A step forward in productivity

2017-2018

VAN HOORN CARBIDE

Workpiece material / Werkstoffe

	Group / *Gruppe*	Properties / *Eigenschaften*
P	**P1.1** Very soft low-carbon steels, Purely firritic steels / *Kohlenstoffstahl, Ferritische Stähle.* Free-cutting steels / *Automatenstähle.*	≤ 800 N/mm²
	P1.2 Steels (<0,5% C) / *Stahl (<0,5% C).* Steels (>0,5% C), low-alloy steels / *Stahl (>0,5% C), Kohlenstoffstahl.*	≤ 1000 N/mm²
	P1.3 Normal tool steel, High-alloy steels with high hardness / *Werkzeugstähle, Härtere Vergütungsstähle, Martensitische Stähle.* High-alloy steels, High strength steels, Martensitic stainless steels / *Hochgelegierte Stähle, Gehärtete Stähle.*	≤ 1400 N/mm²
H	**H2.1** > 42 - ≤ 50 HRC	42 < HRc < 50
	H2.2 > 50 - ≤ 55 HRC	50 < HRc < 55
	H2.3 > 55 - < 70 HRC	55 < HRc < 70
M	**M3.1** Stainless steel, Free-cutting stainless steel / *Rostfreie Stähle.*	≤ 950 N/mm²
	M3.2 Difficult stainless steel, Austenitic and Duplex stainless steel / *Schwierige rostfreie Stähle, Austenit und Duplex*	≤ 1250 N/mm²
K	**K4.1** Cast iron / *Guss*	≤ 800 N/mm²
N	**N5.1** Aluminium Si < 5%	Si < 5%
	N5.2 Aluminium Si > 5%	Si > 5%
	N5.3 Copper, Copper alloys / *Kupfer, Kupfer legierungen.*	
	N5.4 Synthetics / *Kunststoffe.*	
	N5.5 Composites CFRP - GFRP / *Verbundwerkstoffe CFK - GFK*	
	N5.6 Graphite / *Graphit*	
S	**S6.1** Fe-Superalloys / *Fe-Superlegierungen.*	≤ 1500 N/mm²
	S6.2 Co-Superalloys / *Co-Superlegierungen*	≤ 1600 N/mm²
	S6.3 Ni-Superalloys / *Ni-Superlegierungen*	≤ 1600 N/mm²
	S6.4 Titanium Superalloys / *Titanium Superlegierungen.*	≤ 1250 N/mm²

For each application the perfect end mill!

Für jede Anwendung der perfekte Schaftfräser!

VAN HOORN CARBIDE

Van Hoorn Carbide

Van Hoorn Carbide is committed to manufacture and provide the best solid carbide end mills, leading innovations and reliable support. Developments of materials, machine tools for milling applications and product demands challenge us every day to improve our end mills and optimize the combination between solid carbide grades, geometries, grinding technology and coating.
Our goal is to improve your production processes and reduce your cost per product.

Van Hoorn Carbide sieht sich seinen Kunden gegenüber verpflichtet, neben der Herstellung von hochpräzisen Vollhartmetallfräsern, auch einen Innovationsvorsprung und einen zuverlässigen Service zu bieten. Die kontinuierliche Weiterentwicklung von Werkstoffen und Maschinen sowie wachsende Produktanforderungen motivieren uns täglich aufs Neue unsere Fräser, unter Berücksichtigung des Zusammenwirkens von Hartmetallsorte, Schneidengeometrie und Beschichtung, zu verbessern.
Unser Ziel ist es, Ihren Fertigungsprozess zu optimieren und damit Ihre Produkt- und Prozesskosten zu senken.

Reducing total cost of ownership is our goal!
Kostenreduzierung pro Produkt ist unser Ziel!

