120-30012	12.0 x 30.0 x C12			75	●	●
160-40016	16.0 x 40.0 x C16			100	◇	◇
200-40020	20.0 x 40.0 x C20			100	◇	◇

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

VHM K10-K30	35°	HPC
Al-X Coating	90°	
HRc 60		

Roughing & Finishing end mills

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

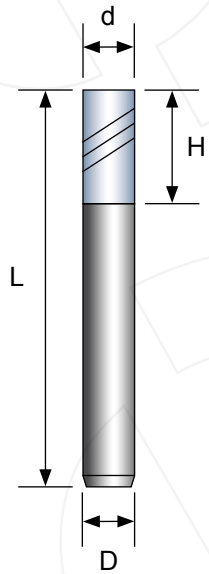
Schruppen & Schlichten Schaftfräser

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

Example: Order code WE 435 RF 060-15006

d-Code	d x H x D	L	WE 435 RF Z=4
060-15006	6.0 x 15.0 x C 6	50	●
070-17008	7.0 x 17.0 x C 8	60	◇
080-20008	8.0 x 20.0 x C 8	60	●
090-23010	9.0 x 23.0 x C10	75	◇
100-25010	10.0 x 25.0 x C10	75	●
110-28012	11.0 x 28.0 x C12	75	◇
120-30012	12.0 x 30.0 x C12	75	●
160-40016	16.0 x 40.0 x C16	100	◇
200-40020	20.0 x 40.0 x C20	100	◇

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	35°/ 38°	HPC
New AlCrN Coating	90°	
HRc 55		

End mills, unequial helix (35° - 38°) and division

For steels, stainless steels, titanium alloy, tempered steels and hardened steels up to 55 HRc

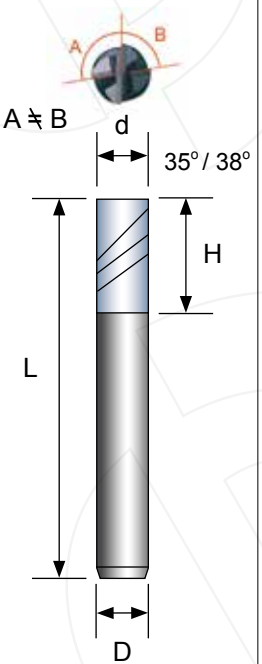
Schaftfräser, ungleicher Drallwinkel und ungleiche Teilung

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 55 HRc

		WE 43X
		Z=4

Example: Order code WE 43X 030-06006

P	HRc < 24	◎	**d-Code**	d x H x D	L
	HRc 24 - 35	◎	**030-06006**	3.0 x 6.0 x C 6	50
	HRc > 35	◎	**040-08006**	4.0 x 8.0 x C 6	50
H	HRc 45 - 55	◎	**050-10006**	5.0 x 10.0 x C 6	50
	HRc 56 - 60		**060-12006**	6.0 x 12.0 x C 6	50
	HRc > 60		**080-16008**	8.0 x 16.0 x C 8	60
M	Stainless steel	◎	**100-20010**	10.0 x 20.0 x C10	75
K	Cast iron	◎	**120-24012**	12.0 x 24.0 x C12	75
N	Copper alloy	○	**160-32016**	16.0 x 32.0 x C16	100
S	Titanium alloy	◎	**200-40020**	20.0 x 40.0 x C20	100
	High-temperature alloy	○			



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

VHM K10-K30	42°/ 45°	HPC
New AlCrN Coating	90°	
HRc 55		

End mills, unequial helix (42° - 45°) and division

For steels, stainless steels, titanium alloy, tempered steels and hardened steels up to 55 HRc

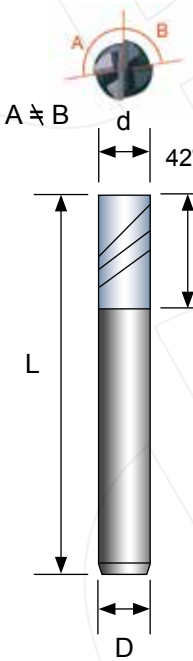
Schaftfräser, ungleicher Drallwinkel und ungleiche Teilung

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 55 HRc

Example: Order code WE 44X 030-06006

d-Code	d x H x D	L	WE 44X Z=4	
030-06006	3.0 x 6.0 x C 6	50	◇	
040-08006	4.0 x 8.0 x C 6	50	◇	
050-10006	5.0 x 10.0 x C 6	50	◇	
060-12006	6.0 x 12.0 x C 6	50	●	
080-16008	8.0 x 16.0 x C 8	60	●	
100-20010	10.0 x 20.0 x C10	75	●	
120-24012	12.0 x 24.0 x C12	75	●	
160-32016	16.0 x 32.0 x C16	100	●	
200-40020	20.0 x 40.0 x C20	100	◇	

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	35°	HSC
Al-X Coating		
HRC 60		

Ball nose end mills

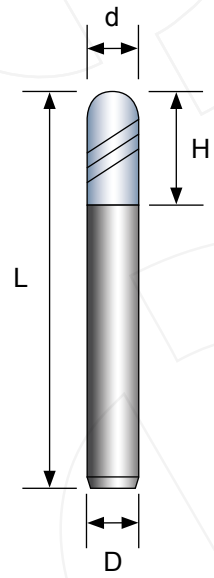
For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Kugelkopffräser

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P72 - P73



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Example: Order code WB 235 004-00804

d-Code	d x H x D	L	WB 235 Z=2	WB 435 Z=4
004-00804	R0.2 x 0.8 x C 4	50	●	
005-01004	R0.25 x 1.0 x C 4	50	●	
006-01204	R0.3 x 1.2 x C 4	50	●	
007-01404	R0.35 x 1.4 x C 4	50	◇	
008-01604	R0.4 x 1.6 x C 4	50	●	
010-02003	R0.5 x 2.0 x C 3	50	◇	
010-02004	R0.5 x 2.0 x C 4	50	●	
012-02404	R0.6 x 2.4 x C 4	50	◇	
014-02804	R0.7 x 2.8 x C 4	50	◇	
015-03003	R0.75 x 3.0 x C 3	50	◇	
015-03004	R0.75 x 3.0 x C 4	50	●	
016-03204	R0.8 x 3.2 x C 4	50	◇	
020-04003	R1.0 x 4.0 x C 3	50	◇	
020-04004	R1.0 x 4.0 x C 4	50	●	◇
020-04006	R1.0 x 4.0 x C 6	50	●	
025-05004	R1.25 x 5.0 x C 4	50	◇	
030-06003	R1.5 x 6.0 x C 3	50	◇	
030-06004	R1.5 x 6.0 x C 4	50	●	◇
030-06006	R1.5 x 6.0 x C 6	50	●	◇
040-08004	R2.0 x 8.0 x C 4	50	●	◇
040-08006	R2.0 x 8.0 x C 6	50	●	◇
050-10006	R2.5 x 10.0 x C 6	50	●	◇
060-12006	R3.0 x 12.0 x C 6	50	●	●
070-14008	R3.5 x 14.0 x C 8	60	◇	
080-16008	R4.0 x 16.0 x C 8	60	●	●
100-20010	R5.0 x 20.0 x C10	75	●	●
120-24012	R6.0 x 24.0 x C12	75	●	●
160-30016	R8.0 x 30.0 x C16	100	◇	
200-30020	R10.0 x 30.0 x C20	100	◇	

VHM K10-K30	35°	HSC
Al-X Coating		
HRC 60		

Ball nose end mills, long shank

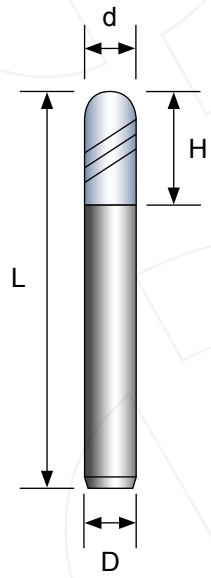
For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Kugelkopffräser, langer schaft

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P72 - P73



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Example: Order code WBLS 235 010-02104

d-Code	d x L x D	H	WBLS 235 Z=2	WBLS 435 Z=4
010-02104	R0.5 x L 75 x C 4	2.0	◇	
015-03104	R0.75 x L 75 x C 4	3.0	◇	
020-04104	R1.0 x L 75 x C 4	4.0	●	
020-04106	R1.0 x L 75 x C 6	4.0	◇	◇
020-04306	R1.0 x L100 x C 6	4.0	◇	◇
030-06104	R1.5 x L 75 x C 4	6.0	◇	
030-06106	R1.5 x L 75 x C 6	6.0	◇	◇
030-06306	R1.5 x L100 x C 6	6.0	●	◇
040-08104	R2.0 x L 75 x C 4	8.0	●	
040-08106	R2.0 x L 75 x C 6	8.0	◇	◇
040-08306	R2.0 x L100 x C 6	8.0	●	◇
050-10106	R2.5 x L 75 x C 6	10.0	●	◇
050-10306	R2.5 x L100 x C 6	10.0	●	◇
060-12106	R3.0 x L 75 x C 6	12.0	●	●
060-12306	R3.0 x L100 x C 6	12.0	●	●
060-12506	R3.0 x L150 x C 6	12.0	●	
080-16108	R4.0 x L 75 x C 8	16.0	●	
080-16308	R4.0 x L100 x C 8	16.0	●	●
080-16508	R4.0 x L150 x C 8	16.0	●	
100-20310	R5.0 x L100 x C10	20.0	●	●
100-20510	R5.0 x L150 x C10	20.0	●	
100-20710	R5.0 x L200 x C10	20.0	◇	
120-24312	R6.0 x L100 x C12	24.0	●	●
120-24512	R6.0 x L150 x C12	24.0	●	
120-24712	R6.0 x L200 x C12	24.0	◇	
160-30516	R8.0 x L150 x C16	30.0	◇	
160-30716	R8.0 x L200 x C16	30.0	◇	
200-30520	R10.0 x L150 x C20	30.0	◇	
200-30720	R10.0 x L200 x C20	30.0	◇	

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	35°	HSC
New AlCrN Coating		
HRC 55		

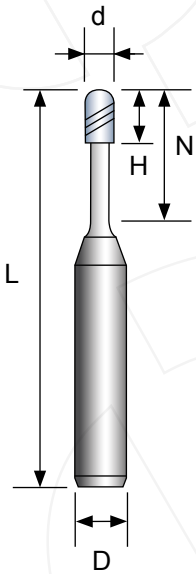
Ball nose end mills, long neck

For steels, stainless steels, titanium alloy, tempered steels and hardened steels up to 55 HRc

Kugelkopffräser, überlaufhals

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 55 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02

Example: Order code WBLN 235 004-02004

d-Code	d x N x D	H	L	WBLN 235 Z=2	
004-02004	R0.2 x N 2 x C 4	0.4	50	◇	
004-03004	R0.2 x N 3 x C 4	0.4	50	◇	
004-04004	R0.2 x N 4 x C 4	0.4	50	◇	
005-02004	R0.25 x N 2 x C 4	0.5	50	●	
005-04004	R0.25 x N 4 x C 4	0.5	50	●	
005-06004	R0.25 x N 6 x C 4	0.5	50	◇	
006-02004	R0.3 x N 2 x C 4	0.6	50	●	
006-04004	R0.3 x N 4 x C 4	0.6	50	●	
006-06004	R0.3 x N 6 x C 4	0.6	50	●	
008-04004	R0.4 x N 4 x C 4	0.8	50	●	
008-06004	R0.4 x N 6 x C 4	0.8	50	●	
008-08004	R0.4 x N 8 x C 4	0.8	50	●	
010-04004	R0.5 x N 4 x C 4	1.0	50	●	
010-06004	R0.5 x N 6 x C 4	1.0	50	●	
010-08004	R0.5 x N 8 x C 4	1.0	50	●	
010-10004	R0.5 x N 10 x C 4	1.0	50	●	
010-12004	R0.5 x N 12 x C 4	1.0	50	●	
015-06004	R0.75 x N 6 x C 4	1.5	50	●	
015-08004	R0.75 x N 8 x C 4	1.5	50	●	
015-12004	R0.75 x N 12 x C 4	1.5	50	●	
015-16004	R0.75 x N 16 x C 4	1.5	60	◇	
015-20004	R0.75 x N 20 x C 4	1.5	60	◇	
020-08004	R1.0 x N 8 x C 4	2.0	50	●	
020-10004	R1.0 x N 10 x C 4	2.0	50	●	
020-12004	R1.0 x N 12 x C 4	2.0	50	●	
020-16004	R1.0 x N 16 x C 4	2.0	60	●	
020-20004	R1.0 x N 20 x C 4	2.0	60	●	
020-25004	R1.0 x N 25 x C 4	2.0	60	●	
030-16006	R1.5 x N 16 x C 6	3.0	60	●	
030-20006	R1.5 x N 20 x C 6	3.0	60	●	
030-25006	R1.5 x N 25 x C 6	3.0	60	◇	
030-30006	R1.5 x N 30 x C 6	3.0	75	◇	
040-16006	R2.0 x N 16 x C 6	4.0	60	●	
040-20006	R2.0 x N 20 x C 6	4.0	60	●	
040-25006	R2.0 x N 25 x C 6	4.0	60	●	
040-30006	R2.0 x N 30 x C 6	4.0	75	●	

VHM K10-K30 | 35° | HSC

Al-X Coating

HRc 60

Ball nose end mills, pencil neck

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Kugelkopffräser, konischer schaft

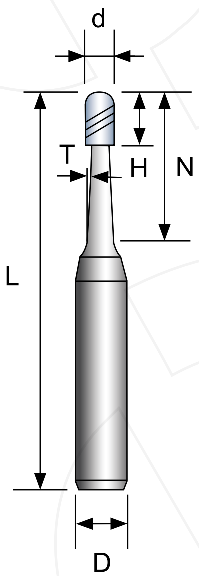
Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

Example: Order code WBTN 2351 020-10256

d-Code	d x T x N x D	H	L	WBTN 2351 Z=2
020-10256	R1.0 x T1.0 x N 25 x C 6	3.0	75	◇
030-10306	R1.5 x T1.0 x N 30 x C 6	5.0	75	◇
040-10356	R2.0 x T1.0 x N 35 x C 6	7.0	75	◇

Wide-cut

P	HRc < 24	◎
P	HRc 24 - 35	◎
P	HRc > 35	◎
H	HRc 45 - 55	◎
H	HRc 56 - 60	○
H	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
S	High-temperature alloy	○



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	35°	HSC
Al-X Coating		
HRc 60		

Ball nose end mills, long pencil neck

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

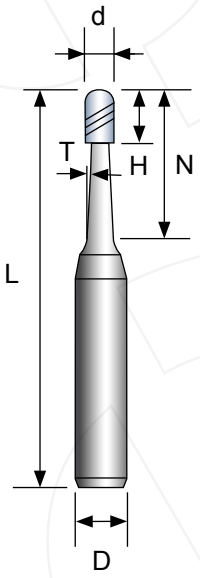
Kugelkopffräser, langer konischer schaft

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Example: Order code WBTN 2352 020-05606

d-Code	d x T x N x D	H L	WBTN 2352 Z=2	
020-05606	R1.0 x T0.5 x N 60 x C 6	3.0 100	◇	
020-10606	R1.0 x T1.0 x N 60 x C 6	3.0 100	◇	
020-15606	R1.0 x T1.5 x N 60 x C 6	3.0 100	◇	
020-20576	R1.0 x T2.0 x N 57 x C 6	3.0 100	◇	
030-05606	R1.5 x T0.5 x N 60 x C 6	5.0 100	◇	
030-10606	R1.5 x T1.0 x N 60 x C 6	5.0 100	◇	
030-15576	R1.5 x T1.5 x N 57 x C 6	5.0 100	◇	
030-20436	R1.5 x T2.0 x N 43 x C 6	5.0 100	◇	
040-05606	R2.0 x T0.5 x N 60 x C 6	7.0 100	◇	
040-10576	R2.0 x T1.0 x N 57 x C 6	7.0 100	◇	
040-15386	R2.0 x T1.5 x N 38 x C 6	7.0 100	◇	
040-20296	R2.0 x T2.0 x N 29 x C 6	7.0 100	◇	



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

DNKO

VHM K10-K30	30°	HSC
Al-X Coating	R	
HRc 60		

Corner radius end mills

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Eckradiusfräser

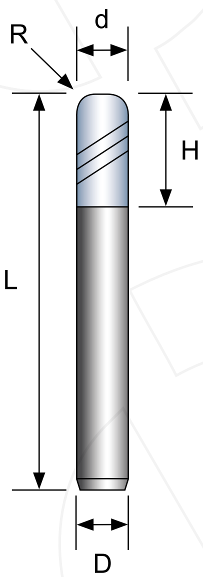
Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc


Example: Order code WR 230 010-02004

d-Code	d x R x H x D	L	WR 230 Z=2	WR 430 Z=4
010-02004	1.0 x R0.2 x 2.0 x C 4	50	●	◇
015-02004	1.5 x R0.2 x 3.0 x C 4	50	●	◇
015-05004	1.5 x R0.5 x 3.0 x C 4	50	◇	◇
020-02004	2.0 x R0.2 x 4.0 x C 4	50	●	●
020-05004	2.0 x R0.5 x 4.0 x C 4	50	●	●
025-02004	2.5 x R0.2 x 5.0 x C 4	50	●	●
025-05004	2.5 x R0.5 x 5.0 x C 4	50	●	●
030-02004	3.0 x R0.2 x 6.0 x C 4	50	●	●
030-05004	3.0 x R0.5 x 6.0 x C 4	50	●	●
030-10004	3.0 x R1.0 x 6.0 x C 4	50	◇	◇
040-02004	4.0 x R0.2 x 8.0 x C 4	50	●	●
040-05004	4.0 x R0.5 x 8.0 x C 4	50	●	●
040-10004	4.0 x R1.0 x 8.0 x C 4	50	◇	◇
050-05006	5.0 x R0.5 x 10.0 x C 6	50	◇	●
050-10006	5.0 x R1.0 x 10.0 x C 6	50	◇	●
060-02006	6.0 x R0.2 x 12.0 x C 6	50	◇	◇
060-05006	6.0 x R0.5 x 12.0 x C 6	50	◇	●
060-10006	6.0 x R1.0 x 12.0 x C 6	50	◇	●
060-15006	6.0 x R1.5 x 12.0 x C 6	50	◇	◇
060-20006	6.0 x R2.0 x 12.0 x C 6	50	◇	◇
080-05008	8.0 x R0.5 x 16.0 x C 8	60	◇	●
080-10008	8.0 x R1.0 x 16.0 x C 8	60	◇	●
080-15008	8.0 x R1.5 x 16.0 x C 8	60	◇	◇
080-20008	8.0 x R2.0 x 16.0 x C 8	60	◇	◇
100-05010	10.0 x R0.5 x 20.0 x C10	75	◇	●
100-10010	10.0 x R1.0 x 20.0 x C10	75	◇	●
100-15010	10.0 x R1.5 x 20.0 x C10	75	◇	◇
100-20010	10.0 x R2.0 x 20.0 x C10	75	◇	◇
120-05012	12.0 x R0.5 x 24.0 x C12	75	◇	●
120-10012	12.0 x R1.0 x 24.0 x C12	75	◇	●
120-20012	12.0 x R2.0 x 24.0 x C12	75	◇	◇
120-30012	12.0 x R3.0 x 24.0 x C12	75	◇	◇

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P74 - P75



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

● Stock item, subject to confirmation ◇ On request

VHM K10-K30	30°	HSC
Al-X Coating	R	
HRc 60		

Corner radius end mills, long shank

For steels, stainless steels, titanium alloy, prehardened steels and hardened steels up to 60 HRc

Eckradiusfräser, langer schaft

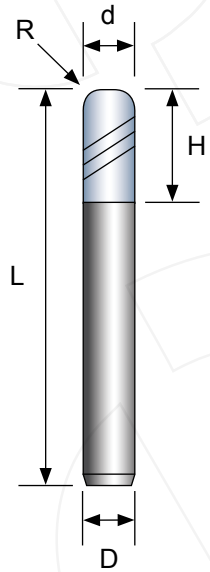
Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 60 HRc