	P1.1	P1.2	P1.3	H2.1	H2.2	H2.3	M3.1	M3.2	K4.1	N5.1	N5.2	N5.3	N5.4	N5.5	N5.6	S6.1	S6.2	S6.3	S6.4	Number of Flutes | Schneidenanzahl	Coating | Beschichtung	Size range | Durchmesserbereich	Page | Seite
VHPK					◐	●			◐											2	TiAlN+	0,1 / 12,0	8
VHPT					◐	●			◐											4	TiAlN+	0,2 / 12,0	12
VHPM					◐	●			◐											6-16	TiAlN+	3,0 / 20,0	18
VHPMR					◐	●			◐											6-16	TiAlN+	3,0 / 20,0	20
VHKF2	●	●	●	●	●	◐			●											2	TiAlN	1,0 / 16,0	24
VHKF4	●	●	●	●	●	◐			●											4	TiAlN	6,0 / 16,0	26
VHTF2	●	●	●	●	●	◐			●											2	TiAlN	1,0 / 16,0	28
VHTF4	●	●	●	●	●	◐			●											4	TiAlN	3,0 / 16,0	30
VHDR	●	●	●	◐					●											4	TiAlN	2,0 / 12,0	32
VHMF	●	●	●	●	●	◐			●											6-8	TiAlN GOLD	3,0 / 20,0	34
VHMFR	●	●	●	●	●	◐			●											6-8	TiAlN GOLD	3,0 / 20,0	36
VHMS	●	●	●	●	●	◐	●	●	●							●	●	●	●	2-4	TiAlN	0,1 / 3,0	38
VHMSR	●	●	●	●	●	◐	●	●	●							●	●	●	●	2-4	TiAlN	0,1 / 3,0	44
VHMSK	●	●	●	●	●	◐	●	●	●							●	●	●	●	2	TiAlN	0,1 / 3,0	50
VHVTR4	◐	◐	◐	◐			●	●								●	●	●	●	4	TiAlN GOLD	3,0 / 25,0	58
VHVTR5	◐	◐	◐	◐			●	●								●	●	●	●	5	TiAlN GOLD	3,0 / 25,0	62
VHTR	◐	◐	◐	◐			●	●								●	●	●	●	4-7	TiAlN GOLD	3,0 / 20,0	66
HAMF^{I-XI}	◐	◐	◐	◐			●	●								●	●	●	●	6-8	TiAlN GOLD	6,0 / 20,0	68
HABM	◐	◐	◐	◐			●	●								●	●	●	●	2	TiAlN GOLD	0,4 / 12,0	70
VHVFR	●	●	●	◐			◐	◐	●							◐	◐	◐	◐	3	TiAlN	2,0 / 16,0	74
VHVF	●	●	●	◐			◐	◐	●							◐	◐	◐	◐	3	TiAlN	2,0 / 16,0	76
VHVFF3	●	●	●	◐			◐	◐	●							◐	◐	◐	◐	3	TiAlN	2,0 / 16,0	78
VHRFF	●	●	●	◐			◐	◐	●							◐	◐	◐	◐	3-4	TiAlN	6,0 / 20,0	80
VHRS4	●	●	●	◐			◐	◐	●							◐	◐	◐	◐	4	TiAlN	3,0 / 25,0	82
VHRS5	●	●	●	◐			◐	◐	●							◐	◐	◐	◐	5	TiAlN	3,0 / 25,0	86
VHTS	●	●	●	◐			◐	◐	●							◐	◐	◐	◐	4-7	TiAlN	3,0 / 20,0	90

It is all about productivity, quality and reliability!

Alles dreht um Produktivität, Qualität und Zuverlässigkeit!

		P1.1	P1.2	P1.3	H2.1	H2.2	H2.3	M3.1	M3.2	K4.1	N5.1	N5.2	N5.3	N5.4	N5.5	N5.6	S6.1	S6.2	S6.3	S6.4	Number of Flutes | Schneidenanzahl	Coating | Beschichtung	Size range | Durchmesserbereich	Page | Seite
VHDT											◐	◐	◐	◐	●	●					2	Diamond	3,0 / 12,0	94
VHDB											◐	◐	◐	◐	●	●					2	Diamond	3,0 / 12,0	96
VHGR														◐	◐	●					2	Diamond	4,0 / 16,0	100
VHGT														◐	◐	●					3	Diamond	2,0 / 12,0	102
VHGTF														◐	◐	●					2-3-4	Diamond	2,0 / 12,0	104
VHGKF														◐	◐	●					2-3-4	Diamond	2,0 / 12,0	106
VHMG														◐	◐	●					2	Diamond	0,3 / 1,5	108
VHMGK														◐	◐	●					2	Diamond	0,3 / 1,5	110
VHMA											●	●	●	●	◐						2	Uncoated	0,3 / 3,0	114
VHMAK											●	●	●	●	◐						2	Uncoated	0,3 / 3,0	116
VHKE											◐	◐	◐	●	◐						1	Uncoated	1,0 / 12,0	118
VHRAW											●	●	●	●	◐						3	Uncoated	6,0 / 25,0	120
VHLA2											●	●	●	●	◐						2	Uncoated	2,0 / 25,0	122
VHLA3											●	●	●	●	◐						3	Uncoated	4,0 / 25,0	124
VHAE											●	●	●	◐	◐						1	Uncoated	0,5 / 16,0	126
VHAD											●	●	●	●	◐						3	Uncoated	2,0 / 20,0	128

	PARA TOOLING	132

● Well suited / besonders geeignet

◖ Suited / geeignet

Van Hoorn Carbide is the solid carbide end mills specialist: the highest quality standards, leading technology, technical knowledge, experience and support.