Example: Order code WRLS 230 040-02104

d-Code	d x R x L x D	H	WRLS 230 Z=2	WRLS 430 Z=4
040-02104	4.0 x R0.2 x L 75 x C 4	8.0	◇	◇
040-05104	4.0 x R0.5 x L 75 x C 4	8.0	◇	●
040-10104	4.0 x R1.0 x L 75 x C 4	8.0	◇	◇
050-05106	5.0 x R0.5 x L 75 x C 6	10.0	◇	◇
050-05306	5.0 x R0.5 x L100 x C 6	10.0	◇	◇
050-10106	5.0 x R1.0 x L 75 x C 6	10.0	◇	◇
050-10306	5.0 x R1.0 x L100 x C 6	10.0	◇	◇
060-02106	6.0 x R0.2 x L 75 x C 6	12.0	◇	◇
060-02306	6.0 x R0.2 x L100 x C 6	12.0	◇	◇
060-05106	6.0 x R0.5 x L 75 x C 6	12.0	◇	●
060-05306	6.0 x R0.5 x L100 x C 6	12.0	◇	●
060-10106	6.0 x R1.0 x L 75 x C 6	12.0	◇	●
060-10306	6.0 x R1.0 x L100 x C 6	12.0	◇	●
080-05108	8.0 x R0.5 x L 75 x C 8	16.0	◇	◇
080-05308	8.0 x R0.5 x L100 x C 8	16.0	◇	●
080-10108	8.0 x R1.0 x L 75 x C 8	16.0	◇	◇
080-10308	8.0 x R1.0 x L100 x C 8	16.0	◇	●
080-10508	8.0 x R1.0 x L150 x C 8	16.0		●
100-05310	10.0 x R0.5 x L100 x C10	20.0	◇	◇
100-10310	10.0 x R1.0 x L100 x C10	20.0	◇	●
100-10510	10.0 x R1.0 x L150 x C10	20.0		●
100-20310	10.0 x R2.0 x L100 x C10	20.0		◇
120-05312	12.0 x R0.5 x L100 x C12	24.0	◇	◇
120-10312	12.0 x R1.0 x L100 x C12	24.0	◇	●
120-10512	12.0 x R1.0 x L150 x C12	24.0		●
120-20312	12.0 x R2.0 x L100 x C12	24.0		◇
120-30312	12.0 x R3.0 x L100 x C12	24.0		◇

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○

Cutting data, P74 - P75



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

VHM
K10-K30

30°

HSC

New
AlCrN
Coating

R

HRc
55

Corner radius end mills, long neck

For steels, stainless steels, titanium alloy, tempered steels and hardened steels up to 55 HRc

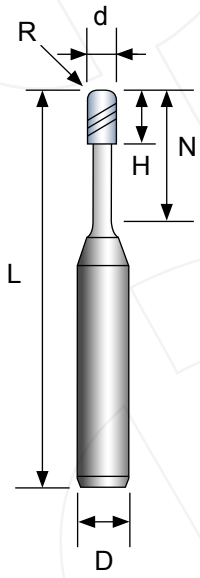
Eckradiusfräser, überlaufhals

Für Stählen, rostfreie Stählen, Titan, vergüteten Stählen und gehärteten Stählen bis 55 HRc

Example: Order code WRLN 230 010-02064

d-Code	d x R x N x D	H	L	WRLN 230 Z=2
010-02064	1.0 x R0.2 x N 6 x C 4	1.2	50	●
010-02084	1.0 x R0.2 x N 8 x C 4	1.2	50	●
010-02104	1.0 x R0.2 x N 10 x C 4	1.2	50	●
010-02124	1.0 x R0.2 x N 12 x C 4	1.2	50	●
015-02064	1.5 x R0.2 x N 6 x C 4	1.8	50	●
015-02124	1.5 x R0.2 x N 12 x C 4	1.8	50	●
020-02084	2.0 x R0.2 x N 8 x C 4	2.4	50	●
020-02124	2.0 x R0.2 x N 12 x C 4	2.4	50	●
020-02164	2.0 x R0.2 x N 16 x C 4	2.4	60	●
020-05084	2.0 x R0.5 x N 8 x C 4	2.4	50	●
020-05124	2.0 x R0.5 x N 12 x C 4	2.4	50	●
020-05164	2.0 x R0.5 x N 16 x C 4	2.4	60	●

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	◎
	High-temperature alloy	○



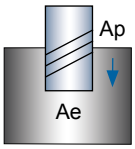
Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

Wide-cut

● Stock item, subject to confirmation ◇ On request

Wide-cut — Slotting / Roughing

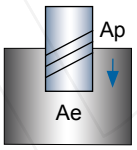


Ap = 0.25 x d [mm]
Ae = 1 x d [mm]

WE 235, WE 345

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc < 24	100 - 130	0.005	0.008	0.012	0.017	0.027	0.032	0.042	0.050	0.060
	HRc 24 - 35	85 - 110	0.004	0.007	0.011	0.016	0.025	0.029	0.039	0.046	0.055
	HRc > 35	75 - 100	0.003	0.006	0.010	0.014	0.022	0.027	0.035	0.042	0.050
H	HRc < 52	55 - 75	0.003	0.006	0.009	0.013	0.020	0.024	0.032	0.038	0.045
M	Stainless steels	50 - 70	0.003	0.006	0.009	0.013	0.021	0.025	0.033	0.040	0.047
K	Cast iron	90 - 120	0.004	0.008	0.012	0.017	0.027	0.032	0.042	0.050	0.060
N	Copper alloy	110 - 150	0.004	0.008	0.012	0.017	0.027	0.032	0.042	0.050	0.060
S	Titanium alloy	40 - 55	0.003	0.006	0.009	0.013	0.021	0.025	0.033	0.040	0.047
	High-temperature alloy	20 - 30	0.003	0.006	0.009	0.013	0.021	0.025	0.033	0.040	0.047

Wide-cut — Slotting / Pre-Finishing (HSC)



Ap = 0.1 x d [mm]
Ae = 1 x d [mm]

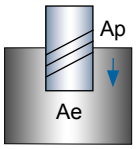
WE 235, WE 345

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc < 24	110 - 140	0.006	0.011	0.015	0.021	0.033	0.040	0.052	0.062	0.074
	HRc 24 - 35	95 - 125	0.005	0.010	0.014	0.019	0.031	0.037	0.048	0.057	0.068
	HRc > 35	80 - 105	0.004	0.009	0.012	0.017	0.028	0.033	0.043	0.051	0.062
H	HRc < 52	60 - 80	0.004	0.008	0.011	0.016	0.025	0.030	0.039	0.047	0.056
	HRc 52 - 55	50 - 65	0.003	0.007	0.010	0.014	0.022	0.026	0.034	0.040	0.048
M	Stainless steels	55 - 75	0.004	0.009	0.012	0.017	0.026	0.031	0.041	0.049	0.059
K	Cast iron	100 - 130	0.006	0.011	0.015	0.021	0.033	0.040	0.052	0.062	0.074
N	Copper alloy	125 - 165	0.006	0.011	0.015	0.021	0.033	0.040	0.052	0.062	0.074
S	Titanium alloy	45 - 60	0.004	0.009	0.012	0.017	0.026	0.031	0.041	0.049	0.059
	High-temperature alloy	20 - 30	0.004	0.009	0.012	0.017	0.026	0.031	0.041	0.049	0.059

Notes

- ▶ These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
- ▶ Recommend to use oil mist coolant for machining hardened steel.
- ▶ Recommend to apply herical or ramping for approaching into axial direction.
- ▶ Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

Wide-cut — Slotting / Pre-Finishing (HSC)

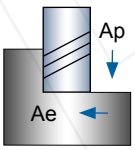


Ap = 0.02 x d [mm]
Ae = 1 x d [mm]

WE 235, WE 435, WE 345, WE 445, WE 645
WELS 235 (#1), WELS 435 (#2)

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc < 24	125 - 165	0.008	0.015	0.022	0.032	0.050	0.060	0.078	0.093	0.112
	HRc 24 - 35	110 - 150	0.007	0.014	0.021	0.029	0.046	0.055	0.072	0.086	0.103
	HRc > 35	95 - 125	0.007	0.013	0.019	0.026	0.042	0.049	0.065	0.077	0.093
H	HRc < 52	70 - 95	0.006	0.011	0.017	0.024	0.038	0.045	0.059	0.070	0.084
	HRc 52 - 55	60 - 80	0.005	0.010	0.015	0.021	0.033	0.039	0.051	0.060	0.073
	HRc 56 - 60	40 - 55	0.004	0.008	0.012	0.017	0.028	0.033	0.043	0.051	0.061
M	Stainless steels	55 - 75	0.006	0.012	0.018	0.025	0.040	0.047	0.062	0.073	0.088
K	Cast iron	100 - 130	0.008	0.015	0.022	0.032	0.050	0.060	0.078	0.093	0.112
N	Copper alloy	125 - 165	0.008	0.015	0.022	0.032	0.050	0.060	0.078	0.093	0.112
S	Titanium alloy	45 - 60	0.006	0.012	0.018	0.025	0.040	0.047	0.062	0.073	0.088
	High-temperature alloy	20 - 30	0.006	0.012	0.018	0.025	0.040	0.047	0.062	0.073	0.088

Wide-cut — Side milling / Roughing (HSC)



Ap = 1 x d [mm]
Ae = 0.2 x d [mm]

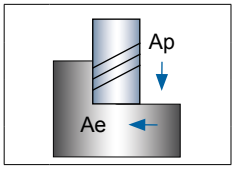
WE 235, WE 345, WE 445

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc < 24	120 - 155	0.006	0.011	0.014	0.020	0.032	0.038	0.050	0.060	0.072
	HRc 24 - 35	105 - 135	0.005	0.010	0.013	0.019	0.030	0.035	0.046	0.055	0.066
	HRc > 35	90 - 120	0.004	0.009	0.012	0.017	0.027	0.032	0.042	0.050	0.060
M	Stainless steels	75 - 100	0.004	0.008	0.011	0.016	0.026	0.030	0.040	0.047	0.057
K	Cast iron	130 - 170	0.006	0.011	0.014	0.020	0.032	0.038	0.050	0.060	0.072
N	Copper alloy	160 - 210	0.006	0.011	0.014	0.020	0.032	0.038	0.050	0.060	0.072
S	Titanium alloy	60 - 80	0.004	0.008	0.011	0.016	0.026	0.030	0.040	0.047	0.057
	High-temperature alloy	20 - 30	0.004	0.008	0.011	0.016	0.026	0.030	0.040	0.047	0.057

Notes

#1 For WELS 235, adjust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
#2 For WELS 435, adjust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
▶ For long cut length series, djust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
▶ These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
▶ Recommend to use oil mist coolant for machining hardened steel.
▶ Recommend to apply herical or ramping for approaching into axial direction.
▶ Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

Wide-cut — Side milling / Pre-Finishing (HSC)

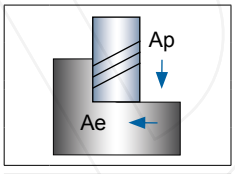


Ap = 1 x d [mm]
Ae = 0.1 x d [mm]

WE 235, WE 345, WE 445

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc < 24	135 - 175	0.007	0.013	0.018	0.025	0.040	0.048	0.062	0.074	0.089
	HRc 24 - 35	115 - 150	0.006	0.012	0.016	0.023	0.037	0.044	0.057	0.068	0.082
	HRc > 35	100 - 130	0.005	0.011	0.015	0.021	0.033	0.040	0.052	0.062	0.074
H	HRc < 52	75 - 100	0.005	0.009	0.013	0.019	0.030	0.036	0.047	0.056	0.067
	HRc 52 - 55	60 - 80	0.004	0.008	0.012	0.016	0.026	0.031	0.041	0.048	0.058
M	Stainless steels	85 - 110	0.005	0.010	0.014	0.020	0.032	0.038	0.049	0.059	0.071
K	Cast iron	150 - 195	0.007	0.013	0.018	0.025	0.040	0.048	0.062	0.074	0.089
N	Copper alloy	190 - 245	0.007	0.013	0.018	0.025	0.040	0.048	0.062	0.074	0.089
S	Titanium alloy	70 - 90	0.005	0.010	0.014	0.020	0.032	0.038	0.049	0.059	0.071
	High-temperature alloy	25 - 40	0.005	0.010	0.014	0.020	0.032	0.038	0.049	0.059	0.071

Wide-cut — Side milling / Finishing (HSC)



Ap = 1 x d [mm]
Ae = 0.02 x d [mm]

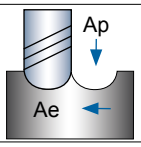
WE 235, WE 435, WE 345, WE 445, WE 645
WELS 235 (#1), WELS 435 (#2)

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			1	2	3	4	6	8	10	12	16
P	HRc < 24	185 - 240	0.010	0.019	0.027	0.038	0.060	0.071	0.094	0.112	0.134
	HRc 24 - 35	160 - 210	0.009	0.018	0.025	0.035	0.055	0.066	0.086	0.103	0.123
	HRc > 35	140 - 180	0.008	0.016	0.022	0.031	0.050	0.059	0.078	0.093	0.111
H	HRc < 52	105 - 140	0.007	0.014	0.020	0.028	0.045	0.054	0.070	0.084	0.100
	HRc 52 - 55	85 - 115	0.006	0.012	0.017	0.025	0.039	0.046	0.061	0.073	0.087
	HRc 56 - 60	60 - 75	0.005	0.010	0.015	0.021	0.033	0.039	0.052	0.061	0.074
M	Stainless steels	85 - 110	0.008	0.015	0.021	0.030	0.048	0.056	0.074	0.088	0.106
K	Cast iron	150 - 195	0.010	0.019	0.027	0.038	0.060	0.071	0.094	0.112	0.134
N	Copper alloy	190 - 245	0.010	0.019	0.027	0.038	0.060	0.071	0.094	0.112	0.134
S	Titanium alloy	70 - 90	0.008	0.015	0.021	0.030	0.048	0.056	0.074	0.088	0.106
	High-temperature alloy	25 - 40	0.008	0.015	0.021	0.030	0.048	0.056	0.074	0.088	0.106

Notes

#1 For WELS 235, adjust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
#2 For WELS 435, adjust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
► For long cut length series, djust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
► Recommend to use oil mist coolant for machining hardened steel.
► Recommend to apply herical or ramping for approaching into axial direction.
► Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

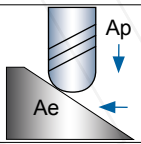
Wide-cut — Contour line / Roughing (HSC)



WB 235

	P						H					
	HRc < 24		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
Ap	0.10 x d		0.08 x d		0.08 x d		0.06 x d		0.05 x d		0.03 x d	
Ae	0.30 x d		0.24 x d		0.24 x d		0.18 x d		0.15 x d		0.09 x d	
Vc	94 - 252		94 - 200		85 - 170		75 - 125		58 - 95		43 - 70	
R [mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
R0.5	30000	1470	30000	1340	27000	1100	24600	940	18700	682	13800	430
R0.75	30000	1900	27500	1560	24500	1280	18600	950	14100	688	10400	440
R1.0	27200	2160	25000	1810	21500	1420	15600	970	11800	700	8700	450
R1.5	23500	2820	21300	2340	18000	1760	13300	1220	10100	870	7400	550
R2.0	17600	2820	16000	2360	13500	1750	10000	1220	7600	870	5600	560
R2.5	16000	3210	14500	2670	12300	2130	8000	1300	6100	930	4500	600
R3.0	13400	3340	12100	2790	10200	2130	6600	1300	5000	930	3700	600
R4.0	10000	3000	9000	2490	7700	2000	5000	1220	3800	870	2800	560
R5.0	8100	2740	7300	2270	6100	1810	4000	1120	3000	790	2200	500
R6.0	6700	2620	6000	2150	5100	1730	3300	1050	2500	750	1900	500

Wide-cut — Copy milling / Pre-Finishing (HSC)



WB 235, WB 435 (#1) , WBLS 235 (#2), WBLS 435 (#3)

	P						H					
	HRc < 24		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
Ap	0.10 x d		0.10 x d		0.10 x d		0.08 x d		0.06 x d		0.05 x d	
Ae	0.10 x d		0.10 x d		0.10 x d		0.08 x d		0.06 x d		0.05 x d	
Vc	88 - 184		80 - 168		70 - 144		64 - 117		49 - 88		36 - 64	
R [mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
R0.5	28000	784	25400	660	22500	518	20600	474	15700	314	11600	209
R0.75	25200	1058	23100	901	20500	707	15600	538	12000	360	8700	235
R1.0	22800	1277	19400	1009	18000	828	14300	658	11000	440	7900	284
R1.5	19500	1680	17800	1430	15300	1070	12200	840	9400	580	6800	380
R2.0	14600	2080	13400	1740	11400	1330	9020	1050	7000	730	5100	470
R2.5	11700	1840	10700	1560	9200	1180	7300	940	5600	650	4100	420
R3.0	9800	1680	8900	1400	7700	1080	6100	840	4600	580	3400	380
R4.0	7400	1470	6700	1240	5800	930	4600	740	3500	510	2600	330
R5.0	5800	1280	5400	1080	4600	810	3600	650	2800	450	2000	290
R6.0	4900	1260	4500	1070	3800	800	3100	630	2300	440	1700	280

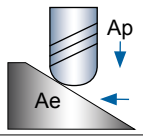
Notes

#1 For WB 435, adjust feed rate (Vf) 60% higher .

#2 For WBLS 235, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

#3 For WBLS 435, adjust feed rate (Vf) 60% higher then adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Wide-cut | **Copy milling / Finishing (HSC)**



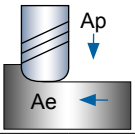
WB 235, WB 435 (#1) , WBLS 235 (#2), WBLS 435 (#3)

	P						H					
	HRc < 24		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
Ap	0.02 x d		0.02 x d		0.02 x d		0.02 x d		0.02 x d		0.02 x d	
Ae	0.015 x d		0.015 x d		0.015 x d		0.015 x d		0.015 x d		0.015 x d	
Vc	38 - 288		38 - 249		38 - 224		38 - 176		33 - 144		30 - 96	
R [mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
R0.2	30000	360	30000	360	30000	360	30000	360	26800	320	23800	290
R0.25	30000	450	30000	450	30000	450	30000	450	26800	400	23800	360
R0.3	30000	540	30000	540	30000	540	30000	540	26800	480	23800	430
R0.4	30000	720	30000	720	30000	720	30000	720	26800	640	18100	430
R0.5	30000	900	26400	790	24000	720	24000	720	21400	640	14300	430
R0.75	30000	1350	26400	1190	24000	1080	24000	1080	20500	920	13600	610
R1.0	30000	1800	26400	1580	24000	1440	21900	1310	17900	1070	12000	720
R1.5	30000	2700	26300	2370	23800	2140	18700	1680	15300	1380	10200	920
R2.0	23000	2760	19800	2380	17800	2140	14000	1680	11400	1370	7700	920
R2.5	18300	2750	15800	2370	14200	2130	11200	1680	9200	1380	6100	920
R3.0	15300	2750	13200	2380	11900	2140	9400	1690	7700	1390	5100	920
R4.0	11400	2740	9800	2350	8900	2140	7000	1680	5800	1390	3800	910
R5.0	9200	2760	7900	2370	7100	2130	5600	1680	4600	1380	3000	900
R6.0	7700	2770	6600	2380	5900	2120	4600	1660	3800	1370	2600	940

Notes

#1 For WB 435, adjust feed rate (Vf) 60% higher .
#2 For WBLS 235, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
#3 For WBLS 435, adjust feed rate (Vf) 60% higher then adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.
► These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
► Recommend to use oil mist coolant for machining hardened steel.
► Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

Wide-cut | **Contour line / Roughing (HSC)**



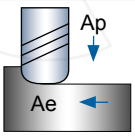
WR 230, WRLS 230 (#1)

		P			H		
		HRc < 24	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]		0.05 x d	0.05 x d	0.04 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]		0.20 x d	0.20 x d	0.20 x d	0.20 x d	0.20 x d	0.20 x d
Vc [m / min]		86 - 154	74 - 133	58 - 105	47 - 84	40 - 71	32 - 55
d	R	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
[mm]	[mm]	[min^{-1}]	[mm/min]	[min^{-1}]	[mm/min]	[min^{-1}]	[mm/min]	[min^{-1}]	[mm/min]	[min^{-1}]	[mm/min]	[min^{-1}]	[mm/min]
1	0.2	27500	930	23600	690	18600	540	14900	340	12700	270	10200	180
1.5	0.2	20500	1160	17600	870	13900	610	11100	370	9500	310	7600	210
2	0.2,0.5	17500	1260	15000	980	11800	690	9400	430	8000	340	6400	230
3	0.2,0.5	16400	1740	14100	1390	11100	980	8900	600	7600	480	5800	310
4	0.2,0.5	12300	1470	10600	1160	8300	830	6700	520	5700	410	4300	260
5	0.5,1.0	9800	1290	8500	1030	6700	740	5300	460	4600	360	3500	230
6	0.5,1.0	8200	1330	7100	1060	5600	750	4500	470	3800	370	2900	240
8	0.5,1.0	6200	1180	5300	940	4200	670	3400	420	2900	330	2200	210
10	0.5,1.0	4900	1170	4300	930	3400	670	2700	410	2200	320	1800	210
12	0.5,1.0	4100	1070	3500	850	2800	620	2200	390	1900	300	1500	190

Notes

#1 For WRLS 230, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Wide-cut | **Contour line / Roughing (HSC)**



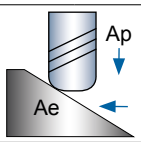
WR 430, WRLS 430 (#1)

		P			H		
		HRc < 24	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]		0.05 x d	0.05 x d	0.04 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]		0.20 x d	0.20 x d	0.20 x d	0.20 x d	0.20 x d	0.20 x d
Vc [m / min]		86 - 154	74 - 133	58 - 105	47 - 84	40 - 71	32 - 55
d	R	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
[mm]	[mm]	[min^{-1}]	[mm/min]	[min^{-1}]	[mm/min]	[min^{-1}]	[mm/min]	[min^{-1}]	[mm/min]	[min^{-1}]	[mm/min]	[min^{-1}]	[mm/min]
1	0.2	27500	1490	23600	1100	18600	860	14900	540	12700	430	10200	290
1.5	0.2	20500	1860	17600	1390	13900	980	11100	590	9500	500	7600	340
2	0.2,0.5	17500	2020	15000	1570	11800	1100	9400	690	8000	540	6400	370
3	0.2,0.5	16400	2780	14100	2220	11100	1570	8900	960	7600	770	5800	500
4	0.2,0.5	12300	2350	10600	1860	8300	1330	6700	830	5700	660	4300	420
5	0.5,1.0	9800	2060	8500	1650	6700	1180	5300	740	4600	580	3500	370
6	0.5,1.0	8200	2130	7100	1700	5600	1200	4500	750	3800	590	2900	380
8	0.5,1.0	6200	1890	5300	1500	4200	1070	3400	670	2900	530	2200	340
10	0.5,1.0	4900	1870	4300	1490	3400	1070	2700	660	2200	510	1800	340
12	0.5,1.0	4100	1710	3500	1360	2800	990	2200	620	1900	480	1500	300

Notes

#1 For WRLS 430, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Wide-cut | **Inclined surface milling / Finishing (HSC)**



WR 230, WRLS 230 (#1)

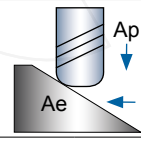
	P			H		
	HRc < 24	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.03 x d
Vc [m / min]	94 - 240	85 - 210	80 - 190	62 - 150	55 - 120	36 - 81

d	R	P						H					
		HRc < 24		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
[mm]	[mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
1	0.2	30000	910	27300	750	25500	640	20000	450	17500	370	11500	210
1.5	0.2	30000	1360	27300	1120	25500	960	20000	670	17500	550	11500	310
2	0.2,0.5	30000	1810	25200	1380	25500	1280	20000	900	17500	740	10600	380
3	0.2,0.5	25400	2300	19900	1640	20100	1490	15900	1090	12800	820	8600	470
4	0.2,0.5	19100	2300	15400	1680	15100	1510	11900	1070	9600	810	6500	470
5	0.5,1.0	15200	2200	12300	1620	12200	1450	9600	1040	7700	770	5100	430
6	0.5,1.0	12700	2280	10200	1670	10100	1480	8000	1050	6500	800	4300	450
8	0.5,1.0	9500	2260	7600	1660	7600	1470	6000	1060	4800	800	3200	450
10	0.5,1.0	7600	2220	6100	1620	6000	1450	4800	1040	3900	810	2600	450
12	0.5,1.0	6300	2220	5100	1630	5000	1460	3900	1030	3200	800	2100	450

Notes

#1: For WRLS 230, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Wide-cut | **Inclined surface milling / Finishing (HSC)**



WR 430, WRLS 430 (#1)

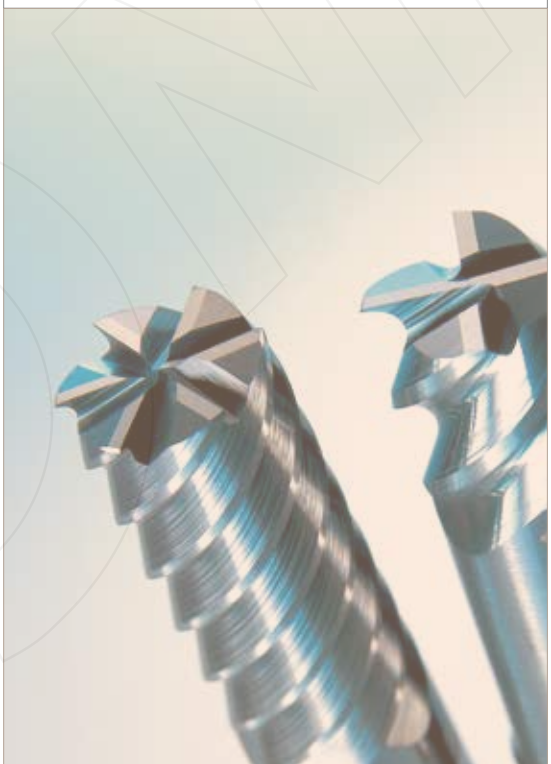
	P			H		
	HRc < 24	HRc 24 - 35	HRc > 35	HRc < 52	HRc 52 - 55	HRc 56 - 60
Ap [mm]	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.02 x d	0.02 x d
Ae [mm]	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.03 x d	0.03 x d
Vc [m / min]	94 - 240	85 - 210	80 - 190	62 - 150	55 - 120	36 - 81

d	R	P						H					
		HRc < 24		HRc 24 - 35		HRc > 35		HRc < 52		HRc 52 - 55		HRc 56 - 60	
[mm]	[mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
1	0.2	30000	1460	27300	1200	25500	1020	20000	720	17500	590	11500	340
1.5	0.2	30000	2180	27300	1790	25500	1540	20000	1070	17500	880	11500	500
2	0.2,0.5	30000	2900	25200	2210	25500	2050	20000	1440	17500	1180	10600	610
3	0.2,0.5	25400	3680	19900	2620	20100	2380	15900	1740	12800	1310	8600	750
4	0.2,0.5	19100	3680	15400	2690	15100	2420	11900	1710	9600	1300	6500	750
5	0.5,1.0	15200	3520	12300	2590	12200	2320	9600	1660	7700	1230	5100	690
6	0.5,1.0	12700	3650	10200	2670	10100	2370	8000	1680	6500	1280	4300	720
8	0.5,1.0	9500	3620	7600	2660	7600	2350	6000	1700	4800	1280	3200	720
10	0.5,1.0	7600	3550	6100	2590	6000	2320	4800	1660	3900	1300	2600	720
12	0.5,1.0	6300	3550	5100	2610	5000	2340	3900	1650	3200	1280	2100	720

Notes

#1: For WRLS 430, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Passion for excellence



Eco-cut

Universal end mills for milling of steels, stainless steels and hardened steels up to 50 HRc

Universal-Schaftfräser für Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

								
Tool code		**E 235**	**E 435**	**E 345**	**ELS 435**	**E 335 RC**	**E 435 RC**	**B 235**
Number of teeth		Z=2	Z=4	Z=3	Z=4	Z=3	Z=4	Z=2
Page		81	81	82	83	84	84	85
		VHM K20-K40	VHM K20-K40	VHM K20-K40	VHM K20-K40	VHM K20-K40	VHM K20-K40	VHM K20-K40
		AlTiN Coating	AlTiN Coating	AlTiN Coating	AlTiN Coating	AlTiN Coating	AlTiN Coating	AlTiN Coating
		HRc 50	HRc 50	HRc 50	HRc 50	HRc 50	HRc 50	HRc 50
		35°	35°	45°	35°	35°	35°	35°
		90°	90°	90°	90°	90°	90°	
		GM	GM	GM	GM	GM	GM	GM
P	HRc < 24	○	○	○	○	○	○	○
P	HRc 24 - 35	◎	◎	◎	◎	◎	◎	◎
P	HRc > 35	◎	◎	◎	◎	◎	◎	◎
H	HRc 45 - 55	○	○	○	○	○	○	○
H	HRc 56 - 60							
H	HRc > 60							
M	Stainless steel	◎	◎	◎	◎	◎	◎	◎
K	Cast iron	○	○	○	○	○	○	○
N	Copper alloy							
S	Titanium alloy	○	○	○	○	○	○	○
S	High-temperature alloy							

								
Tool code		B 435	BLS 235	BLS 435	R 230	R 430	RLS 430	TE 235
Number of teeth		Z=4	Z=2	Z=4	Z=2	Z=4	Z=4	Z=2
Page		85	86	86	87	87	88	89
		VHM K20-K40	VHM K20-K40	VHM K20-K40	VHM K20-K40	VHM K20-K40	VHM K20-K40	VHM K20-K40
		AlTiN Coating	AlTiN Coating	AlTiN Coating	AlTiN Coating	AlTiN Coating	AlTiN Coating	AlTiN Coating
		HRc 50	HRc 50	HRc 50	HRc 50	HRc 50	HRc 50	HRc 50
		35°	35°	35°	30°	30°	30°	35°
					R	R	R	
		GM	GM	GM	GM	GM	GM	GM
P	HRc < 24	○	○	○	○	○	○	○
P	HRc 24 - 35	◎	◎	◎	◎	◎	◎	◎
P	HRc > 35	◎	◎	◎	◎	◎	◎	◎
H	HRc 45 - 55	○	○	○	○	○	○	○
H	HRc 56 - 60							
H	HRc > 60							
M	Stainless steel	◎	◎	◎	◎	◎	◎	◎
K	Cast iron	○	○	○	○	○	○	○
N	Copper alloy							
S	Titanium alloy	○	○	○	○	○	○	○
S	High-temperature alloy							

								
Tool code		NSD 2090	NSD 2120					
Number of teeth		Z=2	Z=2					
Page		91	92					
		VHM K20-K40	VHM K20-K40					
		AlTiN Coating	AlTiN Coating					
		HRc 50	HRc 50					
		20°	20°					
		90°	120°					
		GM	GM					
P	HRc < 24	○	○					
P	HRc 24 - 35	◎	◎					
P	HRc > 35	◎	◎					
H	HRc 45 - 55	○	○					
H	HRc 56 - 60							
H	HRc > 60							
M	Stainless steel	◎	◎					
K	Cast iron	○	○					
N	Copper alloy							
S	Titanium alloy	○	○					
S	High-temperature alloy							

VHM K20-K40	35°	GM
AlTiN Coating	90°	
HRc 50		

Universal end mills

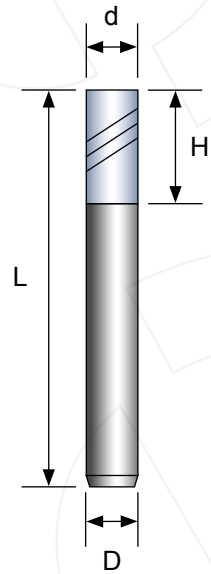
For general application milling of steels, stainless steels and hardened steels up to 50 HRc

Universal Schaftfräser

Für allgemeine Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

P	HRc < 24	○
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	

Cutting data, P93 - P94



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

Example: Order code E 235 010-03004

d-Code	d x H x D	L	E 235 Z=2	E 435 Z=4
010-03004	1.0 x 3.0 x C 4	50	●	◇
015-04004	1.5 x 4.0 x C 4	50	●	◇
020-06004	2.0 x 6.0 x C 4	50	●	●
025-07004	2.5 x 7.0 x C 4	50	●	◇
030-08003	3.0 x 8.0 x C 3	50	◇	◇
030-08004	3.0 x 8.0 x C 4	50	●	●
030-08006	3.0 x 8.0 x C 6	50	◇	◇
035-10004	3.5 x 10.0 x C 4	50	◇	◇
040-11004	4.0 x 11.0 x C 4	50	●	●
040-11006	4.0 x 11.0 x C 6	50	◇	◇
050-13006	5.0 x 13.0 x C 6	50	●	●
060-15006	6.0 x 15.0 x C 6	50	●	●
080-20008	8.0 x 20.0 x C 8	60	●	●
100-25010	10.0 x 25.0 x C10	75	●	●
120-30012	12.0 x 30.0 x C12	75	●	●
140-35016	14.0 x 35.0 x C16	100	◇	◇
160-40016	16.0 x 40.0 x C16	100	◇	●
200-40020	20.0 x 40.0 x C20	100	◇	●

Long cut length / Lange schneidkantenlänge

030-15004	3.0 x 15.0 x C 4	75	◇	◇
040-20004	4.0 x 20.0 x C 4	75	◇	◇
060-25006	6.0 x 25.0 x C 6	75	◇	◇
080-30008	8.0 x 30.0 x C 8	75	◇	◇
100-40010	10.0 x 40.0 x C10	100	◇	◇
120-45012	12.0 x 45.0 x C12	100	◇	◇

VHM
K20-K40

45°

AlTiN
Coating

90°

HRc
50

Universal end mills

For general application milling of steels, stainless steels and hardened steels up to 50 HRc

Universal Schaftfräser

Für allgemeine Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

E 345

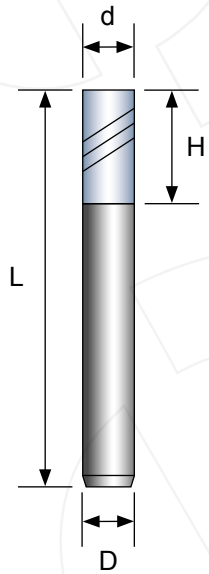
Z=3

Example: Order code E 345 020-06004

P	HRc < 24	○	
	HRc 24 - 35	◎	
	HRc > 35	◎	
H	HRc 45 - 55	○	
	HRc 56 - 60		
	HRc > 60		
M	Stainless steel	◎	
K	Cast iron	○	
N	Copper alloy		
S	Titanium alloy	○	
	High-temperature alloy		

d-Code	d x H x D	L	Z=3	
020-06004	2.0 x 6.0 x C 4	50	◇	
030-08004	3.0 x 8.0 x C 4	50	●	
030-08006	3.0 x 8.0 x C 6	50	◇	
040-11004	4.0 x 11.0 x C 4	50	●	
040-11006	4.0 x 11.0 x C 6	50	◇	
050-13006	5.0 x 13.0 x C 6	50	◇	
060-15006	6.0 x 15.0 x C 6	50	●	
080-20008	8.0 x 20.0 x C 8	60	●	
100-25010	10.0 x 25.0 x C10	75	●	
120-30012	12.0 x 30.0 x C12	75	●	
160-40016	16.0 x 40.0 x C16	100	◇	
200-40020	20.0 x 40.0 x C20	100	◇	

Cutting data, P93 - P94



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

● Stock item, subject to confirmation ◇ On request

VHM K20-K40	35°	
AlTiN Coating	90°	
HRc 50		

Universal end mills, long shank

For general application milling of steels, stainless steels and hardened steels up to 50 HRc

Universal Schaftfräser, langer schaft

Für allgemeine Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

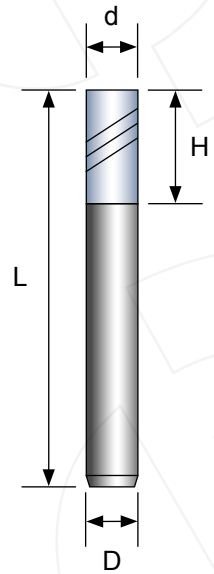
		ELS 435
		Z=4

P	HRc < 24	○
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	

Example: Order code ELS 435 040-11104

d-Code	d x L x D	H	ELS 435 Z=4	
040-11104	4.0 x L 75 x C 4	11.0	◇	
040-11306	4.0 x L100 x C 6	11.0	◇	
050-13106	5.0 x L 75 x C 6	13.0	◇	
050-13306	5.0 x L100 x C 6	13.0	◇	
060-15106	6.0 x L 75 x C 6	15.0	●	
060-15306	6.0 x L100 x C 6	15.0	●	
080-20108	8.0 x L 75 x C 8	20.0	●	
080-20308	8.0 x L100 x C 8	20.0	●	
080-20508	8.0 x L150 x C 8	20.0	◇	
100-25310	10.0 x L100 x C10	25.0	●	
100-25510	10.0 x L150 x C10	25.0	◇	
120-30312	12.0 x L100 x C12	30.0	●	
120-30512	12.0 x L150 x C12	30.0	◇	

Cutting data, P94



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Eco-cut

VHM K20-K40	35°	
AlTiN Coating	90°	
HRc 50		

Roughing end mills

For general application milling of steels, stainless steels and hardened steels up to 50 HRc

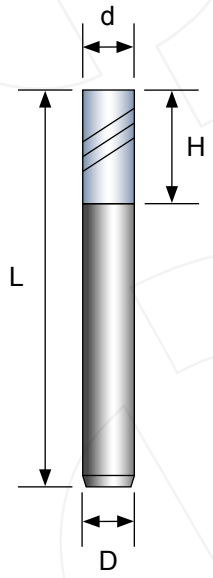
Schruppfräser

Für allgemeine Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

Example: Order code E 335 RC 060-15006

d-Code	d x H x D	L	E 335 RC Z=3	E 435 RC Z=4
060-15006	6.0 x 15.0 x C 6	50	◇	●
080-20008	8.0 x 20.0 x C 8	60	◇	●
100-25010	10.0 x 25.0 x C10	75	◇	●
120-30012	12.0 x 30.0 x C12	75	◇	●
160-40016	16.0 x 40.0 x C16	100	◇	●
200-45020	20.0 x 45.0 x C20	100	◇	●

P	HRc < 24	○
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

● Stock item, subject to confirmation ◇ On request

VHM K20-K40	35°	
AlTiN Coating		
HRc 50		

Ball nose end mills

For general application milling of steels, stainless steels and hardened steels up to 50 HRc

Kugelkopffräser

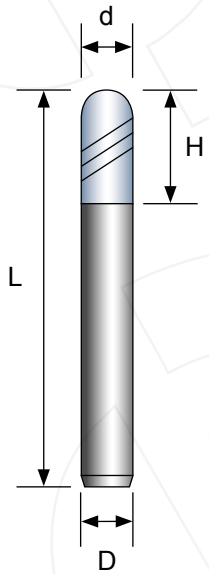
Für allgemeine Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

Example: Order code B 235 010-02004

d-Code	d x H x D	L	B 235 Z=2	B 435 Z=4
010-02004	R0.5 x 2.0 x C 4	50	●	
015-03004	R0.75 x 3.0 x C 4	50	●	
020-04004	R1.0 x 4.0 x C 4	50	●	
030-06003	R1.5 x 6.0 x C 3	50	◇	
030-06004	R1.5 x 6.0 x C 4	50	●	◇
030-06006	R1.5 x 6.0 x C 6	50	◇	◇
040-08004	R2.0 x 8.0 x C 4	50	●	◇
040-08006	R2.0 x 8.0 x C 6	50	◇	◇
050-10006	R2.5 x 10.0 x C 6	50	●	◇
060-12006	R3.0 x 12.0 x C 6	50	●	◇
080-16008	R4.0 x 16.0 x C 8	60	●	◇
100-20010	R5.0 x 20.0 x C10	75	●	◇
120-24012	R6.0 x 24.0 x C12	75	●	◇
160-30016	R8.0 x 30.0 x C16	100	◇	◇
200-30020	R10.0 x 30.0 x C20	100	◇	◇

P	HRc < 24	○
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	

Cutting data, P95



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

Eco-cut

VHM K20-K40	35°	
AlTiN Coating		
HRc 50		

Ball nose end mills, long shank

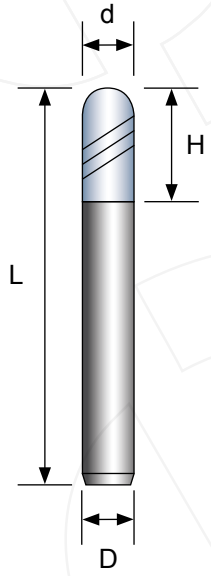
For general application milling of steels, stainless steels and hardened steels up to 50 HRc

Kugelkopffräser, langer schaft

Für allgemeine Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

Example: Order code BLS 235 010-02104

			d-Code	d x L x D	H	BLS 235 Z=2	BLS 435 Z=4
P	HRc < 24	○	010-02104	R0.5 x L 75 x C 4	2.0	◇	
	HRc 24 - 35	◎	015-03104	R0.75 x L 75 x C 4	3.0	◇	
	HRc > 35	◎	020-04104	R1.0 x L 75 x C 4	4.0	●	
H	HRc 45 - 55	○	020-04106	R1.0 x L 75 x C 6	4.0	◇	
	HRc 56 - 60		020-04306	R1.0 x L100 x C 6	4.0	●	
	HRc > 60		030-06104	R1.5 x L 75 x C 4	6.0	●	
M	Stainless steel	◎	030-06106	R1.5 x L 75 x C 6	6.0	◇	
K	Cast iron	○	030-06306	R1.5 x L100 x C 6	6.0	●	
N	Copper alloy		040-08104	R2.0 x L 75 x C 4	8.0	●	
S	Titanium alloy	○	040-08106	R2.0 x L 75 x C 6	8.0	◇	
	High-temperature alloy		040-08306	R2.0 x L100 x C 6	8.0	●	
			050-10106	R2.5 x L 75 x C 6	10.0	◇	
			050-10306	R2.5 x L100 x C 6	10.0	●	
			060-12106	R3.0 x L 75 x C 6	12.0	●	◇
			060-12306	R3.0 x L100 x C 6	12.0	●	◇
			060-12506	R3.0 x L150 x C 6	12.0	◇	◇
			080-16108	R4.0 x L 75 x C 8	16.0	◇	◇
			080-16308	R4.0 x L100 x C 8	16.0	●	◇
			080-16508	R4.0 x L150 x C 8	16.0	◇	◇
			100-20310	R5.0 x L100 x C10	20.0	●	◇
			100-20510	R5.0 x L150 x C10	20.0	◇	◇
			120-24312	R6.0 x L100 x C12	24.0	●	◇
			120-24512	R6.0 x L150 x C12	24.0	◇	◇
			160-30516	R8.0 x L150 x C16	30.0	◇	◇



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

● Stock item, subject to confirmation ◇ On request

VHM K20-K40	30°	
AlTiN Coating	R	
HRc 50		

Corner radius end mills

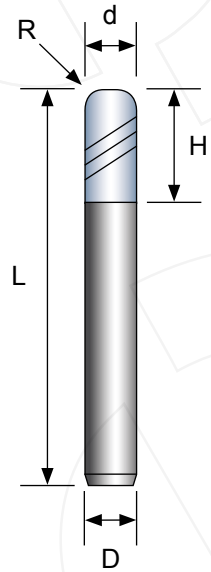
For general application milling of steels, stainless steels and hardened steels up to 50 HRc

Eckradiusfräser

Für allgemeine Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

P	HRc < 24	○
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	

Cutting data, P95



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Example: Order code R 230 040-05004

d-Code	d x R x H x D	L	R 230 Z=2	R 430 Z=4
040-05004	4.0 x R0.5 x 8.0 x C 4	50	●	●
040-10004	4.0 x R1.0 x 8.0 x C 4	50	●	●
050-05006	5.0 x R0.5 x 10.0 x C 6	50	◇	◇
050-10006	5.0 x R1.0 x 10.0 x C 6	50	◇	◇
060-02006	6.0 x R0.2 x 12.0 x C 6	50	◇	◇
060-05006	6.0 x R0.5 x 12.0 x C 6	50	●	●
060-10006	6.0 x R1.0 x 12.0 x C 6	50	●	●
060-15006	6.0 x R1.5 x 12.0 x C 6	50	◇	◇
060-20006	6.0 x R2.0 x 12.0 x C 6	50	◇	◇
080-05008	8.0 x R0.5 x 16.0 x C 8	60	●	●
080-10008	8.0 x R1.0 x 16.0 x C 8	60	●	●
080-15008	8.0 x R1.5 x 16.0 x C 8	60	◇	◇
080-20008	8.0 x R2.0 x 16.0 x C 8	60	◇	◇
100-05010	10.0 x R0.5 x 20.0 x C10	75	◇	◇
100-10010	10.0 x R1.0 x 20.0 x C10	75	●	●
100-15010	10.0 x R1.5 x 20.0 x C10	75	◇	◇
100-20010	10.0 x R2.0 x 20.0 x C10	75	◇	◇
120-05012	12.0 x R0.5 x 24.0 x C12	75	◇	◇
120-10012	12.0 x R1.0 x 24.0 x C12	75	●	●
120-20012	12.0 x R2.0 x 24.0 x C12	75	◇	◇
120-30012	12.0 x R3.0 x 24.0 x C12	75	◇	◇

VHM
K20-K40

30°

AlTiN
Coating

R

HRc
50

Corner radius end mills, long shank

For general application milling of steels, stainless steels and hardened steels up to 50 HRc

Eckradiusfräser, langer schaft

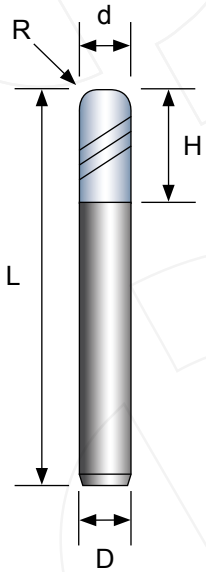
Für allgemeine Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

Example: Order code RLS 430 040-02104

d-Code	d x R x L x D	H	RLS 430 Z=4	
040-02104	4.0 x R0.2 x L 75 x C 4	8.0	◇	
040-05104	4.0 x R0.5 x L 75 x C 4	8.0	◇	
040-10104	4.0 x R1.0 x L 75 x C 4	8.0	◇	
060-05106	6.0 x R0.5 x L 75 x C 6	12.0	●	
060-05306	6.0 x R0.5 x L100 x C 6	12.0	●	
060-10106	6.0 x R1.0 x L 75 x C 6	12.0	●	
060-10306	6.0 x R1.0 x L100 x C 6	12.0	●	
080-05108	8.0 x R0.5 x L 75 x C 8	16.0	◇	
080-05308	8.0 x R0.5 x L100 x C 8	16.0	●	
080-10108	8.0 x R1.0 x L 75 x C 8	16.0	◇	
080-10308	8.0 x R1.0 x L100 x C 8	16.0	●	
100-05310	10.0 x R0.5 x L100 x C10	20.0	◇	
100-10310	10.0 x R1.0 x L100 x C10	20.0	●	
100-15310	10.0 x R1.5 x L100 x C10	20.0	◇	
100-20310	10.0 x R2.0 x L100 x C10	20.0	◇	
120-05312	12.0 x R0.5 x L100 x C12	24.0	◇	
120-10312	12.0 x R1.0 x L100 x C12	24.0	●	
120-20312	12.0 x R2.0 x L100 x C12	24.0	◇	
120-30312	12.0 x R3.0 x L100 x C12	24.0	◇	

P	HRc < 24	○
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	

Cutting data, P95



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

● Stock item, subject to confirmation ◇ On request

VHM K20-K40	35°	
AlTiN Coating		
HRc 50		

Tapered end mills

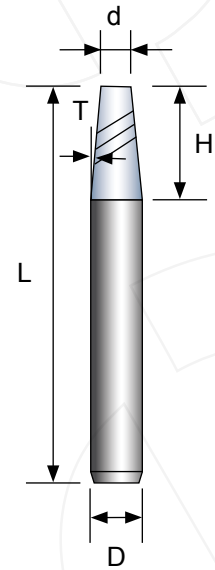
For general application milling of steels, stainless steels and hardened steels up to 50 HRc

Konisfräser

Für allgemeine Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

	TE 235	
	Z=2	

P	HRc < 24	○
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

Example: Order code TE 235 010-00504

d-Code	d x T x D	H	L	TE 235 Z=2
010-00504	1.0 x T 0.5 x C 4	4.0	50	◇
010-01004	1.0 x T 1.0 x C 4	4.0	50	◇
010-01504	1.0 x T 1.5 x C 4	4.0	50	◇
010-02004	1.0 x T 2.0 x C 4	4.0	50	◇
010-02504	1.0 x T 2.5 x C 4	4.0	50	◇
010-03004	1.0 x T 3.0 x C 4	4.0	50	◇
010-05004	1.0 x T 5.0 x C 4	4.0	50	◇
010-07004	1.0 x T 7.0 x C 4	4.0	50	◇
010-10004	1.0 x T 10.0 x C 4	4.0	50	◇
015-00504	1.5 x T 0.5 x C 4	5.0	50	◇
015-01004	1.5 x T 1.0 x C 4	5.0	50	◇
015-01504	1.5 x T 1.5 x C 4	5.0	50	◇
015-02004	1.5 x T 2.0 x C 4	5.0	50	◇
015-02504	1.5 x T 2.5 x C 4	5.0	50	◇
015-03004	1.5 x T 3.0 x C 4	5.0	50	◇
015-05004	1.5 x T 5.0 x C 4	5.0	50	◇
015-07004	1.5 x T 7.0 x C 4	5.0	50	◇
015-10004	1.5 x T 10.0 x C 4	5.0	50	◇
020-00504	2.0 x T 0.5 x C 4	6.0	50	◇
020-01004	2.0 x T 1.0 x C 4	6.0	50	◇
020-01504	2.0 x T 1.5 x C 4	6.0	50	◇
020-02004	2.0 x T 2.0 x C 4	6.0	50	◇
020-02504	2.0 x T 2.5 x C 4	6.0	50	◇
020-03004	2.0 x T 3.0 x C 4	6.0	50	◇
020-05004	2.0 x T 5.0 x C 4	6.0	50	◇
020-07004	2.0 x T 7.0 x C 4	6.0	50	◇
020-10006	2.0 x T 10.0 x C 6	6.0	50	◇
025-00504	2.5 x T 0.5 x C 4	8.0	50	◇
025-01004	2.5 x T 1.0 x C 4	8.0	50	◇
025-01504	2.5 x T 1.5 x C 4	8.0	50	◇
025-02004	2.5 x T 2.0 x C 4	8.0	50	◇
025-02504	2.5 x T 2.5 x C 4	8.0	50	◇
025-03004	2.5 x T 3.0 x C 4	8.0	50	◇
025-05004	2.5 x T 5.0 x C 4	8.0	50	◇
025-07006	2.5 x T 7.0 x C 6	8.0	50	◇
025-10006	2.5 x T 10.0 x C 6	8.0	50	◇

VHM K20-K40	35°	
AlTiN Coating		
HRc 50		

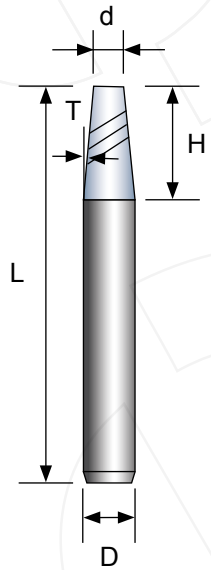
Tapered end mills

For general application milling of steels, stainless steels and hardened steels up to 50 HRc

Konisfräser

Für allgemeine Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

P	HRc < 24	○
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

Example: Order code TE 235 030-00504

d-Code	d x T x D	H L	TE 235 Z=2	
030-00504	3.0 x T 0.5 x C 4	10.0 50	◇	
030-01004	3.0 x T 1.0 x C 4	10.0 50	◇	
030-01504	3.0 x T 1.5 x C 4	10.0 50	◇	
030-02004	3.0 x T 2.0 x C 4	10.0 50	◇	
030-02504	3.0 x T 2.5 x C 4	10.0 50	◇	
030-03006	3.0 x T 3.0 x C 6	10.0 50	◇	
030-05006	3.0 x T 5.0 x C 6	10.0 50	◇	
030-07006	3.0 x T 7.0 x C 6	10.0 50	◇	
030-10008	3.0 x T 10.0 x C 8	10.0 60	◇	
040-00506	4.0 x T 0.5 x C 6	15.0 50	◇	
040-01006	4.0 x T 1.0 x C 6	15.0 50	◇	
040-01506	4.0 x T 1.5 x C 6	15.0 50	◇	
040-02006	4.0 x T 2.0 x C 6	15.0 50	◇	
040-02506	4.0 x T 2.5 x C 6	15.0 50	◇	
040-03006	4.0 x T 3.0 x C 6	15.0 50	◇	
040-05008	4.0 x T 5.0 x C 8	15.0 60	◇	
040-07008	4.0 x T 7.0 x C 8	15.0 60	◇	
040-10010	4.0 x T 10.0 x C10	15.0 75	◇	
050-00506	5.0 x T 0.5 x C 6	20.0 50	◇	
050-01006	5.0 x T 1.0 x C 6	20.0 50	◇	
050-01506	5.0 x T 1.5 x C 6	20.0 50	◇	
050-02008	5.0 x T 2.0 x C 8	20.0 60	◇	
050-02508	5.0 x T 2.5 x C 8	20.0 60	◇	
050-03008	5.0 x T 3.0 x C 8	20.0 60	◇	
050-05010	5.0 x T 5.0 x C10	20.0 75	◇	
050-07010	5.0 x T 7.0 x C10	20.0 75	◇	
050-10012	5.0 x T 10.0 x C12	20.0 75	◇	
060-00508	6.0 x T 0.5 x C 8	20.0 60	◇	
060-01008	6.0 x T 1.0 x C 8	20.0 60	◇	
060-01508	6.0 x T 1.5 x C 8	20.0 60	◇	
060-02008	6.0 x T 2.0 x C 8	20.0 60	◇	
060-02508	6.0 x T 2.5 x C 8	20.0 60	◇	
060-03008	6.0 x T 3.0 x C 8	20.0 60	◇	
060-05010	6.0 x T 5.0 x C10	20.0 75	◇	

● Stock item, subject to confirmation ◇ On request

VHM K20-K40	20°	
AlTiN Coating	90°	
HRc 50		

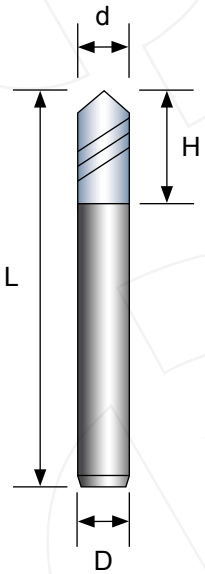
Carbide NC spot drills / 90°

For general application milling of steels, stainless steels and hardened steels up to 50 HRc

NC Anbohrer, 90°

Für allgemeine Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

P	HRc < 24	○
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	



Tolerance / Toleranz

Range	Diameter
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

Example: Order code NSD 2090 020-04002

d-Code	d x H x D	L	NSD 2090 Z=2	
020-04002	2.0 x 4.0 x C 2	50	◇	
030-06003	3.0 x 6.0 x C 3	50	◇	
040-08004	4.0 x 8.0 x C 4	50	◇	
050-10005	5.0 x 10.0 x C 5	50	◇	
060-12006	6.0 x 12.0 x C 6	50	●	
080-16008	8.0 x 16.0 x C 8	60	●	
100-20010	10.0 x 20.0 x C10	75	●	
120-20012	12.0 x 20.0 x C12	75	●	
160-25016	16.0 x 25.0 x C16	100	◇	
200-25020	20.0 x 25.0 x C20	100	◇	

VHM K20-K40	20°	
AlTiN Coating	120°	
HRc 50		

Carbide NC spot drills / 120°

For general application milling of steels, stainless steels and hardened steels up to 50 HRc

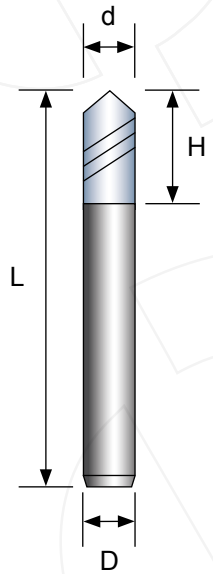
NC Anbohrer, 120°

Für allgemeine Bearbeitung von Stählen, rostfreie Stählen und gehärteten Stählen bis 50 HRc

P	HRc < 24	○
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	◎
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	

Example: Order code NSD 2120 020-04002

d-Code	d x H x D	L	NSD 2120 Z=2	
020-04002	2.0 x 4.0 x C 2	50	◇	
030-06003	3.0 x 6.0 x C 3	50	◇	
040-08004	4.0 x 8.0 x C 4	50	◇	
050-10005	5.0 x 10.0 x C 5	50	◇	
060-12006	6.0 x 12.0 x C 6	50	●	
080-16008	8.0 x 16.0 x C 8	60	●	
100-20010	10.0 x 20.0 x C10	75	●	
120-20012	12.0 x 20.0 x C12	75	●	
160-25016	16.0 x 25.0 x C16	100	◇	
200-25020	20.0 x 25.0 x C20	100	◇	



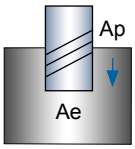
Tolerance / Toleranz

Range	Diameter
8 ≤ d < 18	0 / -0.03
18 ≤ d	0 / -0.04

Eco-cut

● Stock item, subject to confirmation ◇ On request

Eco-cut — Slotting / Roughing

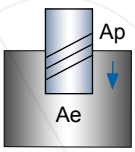


Ap = 0.2 x d [mm]
Ae = 1 x d [mm]

E 235, E 345

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			2	3	4	5	6	8	10	12	16
P	HRc < 24	90 - 120	0.007	0.009	0.013	0.016	0.021	0.024	0.032	0.038	0.046
P	HRc 24 - 35	75 - 100	0.006	0.008	0.012	0.015	0.019	0.022	0.030	0.035	0.042
P	HRc > 35	60 - 75	0.006	0.008	0.011	0.014	0.017	0.021	0.027	0.032	0.038
H	HRc < 52	40 - 50	0.005	0.007	0.010	0.012	0.016	0.019	0.025	0.030	0.036
M	Stainless steels	45 - 65	0.005	0.007	0.010	0.012	0.016	0.019	0.025	0.030	0.036
K	Cast iron	90 - 120	0.007	0.009	0.013	0.016	0.021	0.024	0.032	0.038	0.046
S	Titanium alloy	30 - 50	0.005	0.007	0.010	0.012	0.016	0.019	0.025	0.030	0.036

Eco-cut — Slotting / Pre-finishing

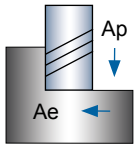


Ap = 0.1 x d [mm]
Ae = 1 x d [mm]

E 235, E 345

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			2	3	4	5	6	8	10	12	16
P	HRc < 24	110 - 140	0.008	0.011	0.016	0.021	0.025	0.030	0.040	0.047	0.056
P	HRc 24 - 35	95 - 125	0.007	0.010	0.014	0.019	0.024	0.028	0.036	0.043	0.052
P	HRc > 35	70 - 95	0.006	0.009	0.013	0.017	0.021	0.025	0.033	0.039	0.047
H	HRc < 52	50 - 65	0.005	0.008	0.011	0.015	0.018	0.022	0.029	0.035	0.042
M	Stainless steels	45 - 65	0.006	0.009	0.013	0.017	0.020	0.024	0.031	0.037	0.045
K	Cast iron	100 - 135	0.008	0.011	0.016	0.021	0.025	0.030	0.040	0.047	0.056
S	Titanium alloy	30 - 50	0.006	0.009	0.013	0.017	0.020	0.024	0.031	0.037	0.045

Eco-cut — Side milling / Roughing

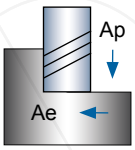


Ap = 1 x d [mm]
Ae = 0.2 x d [mm]

E 235, E 345, E435

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			2	3	4	5	6	8	10	12	16
P	HRc < 24	105 - 135	0.008	0.011	0.015	0.020	0.024	0.029	0.038	0.046	0.055
P	HRc 24 - 35	90 - 115	0.007	0.010	0.014	0.018	0.023	0.027	0.035	0.042	0.050
P	HRc > 35	70 - 90	0.006	0.009	0.013	0.017	0.021	0.024	0.032	0.038	0.046
M	Stainless steels	50 - 70	0.005	0.008	0.012	0.016	0.020	0.023	0.030	0.036	0.043
K	Cast iron	115 - 150	0.008	0.011	0.015	0.020	0.024	0.029	0.038	0.046	0.055
N	Copper alloy	150 - 180	0.008	0.011	0.015	0.020	0.024	0.029	0.038	0.046	0.055
S	Titanium alloy	50 - 70	0.005	0.008	0.012	0.016	0.020	0.023	0.030	0.036	0.043

Eco-cut — Side milling / Pre-finishing



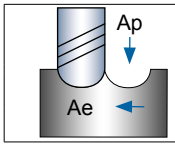
Ap = 1 x d [mm]
Ae = 0.1 x d [mm]

E 235, E 345, E 435, ELS 435 (#1)

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			2	3	4	5	6	8	10	12	16
P	HRc < 24	120 - 160	0.011	0.014	0.019	0.025	0.030	0.036	0.047	0.056	0.068
P	HRc 24 - 35	105 - 135	0.010	0.012	0.017	0.023	0.028	0.033	0.043	0.052	0.062
P	HRc > 35	80 - 105	0.009	0.011	0.016	0.021	0.025	0.030	0.040	0.047	0.056
M	Stainless steels	60 - 80	0.008	0.011	0.015	0.020	0.024	0.029	0.037	0.045	0.054
K	Cast iron	135 - 170	0.010	0.014	0.019	0.025	0.030	0.036	0.047	0.056	0.068
N	Copper alloy	150 - 180	0.010	0.014	0.019	0.025	0.030	0.036	0.047	0.056	0.068
S	Titanium alloy	60 - 80	0.008	0.011	0.015	0.020	0.024	0.029	0.037	0.045	0.054

Notes	
	#1 For ELS 435, adjust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Eco-cut | **Contour line**

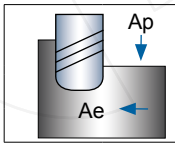


B 235

	P			H
	HRc < 24	HRc 24 - 35	HRc > 35	HRc < 52
Ap	0.06 x d	0.05 x d	0.05 x d	0.05 x d
Ae	0.18 x d	0.15 x d	0.15 x d	0.15 x d
Vc	65 - 135	55 - 110	50 - 90	40 - 65

R [mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
R0.5	21000	630	17800	510	14400	340	11500	240
R0.75	18000	940	15200	750	12200	500	9700	350
R1.0	15600	1060	13200	850	10600	560	8400	390
R1.5	12400	1280	10500	1030	8500	680	6700	470
R2.0	10700	1450	9000	1160	7200	770	5700	540
R2.5	8500	1400	7100	1100	5700	720	4500	500
R3.0	7100	1230	5900	970	4800	650	3800	450
R4.0	5300	930	4400	740	3600	500	2900	350
R5.0	4200	650	3500	520	2900	350	2300	240
R6.0	3500	560	2900	440	2400	310	1900	220

Eco-cut | **Contour line**



R 430, RLS 430 (#1)

	P			H
	HRc < 24	HRc 24 - 35	HRc > 35	HRc < 52
Ap [mm]	1 x d	1 x d	1 x d	1 x d
Ae [mm]	0.20 x d	0.20 x d	0.20 x d	0.10 x d
Vc [m / min]	105	90	70	50

d [mm]	R [mm]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]	n [min^{-1}]	Vf [mm/min]
4	0.2,0.5	8400	580	7200	460	5600	330	4000	200
5	0.5,1.0	6700	620	5700	470	4500	350	3200	210
6	0.5,1.0	5600	620	4800	510	3700	360	2700	210
8	0.5,1.0	4200	585	3600	450	2800	310	2000	185
10	0.5,1.0	3300	580	2900	440	2200	300	1600	180
12	0.5,1.0	2800	560	2400	430	1900	290	1300	170

Notes	**#1** For RLS 430, adjust feed rate (Vf) and spindle speed (n) 10% - 50% lower according to the ratio of overhang length / cutting diameter.

Alu-cut

High-performance end mills for HSC and general machining of aluminum, magnesium, copper alloys and plastic.

Hochleistungs-Schaftfräser für die HSC und die Bearbeitung von Aluminium, Magnesium, Kupfer und Kunststoff.

			 New					
Tool code		AE 250	AE 350	AE 255	AE 355	AB 240	ABLN 240	
Number of teeth		Z=2	Z=3	Z=2	Z=3	Z=2	Z=2	
Page		99	100	101	101	102	103	
		VHM	VHM	VHM	VHM	VHM	VHM	
		50°	50°	55°	55°	40°	40°	
		90°	90°	90°	90°			
		HSC	HSC	HSC	HSC	HSC	HSC	
N	Al and Al-alloy	◎	◎	◎	◎	◎	◎	
	Al cast alloy	○	○	○	○	○	○	
	Copper alloy	○	○	○	○	○	○	
	Brass, Bronze	○	○	○	○	○	○	
	Magnesium alloy	○	○	○	○	○	○	
	Plastic	◎	◎	◎	◎	◎	◎	

VHM	50°	HSC
	90°	

End mills
For HSC of aluminum, magnesium, copper alloys and plastic.

Schaftfräser
Für die HSC von Aluminium, Magnesium, Kupfer und Kunststoff.

N		
	Al and Al-alloy	◎
	Al cast alloy	○
	Copper alloy	○
	Brass, Bronze	○
	Magnesium alloy	○
	Plastic	◎

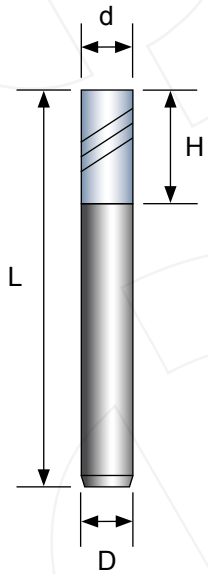
Example: Order code AE 250 030-09006

d-Code	d x H x D	L	AE 250 Z=2	
030-09006	3.0 x 9.0 x C 6	50	●	
040-12006	4.0 x 12.0 x C 6	50	●	
050-15006	5.0 x 15.0 x C 6	50	●	
060-18006	6.0 x 18.0 x C 6	50	●	
080-20008	8.0 x 20.0 x C 8	60	●	
100-25010	10.0 x 25.0 x C10	75	●	
120-30012	12.0 x 30.0 x C12	75	●	

Long cut length / Lange schneidkantenlänge

030-12006	3.0 x 12.0 x C 6	60	●	
040-16006	4.0 x 16.0 x C 6	60	●	
050-20006	5.0 x 20.0 x C 6	60	●	
060-24006	6.0 x 24.0 x C 6	75	●	
080-32008	8.0 x 32.0 x C 8	75	●	
100-40010	10.0 x 40.0 x C10	100	●	
120-50012	12.0 x 50.0 x C12	100	●	

Cutting data, P104



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

VHM | 50° | HSC

90°

End mills
For HSC of aluminum, magnesium, copper alloys and plastic.

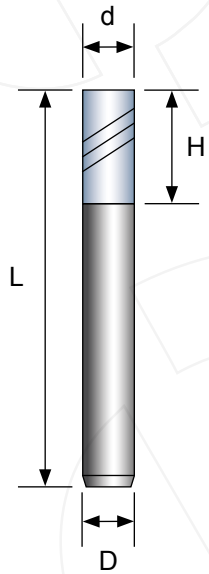
Schaftfräser
Für die HSC von Aluminium, Magnesium, Kupfer und Kunststoff.

N		
	Al and Al-alloy	◎
	Al cast alloy	○
	Copper alloy	○
	Brass, Bronze	○
	Magnesium alloy	○
	Plastic	◎

Example: Order code AE 350 030-09006

d-Code	d x H x D	L	AE 350 Z=3	
030-09006	3.0 x 9.0 x C 6	50	●	
040-12006	4.0 x 12.0 x C 6	50	●	
050-15006	5.0 x 15.0 x C 6	50	●	
060-18006	6.0 x 18.0 x C 6	50	●	
080-24008	8.0 x 24.0 x C 8	60	●	
100-30010	10.0 x 30.0 x C10	75	●	
120-36012	12.0 x 36.0 x C12	75	●	
160-50016	16.0 x 50.0 x C16	100	●	

Cutting data, P104



Tolerance

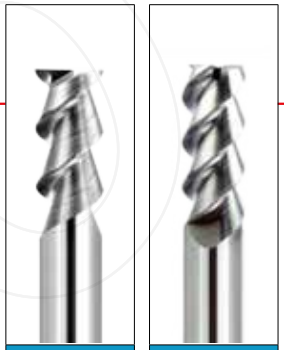
Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

● Stock item, subject to confirmation ◇ On request

VHM	55°	HSC
	90°	

End mills
For HSC of aluminum, magnesium, copper alloys and plastic.

Schaftfräser
Für die HSC von Aluminium, Magnesium, Kupfer und Kunststoff.



N	Al and Al-alloy	◎
	Al cast alloy	○
	Copper alloy	○
	Brass, Bronze	○
	Magnesium alloy	○
	Plastic	◎

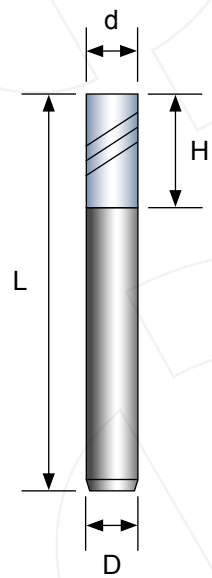
Example: Order code AE 255 010-03004

d-Code	d x H x D	L	AE 255 Z=2	AE 355 Z=3
010-03004	1.0 x 3.0 x C 4	50	◇	●
015-04004	1.5 x 4.0 x C 4	50	◇	●
020-06004	2.0 x 6.0 x C 4	50	◇	●
025-07004	2.5 x 7.0 x C 4	50	◇	●
030-08004	3.0 x 8.0 x C 4	50	◇	●
040-11004	4.0 x 11.0 x C 4	50	●	●
050-13006	5.0 x 13.0 x C 6	50	●	●
060-15006	6.0 x 15.0 x C 6	50	●	●
080-20008	8.0 x 20.0 x C 8	60	●	●
100-25010	10.0 x 25.0 x C10	75	●	●
120-30012	12.0 x 30.0 x C12	75	●	●
160-40016	16.0 x 40.0 x C16	100	●	●
200-40020	20.0 x 40.0 x C20	100	◇	◇

Long cut length / Lange schneidkantenlänge

030-12006	3.0 x 12.0 x C 6	75	◇	
040-16006	4.0 x 16.0 x C 6	75	◇	
050-20006	5.0 x 20.0 x C 6	75	◇	
060-24006	6.0 x 24.0 x C 6	75	◇	
080-35008	8.0 x 35.0 x C 8	100	◇	
100-40010	10.0 x 40.0 x C10	100	◇	
120-45012	12.0 x 45.0 x C12	100	◇	

Cutting data, P104



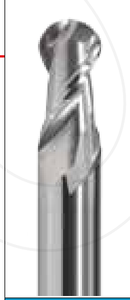
Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

VHM	40°	HSC

Ball nose end mills
For HSC of aluminum, magnesium, copper alloys and plastic

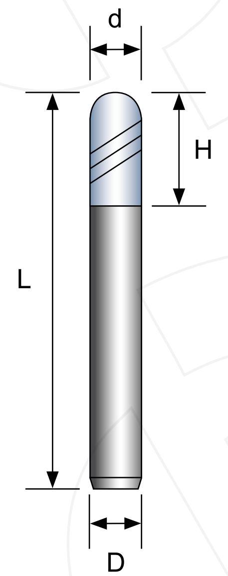
Kugelkopffräser
Für die HSC von Aluminium, Magnesium, Kupfer und Kunststoff



Example: Order code AB 240 010-02004

d-Code	d x H x D	L	AB 240 Z=2
010-02004	R0.5 x 2.0 x C 4	50	●
015-03004	R0.75 x 3.0 x C 4	50	●
020-04004	R1.0 x 4.0 x C 4	50	●
030-06004	R1.5 x 6.0 x C 4	50	●
040-08004	R2.0 x 8.0 x C 4	50	●
050-10006	R2.5 x 10.0 x C 6	50	●
060-12006	R3.0 x 12.0 x C 6	50	●
080-16008	R4.0 x 16.0 x C 8	60	●
100-20010	R5.0 x 20.0 x C10	75	●
120-24012	R6.0 x 24.0 x C12	75	●

	Material	
N	Al and Al-alloy	◎
N	Al cast alloy	○
N	Copper alloy	○
N	Brass, Bronze	○
N	Magnesium alloy	○
N	Plastic	◎



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Alu-cut

● Stock item, subject to confirmation ◇ On request

VHM	40°	HSC

Ball nose end mills, long neck

For machining of aluminum, magnesium, copper alloys and plastic.

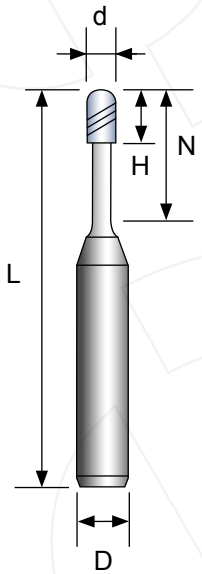
Kugelkopffräser, überlaufhals

Für die Bearbeitung von Aluminium, Magnesium, Kupfer und Kunststoff.

N	
Al and Al-alloy	◎
Al cast alloy	○
Copper alloy	○
Brass, Bronze	○
Magnesium alloy	○
Plastic	◎

Example: Order code ABLN 240 010-06004

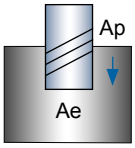
d-Code	d x N x D	H	L	ABLN 240 Z=2	
010-06004	R0.5 x N 6 x C 4	1.5	50	◇	
010-08004	R0.5 x N 8 x C 4	1.5	50	◇	
010-10004	R0.5 x N 10 x C 4	1.5	50	◇	
010-12004	R0.5 x N 12 x C 4	1.5	50	◇	
015-08004	R0.75 x N 8 x C 4	2.3	50	◇	
015-12004	R0.75 x N 12 x C 4	2.3	50	◇	
015-16004	R0.75 x N 16 x C 4	2.3	50	◇	
020-08004	R1.0 x N 8 x C 4	3.0	50	◇	
020-12004	R1.0 x N 12 x C 4	3.0	50	◇	
020-16004	R1.0 x N 16 x C 4	3.0	50	◇	



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

Alu-cut — Slotting / Roughing

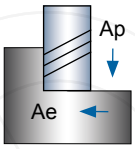


Ap = 0.5 x d [mm]
Ae = 1 x d [mm]

AE 250, AE 350, AE 255 (#1), AE 355 (#2)

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			2	3	4	5	6	8	10	12	16
N	Al and Al-alloy	300 - 400	0.011	0.015	0.020	0.025	0.031	0.042	0.050	0.060	0.082
	Al cast alloy	120 - 160	0.007	0.010	0.018	0.022	0.027	0.035	0.044	0.052	0.071
	Copper alloy	80 - 110	0.011	0.015	0.020	0.025	0.031	0.042	0.050	0.060	0.082
	Brass, Bronze	60 - 80	0.007	0.010	0.016	0.020	0.025	0.032	0.039	0.048	0.066
	Magnesium alloy	160 - 210	0.012	0.016	0.021	0.026	0.029	0.042	0.053	0.063	0.086
	Plastic	80 - 100	0.007	0.010	0.016	0.020	0.024	0.032	0.038	0.046	0.063

Alu-cut — Side milling / Roughing

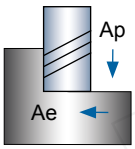


Ap = 1 x d [mm]
Ae = 0.5 x d [mm]

AE 250, AE 350, AE 255 (#1), AE 355 (#2)

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			2	3	4	5	6	8	10	12	16
N	Al and Al-alloy	300 - 400	0.011	0.015	0.020	0.025	0.031	0.042	0.050	0.060	0.082
	Al cast alloy	120 - 160	0.007	0.010	0.018	0.022	0.027	0.035	0.044	0.052	0.071
	Copper alloy	80 - 110	0.011	0.015	0.020	0.025	0.031	0.042	0.050	0.060	0.082
	Brass, Bronze	60 - 80	0.007	0.010	0.016	0.020	0.025	0.032	0.039	0.048	0.066
	Magnesium alloy	160 - 210	0.012	0.015	0.020	0.025	0.031	0.042	0.050	0.060	0.082
	Plastic	80 - 100	0.007	0.010	0.016	0.020	0.024	0.032	0.038	0.046	0.063

Alu-cut — Side milling / Pre-finishing



Ap = 1 x d [mm]
Ae = 0.1 x d [mm]

AE 250, AE 350, AE 255 (#1), AE 355 (#2)

		Vc [m / min]	fz feed [mm / tooth] by diameter								
			2	3	4	5	6	8	10	12	16
N	Al and Al-alloy	380 - 500	0.016	0.024	0.026	0.032	0.041	0.058	0.073	0.090	0.120
	Al cast alloy	160 - 210	0.013	0.019	0.022	0.028	0.039	0.053	0.065	0.079	0.105
	Copper alloy	90 - 120	0.016	0.024	0.026	0.032	0.041	0.058	0.073	0.090	0.120
	Brass, Bronze	75 - 100	0.009	0.013	0.021	0.026	0.033	0.047	0.059	0.072	0.096
	Magnesium alloy	200 - 260	0.016	0.024	0.026	0.032	0.041	0.058	0.073	0.090	0.120
	Plastic	85 - 110	0.011	0.016	0.021	0.026	0.029	0.042	0.053	0.063	0.084

Notes	
	#1: For AE 255, adjust feed (fz) and cutting speed (n) 15% - 25% lower. **#2:** For AE 355, adjust feed (fz) and cutting speed (n) 15% - 25% lower.

Copper

High-performance end mills with CrN coating for HSC of copper electrode.

Hochleistungs-Schaftfräser mit CrN Beschichtung für die HSC von Kupfer-Elektrode.

105 - 114

								
Tool code		CE 235	CE 435	CELN 235	CB 235	CBLS 235	CBLN 235	CR 230
Number of teeth		Z=2	Z=4	Z=2	Z=2	Z=2	Z=2	Z=2
Page		108	108	109	110	111	112	113
		VHM	VHM	VHM	VHM	VHM	VHM	VHM
		CrN Coating	CrN Coating	CrN Coating	CrN Coating	CrN Coating	CrN Coating	CrN Coating
		35°	35°	35°	35°	35°	35°	30°
		90°	90°	90°				R
		HSC	HSC	HSC	HSC	HSC	HSC	HSC
N	Copper alloy	◎	◎	◎	◎	◎	◎	◎
	Al and Al-alloy	○	○	○	○	○	○	○

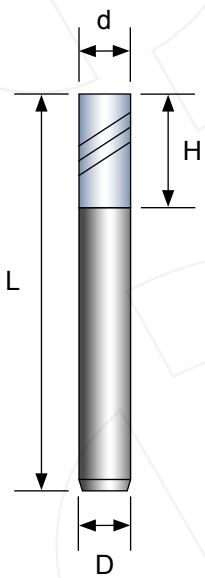
								
Tool code		CRLN 230						
Number of teeth		Z=2						
Page		114						
		VHM CrN Coating  30°   HSC						
N	Copper alloy	◎						
	Al and Al-alloy	○						

VHM	35°	HSC
CrN Coating	90°	

CrN coated end mills
For HSC of copper electrode

CrN beschichtet-Schaftfräser
Für die HSC von Kupfer-Elektrode


N	
Copper alloy	◎
Al and Al-alloy	○



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Example: Order code CE 235 002-00404

d-Code	d x H x D	L	CE 235 Z=2	CE 435 Z=4
002-00404	0.2 x 0.4 x C 4	50	◇	
003-00604	0.3 x 0.6 x C 4	50	◇	
004-00804	0.4 x 0.8 x C 4	50	◇	
005-01004	0.5 x 1.0 x C 4	50	●	
006-01204	0.6 x 1.2 x C 4	50	◇	
008-01604	0.8 x 1.6 x C 4	50	◇	
010-03004	1.0 x 3.0 x C 4	50	●	
015-04004	1.5 x 4.0 x C 4	50	◇	
020-06004	2.0 x 6.0 x C 4	50	●	
025-07004	2.5 x 7.0 x C 4	50	◇	
030-08004	3.0 x 8.0 x C 4	50	●	◇
040-11004	4.0 x 11.0 x C 4	50	●	●
050-13006	5.0 x 13.0 x C 6	50	◇	◇
060-15006	6.0 x 15.0 x C 6	50	●	●
080-20008	8.0 x 20.0 x C 8	60		●
100-25010	10.0 x 25.0 x C10	75		●
120-30012	12.0 x 30.0 x C12	75		●

Long cut length / Lange schneidkantenlänge

030-15004	3.0 x 15.0 x C 4	75		◇
040-20004	4.0 x 20.0 x C 4	75		◇
060-25006	6.0 x 25.0 x C 6	75		◇
080-30008	8.0 x 30.0 x C 8	75		◇
100-40010	10.0 x 40.0 x C10	100		◇
120-45012	12.0 x 45.0 x C12	100		◇

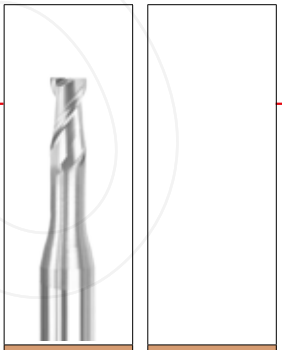
● Stock item, subject to confirmation ◇ On request

VHM | 35° | HSC

CrN Coating | 90°

CrN coated end mills, long neck
For deep milling of copper electrode

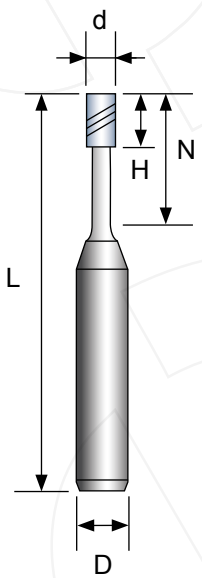
CrN beschichtet-Schaftfräser, überlaufhals
Für die HSC von Kupfer-Elektrode



Example: Order code CELN 235 005-04004

N	
	Copper alloy ◎
	Al and Al-alloy ○

d-Code	d x N x D	H	L	CELN 235 Z=2
005-04004	0.5 x N 4 x C 4	0.7	50	●
005-06004	0.5 x N 6 x C 4	0.7	50	◇
005-08004	0.5 x N 8 x C 4	0.7	50	◇
008-04004	0.8 x N 4 x C 4	1.2	50	◇
008-06004	0.8 x N 6 x C 4	1.2	50	●
008-08004	0.8 x N 8 x C 4	1.2	50	◇
010-06004	1.0 x N 6 x C 4	1.5	50	◇
010-08004	1.0 x N 8 x C 4	1.5	50	●
010-10004	1.0 x N 10 x C 4	1.5	50	◇
010-12004	1.0 x N 12 x C 4	1.5	50	◇
015-08004	1.5 x N 8 x C 4	2.3	50	◇
015-12004	1.5 x N 12 x C 4	2.3	50	●
015-16004	1.5 x N 16 x C 4	2.3	60	◇
020-08004	2.0 x N 8 x C 4	3.0	50	◇
020-12004	2.0 x N 12 x C 4	3.0	50	●
020-16004	2.0 x N 16 x C 4	3.0	60	◇
020-20004	2.0 x N 20 x C 4	3.0	60	◇
030-16006	3.0 x N 16 x C 6	4.5	60	●
040-20006	4.0 x N 20 x C 6	6.0	60	●
060-30006	6.0 x N 30 x C 6	9.0	75	◇



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02

VHM	35°	HSC
CrN Coating		

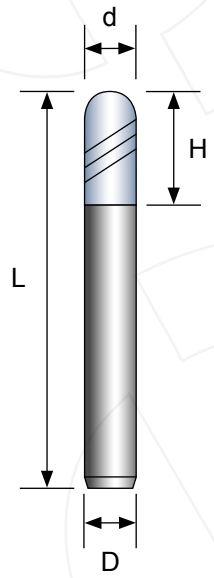
CrN coated ball nose end mills
For HSC of copper electrode

CrN beschichtet-Kugelkopffräser
Für die HSC von Kupfer-Elektrode

Example: Order code CB 235 004-00804

N	
	Copper alloy ◎
	Al and Al-alloy ○

d-Code	d x H x D	L	CB 235 Z=2
004-00804	R0.2 x 0.8 x C 4	50	◇
005-01004	R0.25 x 1.0 x C 4	50	●
006-01204	R0.3 x 1.2 x C 4	50	●
008-01604	R0.4 x 1.6 x C 4	50	◇
010-02004	R0.5 x 2.0 x C 4	50	●
015-03004	R0.75 x 3.0 x C 4	50	◇
020-04004	R1.0 x 4.0 x C 4	50	●
030-06004	R1.5 x 6.0 x C 4	50	●
040-08004	R2.0 x 8.0 x C 4	50	●



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02

● Stock item, subject to confirmation ◇ On request

VHM | 35° | HSC

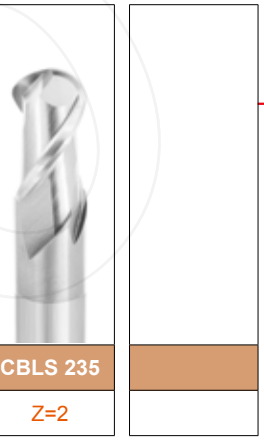
CrN Coating

CrN coated ball nose end mills, long shank

For HSC of copper electrode

CrN beschichtet-Kugelkopffräser, langer schaft

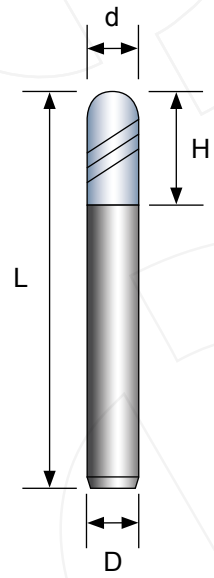
Für die HSC von Kupfer-Elektrode



N	
	Copper alloy ◎
	Al and Al-alloy ○

Example: Order code CBLS 235 040-08104

d-Code	d x L x D	H	CBLS 235 Z=2	
040-08104	R2.0 x L 75 x C 4	8.0	●	
050-10106	R2.5 x L 75 x C 6	10.0	◇	
060-12106	R3.0 x L 75 x C 6	12.0	●	
080-16308	R4.0 x L100 x C 8	16.0	●	
100-20310	R5.0 x L100 x C10	20.0	●	
120-24312	R6.0 x L100 x C12	24.0	◇	



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

VHM | 35° | HSC

CrN Coating

CrN coated ball nose end mills, long neck

For deep milling copper electrode

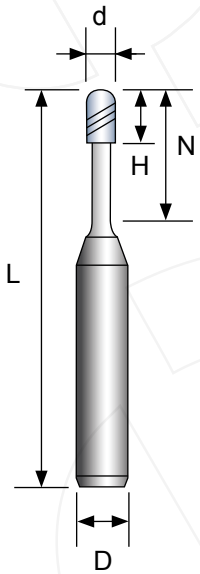
CrN beschichtet-Kugelkopffräser - überlaufhals

Für die HSC von Kupfer-Elektrode

Example: Order code CBLN 235 006-04004

N	
	Copper alloy ◎
	Al and Al-alloy ○

d-Code	d x N x D	H	L	CBLN 235 Z=2	
006-04004	R0.3 x N 4 x C 4	0.6	50	●	
006-06004	R0.3 x N 6 x C 4	0.6	50	●	
008-04004	R0.4 x N 4 x C 4	0.8	50	●	
008-08004	R0.4 x N 8 x C 4	0.8	50	●	
010-06004	R0.5 x N 6 x C 4	1.0	50	●	
010-10004	R0.5 x N 10 x C 4	1.0	50	●	
015-08004	R0.75 x N 8 x C 4	1.5	50	●	
015-16004	R0.75 x N 16 x C 4	1.5	60	●	
020-10004	R1.0 x N 10 x C 4	2.0	50	●	
020-20004	R1.0 x N 20 x C 4	2.0	60	●	
030-16006	R1.5 x N 16 x C 6	3.0	60	●	
030-30006	R1.5 x N 30 x C 6	3.0	75	◇	
040-20006	R2.0 x N 20 x C 6	4.0	75	●	
040-40006	R2.0 x N 40 x C 6	4.0	100	◇	
060-30006	R3.0 x N 30 x C 6	6.0	75	●	
060-60006	R3.0 x N 60 x C 6	6.0	100	◇	



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02

● Stock item, subject to confirmation ◇ On request

VHM | 30° | HSC

CrN Coating | R

CrN coated corner radius end mills
For HSC of copper electrode

CrN beschichtet-Eckradiusfräser
Für die HSC von Kupfer-Elektrode

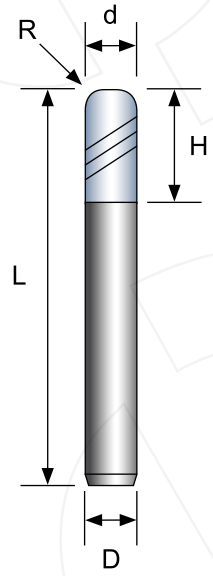
CR 230

Z=2

Example: Order code CR 230 060-05006

N	
	Copper alloy ◎
	Al and Al-alloy ○

d-Code	d x R x H x D	L	CR 230 Z=2	
060-05006	6.0 x R0.5 x 12.0 x C 6	50	◇	
060-10006	6.0 x R1.0 x 12.0 x C 6	50	●	
080-05008	8.0 x R0.5 x 16.0 x C 8	60	◇	
080-10008	8.0 x R1.0 x 16.0 x C 8	60	●	
100-05010	10.0 x R0.5 x 20.0 x C10	75	◇	
100-10010	10.0 x R1.0 x 20.0 x C10	75	●	
120-05012	12.0 x R0.5 x 24.0 x C12	75	◇	
120-10012	12.0 x R1.0 x 24.0 x C12	75	◇	



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

VHM | 30° | HSC

CrN Coating | R

CrN coated corner radius end mills, long neck

For deep milling copper electrode

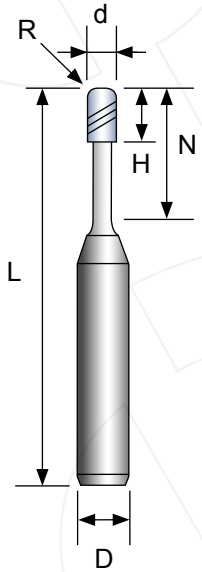
CrN beschichtet-Eckradiusfräser - überlaufhals

Für die HSC von Kupfer-Elektrode

Example: Order code CRLN 230 010-02084

N	
	Copper alloy ◎
	Al and Al-alloy ○

d-Code	d x R x N x D	H	L	CRLN 230 Z=2
010-02064	1.0 x R0.2 x N 6 x C 4	1.2	50	●
010-02084	1.0 x R0.2 x N 8 x C 4	1.2	50	◇
010-02104	1.0 x R0.2 x N 10 x C 4	1.2	50	●
010-02124	1.0 x R0.2 x N 12 x C 4	1.2	50	◇
015-02124	1.5 x R0.2 x N 12 x C 4	1.8	50	●
015-02204	1.5 x R0.2 x N 20 x C 4	1.8	60	◇
020-02124	2.0 x R0.2 x N 12 x C 4	2.4	50	●
020-02164	2.0 x R0.2 x N 16 x C 4	2.4	60	◇
020-02204	2.0 x R0.2 x N 20 x C 4	2.4	60	●
020-05124	2.0 x R0.5 x N 12 x C 4	2.4	50	●
020-05164	2.0 x R0.5 x N 16 x C 4	2.4	60	◇
020-05204	2.0 x R0.5 x N 20 x C 4	2.4	60	●
030-02246	3.0 x R0.2 x N 24 x C 6	3.6	75	●
030-05246	3.0 x R0.5 x N 24 x C 6	3.6	75	●
040-05246	4.0 x R0.5 x N 24 x C 6	4.8	75	●



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

● Stock item, subject to confirmation ◇ On request

Graphite

High-performance end mills with CVD diamond coating for HSC of graphite.

Hochleistungs-Schaftfräser mit CVD-Diamant Beschichtung für die HSC von Graphit.

			New 	New 		New 		
Tool code		GE 235	GELN 435	GBLS 235	GBLN 235	GRLS 430	GRLN 230	
Number of teeth		Z=2	Z=4	Z=2	Z=2	Z=4	Z=2	
Page		117	118	119	120	121	122	
		VHM	VHM	VHM	VHM	VHM	VHM	
		DIA Coating	DIA Coating	DIA Coating	DIA Coating	DIA Coating	DIA Coating	
		35°	35°	35°	35°	30°	30°	
		90°	90°			R	R	
		HSC	HSC	HSC	HSC	HSC	HSC	
N	Graphite	◎	◎	◎	◎	◎	◎	
N	Al-alloy	○	○	○	○	○	○	
N	CFRP	○	○	○	○	○	○	

VHM	35°	HSC
DIA Coating	90°	

Diamond coated end mills
For HSC of Graphite

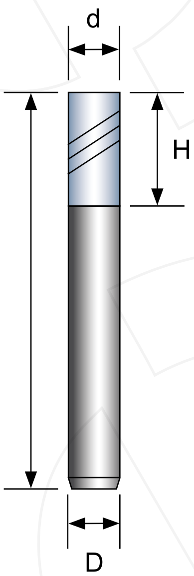
CVD-Diamant beschichtet Schaftfräser
Für die HSC von Graphit

Example: Order code GE 235 005-02004

d-Code	d x H x D	L	GE 235 Z=2
005-02004	0.5 x 2.0 x C 4	50	●
010-03004	1.0 x 3.0 x C 4	50	●
015-04004	1.5 x 4.0 x C 4	50	●
020-06004	2.0 x 6.0 x C 4	50	●
030-08004	3.0 x 8.0 x C 4	50	●
040-11004	4.0 x 11.0 x C 4	50	●

N	Graphite	◎
	Al-alloy	○
	CFRP	○

Cutting data, P123



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

Graphite

VHM | 35° | HSC

DIA Coating | 90°

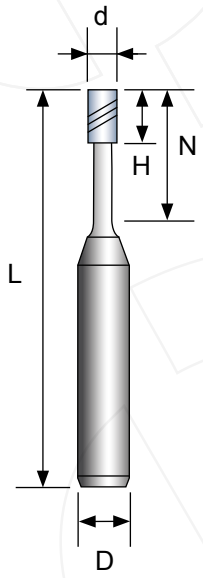
Diamond coated end mills
Long neck for deep milling of Graphite

CVD-Diamant beschichtet Schaftfräser, überlaufhals
Für die HSC von Graphit

New

Example: Order code GELN 435 020-12004			GELN 435	
d-Code	d x N x D	H L	Z=4	
020-12004	2.0 x N 12 x C 4	3.0 50	◇	
020-20004	2.0 x N 20 x C 4	3.0 60	◇	
030-16006	3.0 x N 16 x C 6	4.5 60	◇	
030-30006	3.0 x N 30 x C 6	4.5 75	◇	
040-40006	4.0 x N 40 x C 6	6.0 100	◇	

N	Graphite	◎
	Al-alloy	○
	CFRP	○



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02

● Stock item, subject to confirmation ◇ On request

VHM	35°	HSC
DIA Coating		

Diamond coated ball nose end mills, long shank

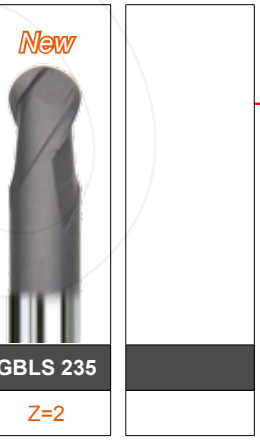
For HSC of Graphite

On demand: available with working depth

CVD-Diamant beschichtet Kugelkopffräser, langer schaft

Für die HSC von Graphit

Auf Wunsch mit Arbeitstiefe lieferbar

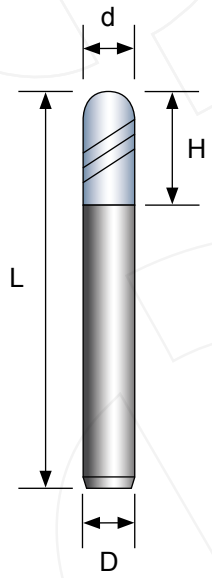


N	
	Graphite ◎
	Al-alloy ○
	CFRP ○

Example: Order code GBLS 230 080-16308

d-Code	d x L x D	H	GBLS 235 Z=2	
080-16308	R4.0 x L100 x C 8	16	●	
080-16508	R4.0 x L150 x C 8	16	●	
100-20310	R5.0 x L100 x C10	20	●	
100-20510	R5.0 x L150 x C10	20	●	
120-24312	R6.0 x L100 x C12	24	◇	
120-24512	R6.0 x L150 x C12	24	◇	

Cutting data, P123



Tolerance / Toleranz

Range	Diameter
8 ≤ d < 18	0 / -0.03

VHM	35°	HSC
DIA Coating		

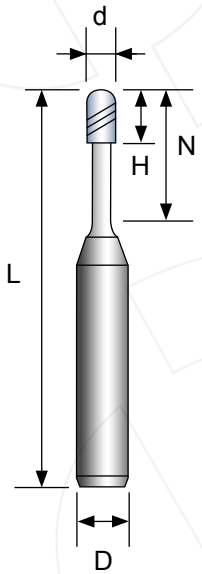
Diamond coated ball nose end mills
Long neck for deep milling of Graphite

CVD-Diamant beschichtet Kugelkopffräser, überlaufhals
Für die HSC von Graphit

N	Graphite	◎
	Al-alloy	○
	CFRP	○

Example: Order code GBLN 235 004-02004

d-Code	d x N x D	H	L	GBLN 235 Z=2
004-02004	R0.2 x N 2 x C 4	0.4	50	◇
004-04004	R0.2 x N 4 x C 4	0.4	50	●
006-04004	R0.3 x N 4 x C 4	0.6	50	◇
006-06004	R0.3 x N 6 x C 4	0.6	50	●
006-10004	R0.3 x N 10 x C 4	0.6	50	◇
010-10004	R0.5 x N 10 x C 4	1.0	50	●
010-16004	R0.5 x N 16 x C 4	1.0	60	●
010-20004	R0.5 x N 20 x C 4	1.0	60	●
020-10004	R1.0 x N 10 x C 4	2.0	50	●
020-20004	R1.0 x N 20 x C 4	2.0	60	●
020-30004	R1.0 x N 30 x C 4	2.0	75	●
030-20006	R1.5 x N 20 x C 6	3.0	75	●
030-30006	R1.5 x N 30 x C 6	3.0	75	●
040-20006	R2.0 x N 20 x C 6	4.0	75	●
040-40006	R2.0 x N 40 x C 6	4.0	100	●
060-30006	R3.0 x N 30 x C 6	6.0	75	●
060-60006	R3.0 x N 60 x C 6	6.0	100	●



Tolerance / Toleranz

Range	Diameter
d < 1	0 / -0.015
1 ≤ d < 8	0 / -0.02

● Stock item, subject to confirmation ◇ On request

VHM	30°	HSC
DIA Coating	R	

Diamond coated corner radius end mills, long shank

For HSC of Graphite
On demand: available with working depth

CVD-Diamant beschichtet Eckradiusfräser, langer schaft

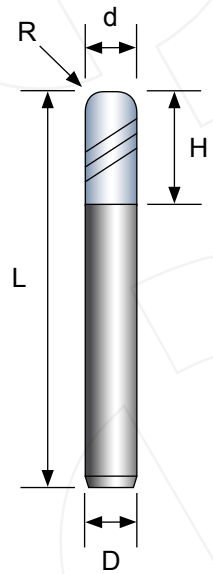
Für die HSC von Graphit
Auf Wunsch mit Arbeitstiefe lieferbar

N	Graphite	◎
	Al-alloy	○
	CFRP	○

Example: Order code GRLS 430 060-05306

d-Code	d x R x L x D	H	GRLS 430 Z=4	
060-05306	6.0 x R0.5 x L100 x C 6	12	●	
060-10306	6.0 x R1.0 x L100 x C 6	12	●	
080-05308	8.0 x R0.5 x L100 x C 8	16	●	
080-10308	8.0 x R1.0 x L100 x C 8	16	●	
100-05510	10.0 x R0.5 x L150 x C10	20	◇	
100-10510	10.0 x R1.0 x L150 x C10	20	●	
120-05512	12.0 x R0.5 x L150 x C12	24	◇	
120-10512	12.0 x R1.0 x L150 x C12	24	◇	

Cutting data, P124



Tolerance / Toleranz

Range	Diameter
1 ≤ d < 8	0 / -0.02
8 ≤ d < 18	0 / -0.03

VHM | 30° | HSC

DIA Coating | R

Diamond coated corner radius end mills, long neck
For deep milling of Graphite

CVD-Diamant beschichtet Eckradiusfräser, überlaufhals
Für die HSC von Graphit

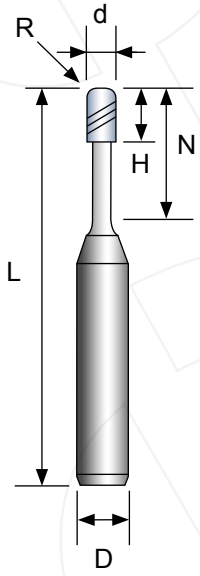
GRLN 230

Z=2

Example: Order code GRLN 230 010-02006

N		
	Graphite	◎
	Al-alloy	○
	CFRP	○

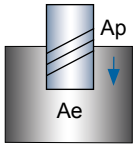
d-Code	d x R x N x D	H	L	Z=2	
010-02064	1.0 x R0.2 x N 6 x C 4	1.2	50	◇	
010-02104	1.0 x R0.2 x N 10 x C 4	1.2	50	●	
015-02104	1.5 x R0.2 x N 10 x C 4	1.8	50	●	
015-02204	1.5 x R0.2 x N 20 x C 4	1.8	60	◇	
020-02124	2.0 x R0.2 x N 12 x C 4	2.4	50	●	
020-02204	2.0 x R0.2 x N 20 x C 4	2.4	60	●	
020-05124	2.0 x R0.5 x N 12 x C 4	2.4	50	◇	
020-05204	2.0 x R0.5 x N 20 x C 4	2.4	60	◇	
030-02246	3.0 x R0.2 x N 24 x C 6	3.6	75	●	
030-05246	3.0 x R0.5 x N 24 x C 6	3.6	75	●	
040-05246	4.0 x R0.5 x N 24 x C 6	4.8	75	●	

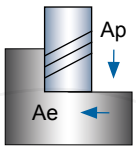


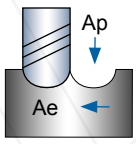
Tolerance / Toleranz

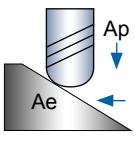
Range	Diameter
1 ≤ d < 8	0 / -0.02

● Stock item, subject to confirmation ◇ On request

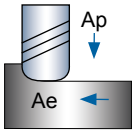
Graphite	Slotting / Roughing						
	Ap = 0.1 x d [mm] Ae = 1 x d [mm]	GE 235 (#1)					
	Vc [m / min]	fz feed [mm / tooth] by diameter					
		0.5	1	1.5	2	3	4
N Graphite	120 - 200	0.006	0.011	0.014	0.018	0.027	0.036

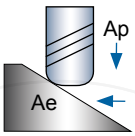
Graphite	Side milling / Roughing							
	Ap = 2.0 x d [mm] Ae = 0.05 x d [mm]	GE 235 (#1)						
	Vc [m / min]	fz feed [mm / tooth] by diameter						
		0.5	1	1.5	2	3	4	6
N Graphite	120 - 200	0.007	0.014	0.018	0.023	0.034	0.045	0.068

Graphite	Contour line / Roughing (HSC)			
	Ap = 0.1 x d [mm] Ae = 0.3 x d [mm]	GBLS 235 (#1)		
	Vc [m / min]	fz feed [mm / tooth] by diameter		
		8.0	10.0	12.0
N Graphite	250 - 350	0.096	0.120	0.144

Graphite	Copy milling / Finishing (HSC)			
	Ap = 0.05 x d [mm] Ae = 0.03 x d [mm]	GBLS 235 (#1)		
	Vc [m / min]	fz feed [mm / tooth] by diameter		
		8.0	10.0	12.0
N Graphite	250 - 350	0.106	0.132	0.158

Notes	
	#1 For GE 235, the maxinum spindle speed (n) should be below 30000 rpm. **#2** For GBLS 235, adjust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 30% lower according to the ratio of overhang length / cutting diameter. ▶ Graphite should be machined by the machining center designed for graphite machining. ▶ When handling with graphite material, dust collector and respirator are recommended to protect against graphite dust. ▶ Air blow cooling is recommended for the machining of graphite. ▶ Adjust both spindle speed and feed at the same rate when chattering.

Graphite	Contour line / Roughing (HSC)			
	Ap = 0.1 x d [mm] Ae = 0.6 x d [mm]	GRLS 430 (#1)		
	Vc [m / min]	fz feed [mm / tooth] by diameter		
		8.0	10.0	12.0
N Graphite	180 - 250	0.096	0.120	0.144

Graphite	Contour line / Finishing (HSC)			
	Ap = 0.15 x d [mm] Ae = 0.15 x d [mm]	GRLS 430 (#1)		
	Vc [m / min]	fz feed [mm / tooth] by diameter		
		8.0	10.0	12.0
N Graphite	250 - 350	0.096	0.120	0.144

Notes	
	#1 For GRLS 430, adjust feed [mm / tooth](fz) and cutting speed (Vc) 10% - 30% lower according to the ratio of overhang length / cutting diameter. ► Graphite should be machined by the machining center designed for graphite machining. ► When handling with graphite material, dust collector and respirator are recommended to protect against graphite dust. ► Air blow cooling is recommended for the machining of graphite. ► Adjust both spindle speed and feed at the same rate when chattering.

Drills

High-performance solid carbide drills with through coolant holes for HPC of steels, tools steels, austenitic stainless steels and cast irons.

Hochleistungs-vollhartmetall-bohrer mit innenkühlung für die HPC von Stählen, Werkzeuge Stählen, austenitische rostfreie Stählen und Gusseisen.

125 - 134

VHM		
Al-X Coating	140°	
HRc 55		

Solid carbide twist drills with internal coolant (3 x d)

For HPC of steels, tools steels, austenitic stainless steels and cast irons.

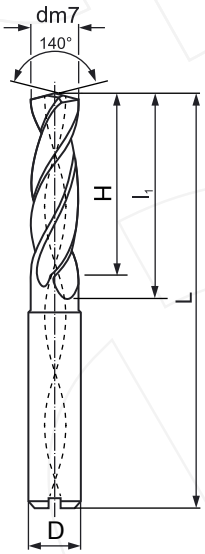
Vollhartmetall-bohrer mit innenkühlung (3 x d)

Für die HPC von Stählen, Werkzeuge Stählen, austenitische rostfreie Stählen und Gusseisen..

Example: Order code 303 DA 030-01406

				303 DA	
d-Code	d x H x D	l_1	L	Z=2	
030-01406	3.0 x 14 x C 6	20	62	●	
031-01406	3.1 x 14 x C 6	20	62	◇	
032-01406	3.2 x 14 x C 6	20	62	◇	
033-01406	3.3 x 14 x C 6	20	62	◇	
034-01406	3.4 x 14 x C 6	20	62	●	
035-01406	3.5 x 14 x C 6	20	62	●	
036-01406	3.6 x 14 x C 6	20	62	◇	
037-01406	3.7 x 14 x C 6	20	62	◇	
038-01706	3.8 x 17 x C 6	24	66	●	
039-01706	3.9 x 17 x C 6	24	66	◇	
040-01706	4.0 x 17 x C 6	24	66	●	
041-01706	4.1 x 17 x C 6	24	66	◇	
042-01706	4.2 x 17 x C 6	24	66	●	
043-01706	4.3 x 17 x C 6	24	66	●	
044-01706	4.4 x 17 x C 6	24	66	◇	
045-01706	4.5 x 17 x C 6	24	66	●	
046-01706	4.6 x 17 x C 6	24	66	◇	
047-01706	4.7 x 17 x C 6	24	66	◇	
048-02006	4.8 x 20 x C 6	28	66	●	
049-02006	4.9 x 20 x C 6	28	66	●	
050-02006	5.0 x 20 x C 6	28	66	●	
051-02006	5.1 x 20 x C 6	28	66	●	
052-02006	5.2 x 20 x C 6	28	66	●	
053-02006	5.3 x 20 x C 6	28	66	◇	
054-02006	5.4 x 20 x C 6	28	66	◇	
055-02006	5.5 x 20 x C 6	28	66	●	
056-02006	5.6 x 20 x C 6	28	66	◇	
057-02006	5.7 x 20 x C 6	28	66	◇	
058-02006	5.8 x 20 x C 6	28	66	●	
059-02006	5.9 x 20 x C 6	28	66	●	
060-02006	6.0 x 20 x C 6	28	66	●	
061-02408	6.1 x 24 x C 8	34	79	◇	
062-02408	6.2 x 24 x C 8	34	79	◇	
063-02408	6.3 x 24 x C 8	34	79	◇	
064-02408	6.4 x 24 x C 8	34	79	◇	
065-02408	6.5 x 24 x C 8	34	79	●	
066-02408	6.6 x 24 x C 8	34	79	●	
067-02408	6.7 x 24 x C 8	34	79	◇	
068-02408	6.8 x 24 x C 8	34	79	●	
069-02408	6.9 x 24 x C 8	34	79	●	

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	○
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	



● Stock item, subject to confirmation ◇ On request

VHM

Al-X Coating

140°

HRc 55

Solid carbide twist drills with internal coolant (3 x d)

For HPC of steels, tools steels, austenitic stainless steels and cast irons.

Vollhartmetall-bohrer mit innenkühlung (3 x d)

Für die HPC von Stählen, Werkzeuge Stähle, austenitische rostfreie Stählen und Gusseisen.

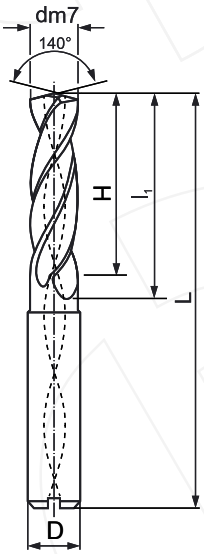
New

303 DA

Z=2

Example: Order code 303 DA 070-02408

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	○
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	



d-Code	d x H x D	l_1 L	Z=2	
070-02408	7.0 x 24 x C 8	34 79	●	
071-02908	7.1 x 29 x C 8	41 79	◇	
072-02908	7.2 x 29 x C 8	41 79	◇	
073-02908	7.3 x 29 x C 8	41 79	◇	
074-02908	7.4 x 29 x C 8	41 79	◇	
075-02908	7.5 x 29 x C 8	41 79	●	
076-02908	7.6 x 29 x C 8	41 79	◇	
077-02908	7.7 x 29 x C 8	41 79	◇	
078-02908	7.8 x 29 x C 8	41 79	●	
079-02908	7.9 x 29 x C 8	41 79	●	
080-02908	8.0 x 29 x C 8	41 79	●	
081-03510	8.1 x 35 x C10	47 89	●	
082-03510	8.2 x 35 x C10	47 89	●	
083-03510	8.3 x 35 x C10	47 89	◇	
084-03510	8.4 x 35 x C10	47 89	◇	
085-03510	8.5 x 35 x C10	47 89	●	
086-03510	8.6 x 35 x C10	47 89	●	
087-03510	8.7 x 35 x C10	47 89	●	
088-03510	8.8 x 35 x C10	47 89	●	
089-03510	8.9 x 35 x C10	47 89	●	
090-03510	9.0 x 35 x C10	47 89	●	
091-03510	9.1 x 35 x C10	47 89	◇	
092-03510	9.2 x 35 x C10	47 89	◇	
093-03510	9.3 x 35 x C10	47 89	◇	
094-03510	9.4 x 35 x C10	47 89	◇	
095-03510	9.5 x 35 x C10	47 89	●	
096-03510	9.6 x 35 x C10	47 89	◇	
097-03510	9.7 x 35 x C10	47 89	◇	
098-03510	9.8 x 35 x C10	47 89	●	
099-03510	9.9 x 35 x C10	47 89	●	
100-03510	10.0 x 35 x C10	47 89	●	
102-04012	10.2 x 40 x C12	55 102	●	
105-04012	10.5 x 40 x C12	55 102	●	
108-04012	10.8 x 40 x C12	55 102	●	
110-04012	11.0 x 40 x C12	55 102	●	
112-04012	11.2 x 40 x C12	55 102	◇	
113-04012	11.3 x 40 x C12	55 102	◇	
115-04012	11.5 x 40 x C12	55 102	●	
118-04012	11.8 x 40 x C12	55 102	●	

VHM

Al-X Coating

140°

HRc 55

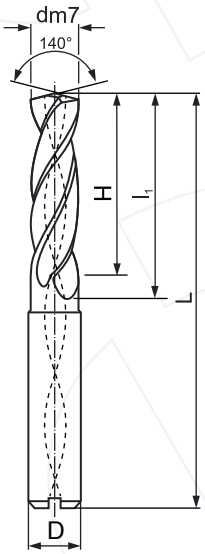
Solid carbide twist drills with internal coolant (3 x d)

For HPC of steels, tools steels, austenitic stainless steels and cast irons.

Vollhartmetall-bohrer mit innenkühlung (3 x d)

Für die HPC von Stählen, Werkzeuge Stählen, austenitische rostfreie Stählen und Gusseisen.

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	○
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	



Example: Order code 303 DA 120-04012

d-Code	d x H x D	l_1 L	303 DA Z=2	
120-04012	12.0 x 40 x C12	55 102	●	
122-04314	12.2 x 43 x C14	60 107	◇	
125-04314	12.5 x 43 x C14	60 107	●	
128-04314	12.8 x 43 x C14	60 107	●	
130-04314	13.0 x 43 x C14	60 107	●	
133-04314	13.3 x 43 x C14	60 107	◇	
135-04314	13.5 x 43 x C14	60 107	●	
138-04314	13.8 x 43 x C14	60 107	●	
140-04314	14.0 x 43 x C14	60 107	●	
145-04516	14.5 x 45 x C16	65 115	●	
150-04516	15.0 x 45 x C16	65 115	●	
153-04516	15.3 x 45 x C16	65 115	◇	
155-04516	15.5 x 45 x C16	65 115	◇	
158-04516	15.8 x 45 x C16	65 115	◇	
160-04516	16.0 x 45 x C16	65 115	◇	
165-05118	16.5 x 51 x C18	73 123	◇	
170-05118	17.0 x 51 x C18	73 123	◇	
175-05118	17.5 x 51 x C18	73 123	◇	
180-05118	18.0 x 51 x C18	73 123	◇	
185-05520	18.5 x 55 x C20	79 131	◇	
190-05520	19.0 x 55 x C20	79 131	◇	
195-05520	19.5 x 55 x C20	79 131	◇	
200-05520	20.0 x 55 x C20	79 131	◇	

● Stock item, subject to confirmation ◇ On request

VHM		
Al-X Coating	140°	
HRc 55		

Solid carbide twist drills with internal coolant (5 x d)

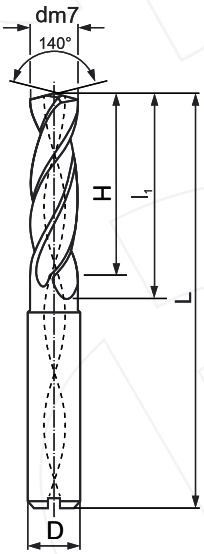
For HPC of steels, tools steels, austenitic stainless steels and cast irons.

Vollhartmetall-bohrer mit innenkühlung (5 x d)

Für die HPC von Stählen, Werkzeuge Stähle, austenitische rostfreie Stählen und Gusseisen.

Example: Order code 305 DA 030-02306

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	○
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	



d-Code	d x H x D	l_1	L	305 DA Z=2	
030-02306	3.0 x 23 x C 6	28	66	●	
031-02306	3.1 x 23 x C 6	28	66	●	
032-02306	3.2 x 23 x C 6	28	66	●	
033-02306	3.3 x 23 x C 6	28	66	●	
034-02306	3.4 x 23 x C 6	28	66	●	
035-02306	3.5 x 23 x C 6	28	66	●	
036-02306	3.6 x 23 x C 6	28	66	●	
037-02306	3.7 x 23 x C 6	28	66	●	
038-02906	3.8 x 29 x C 6	36	74	●	
039-02906	3.9 x 29 x C 6	36	74	●	
040-02906	4.0 x 29 x C 6	36	74	●	
041-02906	4.1 x 29 x C 6	36	74	●	
042-02906	4.2 x 29 x C 6	36	74	●	
043-02906	4.3 x 29 x C 6	36	74	●	
044-02906	4.4 x 29 x C 6	36	74	●	
045-02906	4.5 x 29 x C 6	36	74	●	
046-02906	4.6 x 29 x C 6	36	74	●	
047-02906	4.7 x 29 x C 6	36	74	●	
048-03506	4.8 x 35 x C 6	44	82	●	
049-03506	4.9 x 35 x C 6	44	82	●	
050-03506	5.0 x 35 x C 6	44	82	●	
051-03506	5.1 x 35 x C 6	44	82	●	
052-03506	5.2 x 35 x C 6	44	82	●	
053-03506	5.3 x 35 x C 6	44	82	●	
054-03506	5.4 x 35 x C 6	44	82	●	
055-03506	5.5 x 35 x C 6	44	82	●	
056-03506	5.6 x 35 x C 6	44	82	●	
057-03506	5.7 x 35 x C 6	44	82	●	
058-03506	5.8 x 35 x C 6	44	82	●	
059-03506	5.9 x 35 x C 6	44	82	●	
060-03506	6.0 x 35 x C 6	44	82	●	
061-04308	6.1 x 43 x C 8	53	91	●	
062-04308	6.2 x 43 x C 8	53	91	●	
063-04308	6.3 x 43 x C 8	53	91	●	
064-04308	6.4 x 43 x C 8	53	91	●	
065-04308	6.5 x 43 x C 8	53	91	●	
066-04308	6.6 x 43 x C 8	53	91	●	
067-04308	6.7 x 43 x C 8	53	91	●	
068-04308	6.8 x 43 x C 8	53	91	●	
069-04308	6.9 x 43 x C 8	53	91	●	

VHM

Al-X Coating

140°

HRc 55

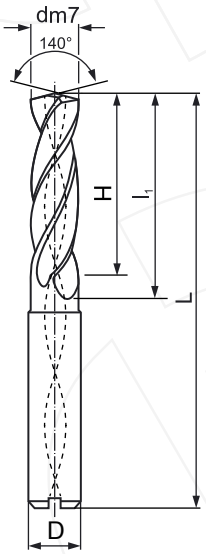
Solid carbide twist drills with internal coolant (5 x d)

For HPC of steels, tools steels, austenitic stainless steels and cast irons.

Vollhartmetall-bohrer mit innenkühlung (5 x d)

Für die HPC von Stählen, Werkzeuge Stählen, austenitische rostfreie Stählen und Gusseisen.

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	○
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	



Example: Order code 305 DA 070-04308

d-Code	d x H x D	l_1 L	305 DA Z=2	
070-04308	7.0 x 43 x C 8	53 91	●	
071-04308	7.1 x 43 x C 8	53 91	●	
072-04308	7.2 x 43 x C 8	53 91	●	
073-04308	7.3 x 43 x C 8	53 91	●	
074-04308	7.4 x 43 x C 8	53 91	●	
075-04308	7.5 x 43 x C 8	53 91	●	
076-04308	7.6 x 43 x C 8	53 91	●	
077-04308	7.7 x 43 x C 8	53 91	●	
078-04308	7.8 x 43 x C 8	53 91	●	
079-04308	7.9 x 43 x C 8	53 91	●	
080-04308	8.0 x 43 x C 8	53 91	●	
081-04910	8.1 x 49 x C10	61 103	●	
082-04910	8.2 x 49 x C10	61 103	●	
083-04910	8.3 x 49 x C10	61 103	●	
084-04910	8.4 x 49 x C10	61 103	●	
085-04910	8.5 x 49 x C10	61 103	●	
086-04910	8.6 x 49 x C10	61 103	●	
087-04910	8.7 x 49 x C10	61 103	●	
088-04910	8.8 x 49 x C10	61 103	●	
089-04910	8.9 x 49 x C10	61 103	●	
090-04910	9.0 x 49 x C10	61 103	●	
091-04910	9.1 x 49 x C10	61 103	●	
092-04910	9.2 x 49 x C10	61 103	●	
093-04910	9.3 x 49 x C10	61 103	●	
094-04910	9.4 x 49 x C10	61 103	●	
095-04910	9.5 x 49 x C10	61 103	●	
096-04910	9.6 x 49 x C10	61 103	●	
097-04910	9.7 x 49 x C10	61 103	●	
098-04910	9.8 x 49 x C10	61 103	●	
099-04910	9.9 x 49 x C10	61 103	●	
100-04910	10.0 x 49 x C10	61 103	●	
102-05612	10.2 x 56 x C12	71 118	●	
105-05612	10.5 x 56 x C12	71 118	●	
108-05612	10.8 x 56 x C12	71 118	●	
110-05612	11.0 x 56 x C12	71 118	●	
112-05612	11.2 x 56 x C12	71 118	●	
113-05612	11.3 x 56 x C12	71 118	●	
115-05612	11.5 x 56 x C12	71 118	●	
118-05612	11.8 x 56 x C12	71 118	●	

● Stock item, subject to confirmation ◇ On request

VHM		
Al-X Coating	140°	
HRc 55		

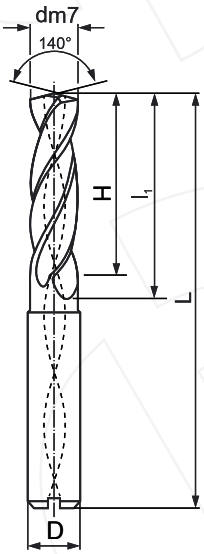
Solid carbide twist drills with internal coolant (5 x d)

For HPC of steels, tools steels, austenitic stainless steels and cast irons.

Vollhartmetall-bohrer mit innenkühlung (5 x d)

Für die HPC von Stählen, Werkzeuge Stähen, austenitische rostfreie Stählen und Gusseisen.

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	○
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	



Example: Order code 305 DA 120-05612

d-Code	d x H x D	l_1 L	305 DA Z=2	
120-05612	12.0 x 56 x C12	71 118	●	
122-06014	12.2 x 60 x C14	77 124	●	
125-06014	12.5 x 60 x C14	77 124	●	
128-06014	12.8 x 60 x C14	77 124	●	
130-06014	13.0 x 60 x C14	77 124	●	
133-06014	13.3 x 60 x C14	77 124	●	
135-06014	13.5 x 60 x C14	77 124	●	
138-06014	13.8 x 60 x C14	77 124	●	
140-06014	14.0 x 60 x C14	77 124	●	
145-06316	14.5 x 63 x C16	83 133	●	
150-06316	15.0 x 63 x C16	83 133	●	
153-06316	15.3 x 63 x C16	83 133	●	
155-06316	15.5 x 63 x C16	83 133	●	
158-06316	15.8 x 63 x C16	83 133	●	
160-06316	16.0 x 63 x C16	83 133	●	
165-07118	16.5 x 71 x C18	93 143	●	
170-07118	17.0 x 71 x C18	93 143	●	
175-07118	17.5 x 71 x C18	93 143	●	
180-07118	18.0 x 71 x C18	93 143	●	
185-07720	18.5 x 77 x C20	101 153	●	
190-07720	19.0 x 77 x C20	101 153	●	
195-07720	19.5 x 77 x C20	101 153	●	
200-07720	20.0 x 77 x C20	101 153	●	

VHM		
Al-X Coating	140°	
HRc 55		

Solid carbide twist drills with internal coolant (8 x d)

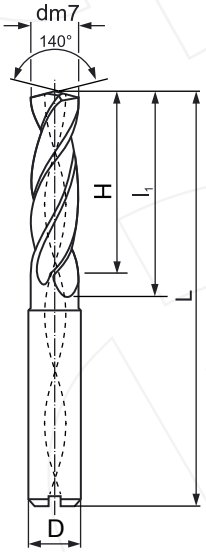
For HPC of steels, tools steels, austenitic stainless steels and cast irons.

Vollhartmetall-bohrer mit innenkühlung (8 x d)

Für die HPC von Stählen, Werkzeuge Stählen, austenitische rostfreie Stählen und Gusseisen..

Example: Order code 308FA 030-03206

				308 FA	
d-Code	d x H x D	l_1	L	Z=2	
P	HRc < 24	◎			
	HRc 24 - 35	◎			
	HRc > 35	◎			
H	HRc 45 - 55	○			
	HRc 56 - 60				
	HRc > 60				
M	Stainless steel	○			
K	Cast iron	○			
N	Copper alloy				
S	Titanium alloy	○			
	High-temperature alloy				
030-03206	3.0 x 32 x C 6	40	85	●	
031-03206	3.1 x 32 x C 6	40	85	●	
032-03206	3.2 x 32 x C 6	40	85	●	
033-03206	3.3 x 32 x C 6	40	85	●	
034-03206	3.4 x 32 x C 6	40	85	◇	
035-03206	3.5 x 32 x C 6	40	85	◇	
036-03606	3.6 x 36 x C 6	40	85	◇	
037-03606	3.7 x 36 x C 6	40	85	◇	
038-03606	3.8 x 36 x C 6	40	85	◇	
039-03606	3.9 x 36 x C 6	40	85	◇	
040-03806	4.0 x 38 x C 6	46	85	●	
041-03806	4.1 x 38 x C 6	46	85	◇	
042-03806	4.2 x 38 x C 6	46	85	●	
043-04006	4.3 x 40 x C 6	46	97	◇	
044-04006	4.4 x 40 x C 6	46	97	◇	
045-04406	4.5 x 44 x C 6	46	97	●	
046-04406	4.6 x 44 x C 6	46	97	●	
047-04406	4.7 x 44 x C 6	46	97	◇	
048-04406	4.8 x 44 x C 6	46	97	●	
049-04406	4.9 x 44 x C 6	46	97	◇	
050-04806	5.0 x 48 x C 6	57	97	●	
051-04806	5.1 x 48 x C 6	57	97	●	
052-04806	5.2 x 48 x C 6	57	97	●	
053-04806	5.3 x 48 x C 6	57	97	◇	
054-04806	5.4 x 48 x C 6	57	97	◇	
055-04806	5.5 x 48 x C 6	57	97	●	
056-04806	5.6 x 48 x C 6	57	97	◇	
057-04806	5.7 x 48 x C 6	57	97	◇	
058-04806	5.8 x 48 x C 6	57	97	●	
059-04806	5.9 x 48 x C 6	57	97	◇	
060-04806	6.0 x 48 x C 6	57	97	●	
061-06408	6.1 x 64 x C 8	76	116	◇	
062-06408	6.2 x 64 x C 8	76	116	◇	
063-06408	6.3 x 64 x C 8	76	116	◇	
064-06408	6.4 x 64 x C 8	76	116	◇	
065-06408	6.5 x 64 x C 8	76	116	●	
066-06408	6.6 x 64 x C 8	76	116	◇	
067-06408	6.7 x 64 x C 8	76	116	◇	
068-06408	6.8 x 64 x C 8	76	116	●	
069-06408	6.9 x 64 x C 8	76	116	●	



● Stock item, subject to confirmation ◇ On request

VHM

Al-X Coating

140°

HRc 55

Solid carbide twist drills with internal coolant (8 x d)

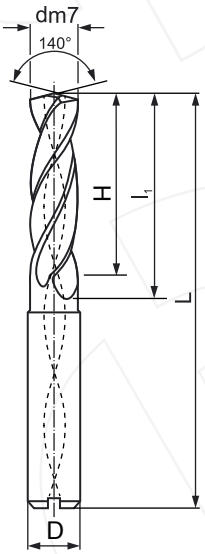
For HPC of steels, tools steels, austenitic stainless steels and cast irons.

Vollhartmetall-bohrer mit innenkühlung (8 x d)

Für die HPC von Stählen, Werkzeuge Stähle, austenitische rostfreie Stählen und Gusseisen.

New

P	HRc < 24	◎
	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	○
	HRc 56 - 60	
	HRc > 60	
M	Stainless steel	○
K	Cast iron	○
N	Copper alloy	
S	Titanium alloy	○
	High-temperature alloy	



Example: Order code 308FA 070-06408

d-Code	d x H x D	l_1 L	308 FA Z=2	
070-06408	7.0 x 64 x C 8	76 116	●	
071-06408	7.1 x 64 x C 8	76 116	◇	
072-06408	7.2 x 64 x C 8	76 116	◇	
073-06408	7.3 x 64 x C 8	76 116	◇	
074-06408	7.4 x 64 x C 8	76 116	◇	
075-06408	7.5 x 64 x C 8	76 116	●	
076-06408	7.6 x 64 x C 8	76 116	◇	
077-06408	7.7 x 64 x C 8	76 116	◇	
078-06408	7.8 x 64 x C 8	76 116	●	
079-06408	7.9 x 64 x C 8	76 116	◇	
080-06408	8.0 x 64 x C 8	76 116	●	
081-08010	8.1 x 80 x C10	95 142	◇	
082-08010	8.2 x 80 x C10	95 142	◇	
083-08010	8.3 x 80 x C10	95 142	◇	
084-08010	8.4 x 80 x C10	95 142	◇	
085-08010	8.5 x 80 x C10	95 142	●	
086-08010	8.6 x 80 x C10	95 142	●	
087-08010	8.7 x 80 x C10	95 142	●	
088-08010	8.8 x 80 x C10	95 142	●	
089-08010	8.9 x 80 x C10	95 142	◇	
090-08010	9.0 x 80 x C10	95 142	●	
091-08010	9.1 x 80 x C10	95 142	◇	
092-08010	9.2 x 80 x C10	95 142	◇	
093-08010	9.3 x 80 x C10	95 142	◇	
094-08010	9.4 x 80 x C10	95 142	◇	
095-08010	9.5 x 80 x C10	95 142	●	
096-08010	9.6 x 80 x C10	95 142	◇	
097-08010	9.7 x 80 x C10	95 142	◇	
098-08010	9.8 x 80 x C10	95 142	●	
099-08010	9.9 x 80 x C10	95 142	◇	
100-08010	10.0 x 80 x C10	95 142	●	
102-09612	10.2 x 96 x C12	114 163	●	
105-09612	10.5 x 96 x C12	114 163	●	
108-09612	10.8 x 96 x C12	114 163	●	
110-09612	11.0 x 96 x C12	114 163	●	
112-09612	11.2 x 96 x C12	114 163	◇	
113-09612	11.3 x 96 x C12	114 163	◇	
115-09612	11.5 x 96 x C12	114 163	●	
118-09612	11.8 x 96 x C12	114 163	●	

VHM

Al-X Coating

140°

HRc 55

Solid carbide twist drills with internal coolant (8 x d)

For HPC of steels, tools steels, austenitic stainless steels and cast irons.

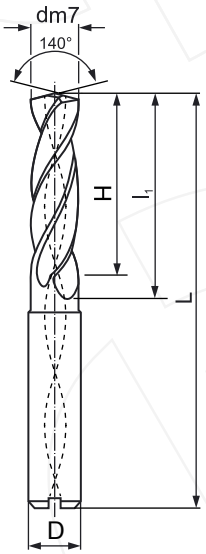
Vollhartmetall-bohrer mit innenkühlung (8 x d)

Für die HPC von Stählen, Werkzeuge Stählen, austenitische rostfreie Stählen und Gusseisen.

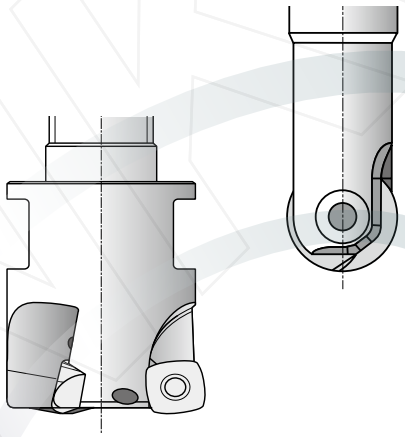
New

Example: Order code 308 FA 120-09612

			d-Code	d x H x D	l_1 L	308 FA Z=2	
P	HRc < 24	◎	120-09612	12.0 x 96 x C12	114 163	●	
	HRc 24 - 35	◎	122-11214	12.2 x112 x C14	133 182	◇	
	HRc > 35	◎	125-11214	12.5 x112 x C14	133 182	●	
H	HRc 45 - 55	○	128-11214	12.8 x112 x C14	133 182	●	
	HRc 56 - 60		130-11214	13.0 x112 x C14	133 182	●	
	HRc > 60		135-11214	13.5 x112 x C14	133 182	●	
M	Stainless steel	○	140-11214	14.0 x112 x C14	133 182	●	
K	Cast iron	○	145-12816	14.5 x128 x C16	152 204	●	
N	Copper alloy		150-12816	15.0 x128 x C16	152 204	●	
S	Titanium alloy	○	155-12816	15.5 x128 x C16	152 204	●	
	High-temperature alloy		160-12816	16.0 x128 x C16	152 204	●	



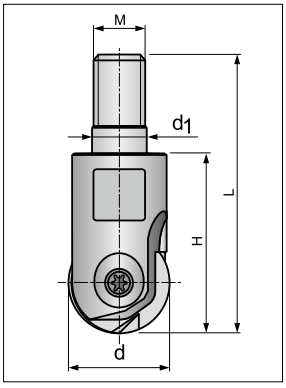
● Stock item, subject to confirmation ◇ On request



Inserts

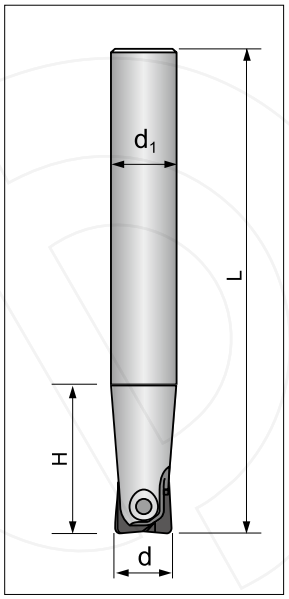
High-performance carbide inserts for HSC of steels, stainless steels, titanium, cast iron and hardened steels up to 58 HRc

Hochleistungs-Hartmetalleinsatz für die HSC von Stählen, Nichtros-tende Stählen, Titan, Gusseisen und gehärteten Stählen bis 58 HRc



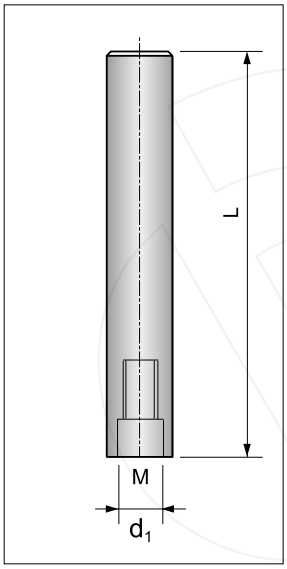
Milling cutter bodies

Part No.	d	H	M	d_1	Screw	Wrench
WGR08-M04	8	16	M4	4.5	MGR3008	TF08
WGR10-M05	10	20	M5	5.5	MGR4010	TF15
WGR12-M06	12	22	M6	6.5	MGR5012	TF20
WGR12-M08	12	30	M8	8.5	MGR5012	TF20
WGR16-M08	16	28	M8	8.5	MGR5016	TF20
WGR20-M10	20	30	M10	10.5	MGR5020	TF20



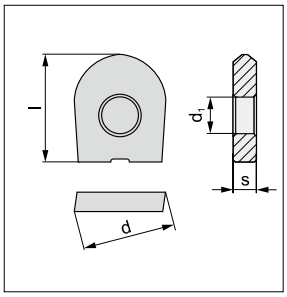
Milling cutters

Part No.	d	H	L	d_1	Screw	Wrench
WGR08-S08-100K	8	20	100	8	MGR3008	TF08
WGR08-S10-100K	8	35	100	10	MGR3008	TF08
WGR10-S10-100K	10	25	100	10	MGR4010	TF15
WGR10-S12-150K	10	36	150	12	MGR4010	TF15
WGR12-S12-150K	12	32	150	12	MGR5012	TF20
WGR12-S16-200K	12	58	200	16	MGR5012	TF20
WGR16-S16-150K	16	36	150	16	MGR5016	TF20
WGR16-S16-200K	16	36	200	16	MGR5016	TF20
WGR16-S20-200K	16	65	200	20	MGR5016	TF20
WGR16-S20-250K	16	65	250	20	MGR5016	TF20
WGR20-S20-150K	20	45	150	20	MGR5020	TF20
WGR20-S20-200K	20	45	200	20	MGR5020	TF20
WGR20-S25-200K	20	76	200	25	MGR5020	TF20
WGR20-S25-250K	20	76	250	25	MGR5020	TF20

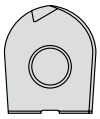


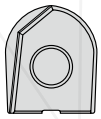
Extension - solid carbide shank

Part No.	d	L	M	d_1		
HD08-100-M04	8	100	M4	4.5		
HD08-120-M04	8	120	M4	4.5		
HD10-100-M05	10	100	M5	5.5		
HD10-150-M05	10	150	M5	5.5		
HD12-100-M06	12	100	M6	6.5		
HD12-150-M06	12	150	M6	6.5		
HD12-200-M06	12	200	M6	6.5		
HD16-100-M08	16	100	M8	8.5		
HD16-150-M08	16	150	M8	8.5		
HD16-200-M08	16	200	M8	8.5		
HD20-100-M10	20	100	M10	10.5		
HD20-150-M10	20	150	M10	10.5		
HD20-200-M10	20	200	M10	10.5		



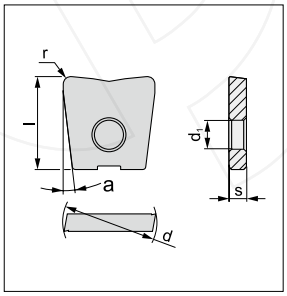
Inserts


RC


RCF

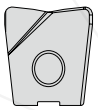
Part No.	Grade	d	l	d_1	s
RC 08	7215	8.0	9.5	3.0	2.0
RC 10	7215	10.0	11.5	4.0	2.5
RC 12	7215	12.0	12.0	5.0	2.5
RC 16	7215	16.0	14.0	5.0	3.0
RC 20	7215	20.0	16.0	5.0	3.0
RC 08-F	7215	8.0	9.5	3.0	2.0
RC 10-F	7215	10.0	11.5	4.0	2.5
RC 12-F	7215	12.0	12.0	5.0	2.5
RC 16-F	7215	16.0	14.0	5.0	3.0
RC 20-F	7215	20.0	16.0	5.0	3.0

Grades		7215
P	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
M	Stainless steel	○
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	



Inserts


KP


KPF

Part No.	Grade	d	r	l	d_1	s	a
LC 0806-KP	7215	8.0	0.6	9.5	3.0	2.0	3°
LC 0810-KP	7215	8.0	1.0	9.5	3.0	2.0	3°
LC 1010-KP	7215	10.0	1.0	11.5	4.0	2.5	3°
LC 1210-KP	7215	12.0	1.0	14.0	5.0	2.5	7°
LC 1610-KP	7215	16.0	1.0	16.0	5.0	3.0	7°
LC 2010-KP	7215	20.0	1.0	18.0	5.0	3.0	7°
LC 2016-KP	7215	20.0	1.6	18.0	5.0	3.0	7°
LC 0806-KPF	7215	8.0	0.6	9.5	3.0	2.0	3°
LC 1008-KPF	7215	10.0	0.8	11.5	4.0	2.5	3°
LC 1210-KPF	7215	12.0	1.0	14.0	5.0	2.5	7°
LC 1613-KPF	7215	16.0	1.3	16.0	5.0	3.0	7°

Grades		7215
P	HRc 24 - 35	◎
	HRc > 35	◎
H	HRc 45 - 55	◎
	HRc 56 - 60	○
M	Stainless steel	○
K	Cast iron	◎
N	Copper alloy	○
S	Titanium alloy	

Calculation formulas for cutting data / Berechnungsformeln für Schnittdaten

Spindle speed n [min-1]
Drehzahl

$$n = \frac{Vc \times 1000}{d \times \pi}$$

Feed speed Vf [mm/min]
Vorschubgeschwindigkeit

$$Vf = fz \times Z \times n$$

Z : Number of cutting edges
Anzahl der Schneiden

Cutting speed Vc [m/min]
Schnittgeschwindigkeit

$$Vc = \frac{d \times \pi \times n}{1000}$$

Feed per tooth fz [mm]
Vorschub pro Zahn und Umdrehung

$$fz = \frac{Vf}{Z \times n}$$

Z : Number of cutting edges
Anzahl der Schneiden

Material removal rate Q [cm^3/min]
Zeitspanvolumen

$$Q = \frac{Ae \times Ap \times Vf}{1000}$$

Ap: Axial depth of cut
Axiale Zustelltiefe
Ae: Radial depth of cut
Radiale Zustelltiefe

Effective diameter for ball nose end mills at a set angle = 0^o

Effektiver Durchmesser für Kugelkopffräser bei Anstellwinkel = 0^o

$$d_{eff} = 2 \times \sqrt{(d \times Ap - Ap^2)}$$

d: Diameter of the cutting edge
Schneidendurchmesser

Passion for excellence

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