Van Hoorn Carbide bietet als der Spezialist für Vollhartmetall Fräswerkzeuge: höchste Qualitätsstandards, führende Technologien, technisches Wissen, Erfahrung und Service.

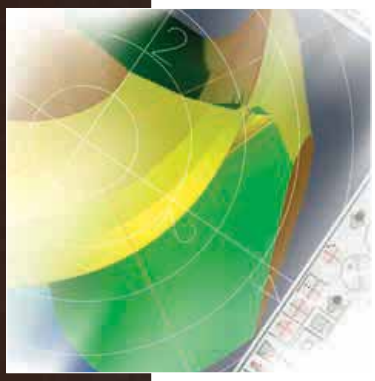
Premium products
Premium Produkte

Research & Development
Forschung und Entwicklung

Demonstration & Test centre
Vorführ- und Testzentrum

Technical support
Technische Unterstützung

Highest level of production!
Modernster Stand der Fertigungstechnik!



- Fully automated process
  Voll automatisierter Fertigungsprozess
- New CNC grinding machines
  Modernste CNC-Schleifmaschinen
- 24/7 production
  24/7 Rund-um-die-Uhr-Produktion
- Climate controlled production
  Klimatisierte Produktionsräume
- Cost reduction!
  Kosten reduzieren!
- Knowledge about carbide, geometry (and coating)
  Know-how über Hartmetall, Geometrien (und Beschichtungen)
- Global presence
  Weltweit vertreten
- High accuracy tools!
  Hohe genauigkeits- Fräser!
- Reliability!
  Zuverlässigkeit!
- ± 1µ tolerances possible!
  ± 1µ Toleranz möglich!
- Optimizing production processes
  Optimalisierung Produktionsprozesse
- 100% visual inspection
  100% visuelle Kontrolle
- Analyzing and solving production problems
  Analysieren en Lösen Produktions-Problemen
- Solving manufacturing challenges!
  Lösen von Produktions-herausforderungen!

Milling hardened steels from 55-70 HRc with VHC technology:

Fräsen in gehärtete Stähle 55-70 HRc mittels VHC Technologie:

Advantages / Vorteile:

1. No EDM is required (milling is much faster).

Kein Errodieren nötig (Fräsen deutlich zeitsparender).

2. Polishing can be minimized.

Aufwand für Nacharbeiten kann minimiert werden.

3. One single clamping, so it is easier to achieve accurate results.

Nur eine Aufspannung - erleichtert das Erreichen von Zielvorgaben.

Several strategies are possible / Mehrere Strategien sind möglich

HPM (High Perfomance Machining)
Hochleistungsbearbeitung

- High cutting speed (V_c)
  Hohe Schnittgeschwindigkeit (V_c)
- Large cutting depth (a_p)
  Große Schnitttiefe (a_p)
- Small cutting width (a_e)
  Geringe Schnittbreite (a_e)
- Medium feed per tooth (F_z) / table feed (V_f)
  Mittlere(r) Zahnvorschub (F_z) / Vorschubgeschwindigkeit (V_f)

HSM (High Speed Machining)
Hochgeschwindigkeitsbearbeitung

- High cutting speed (V_c)
  Hohe Schnittgeschwindigkeit (V_c)
- Small cutting depth (a_p)
  Geringe Schnitttiefe (a_p)
- Small cutting width (a_e)
  Geringe Schnittbreite (a_e)
- High feed per tooth (F_z) / table feed (V_f)
  Hohe(r) Zahnvorschub (F_z) / Vorschubgeschwindigkeit (V_f)

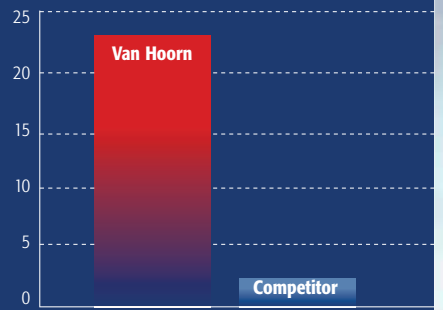
Depending on the workpiece different strategies can be chosen.
Chip removal and coolant in such applications are crucial.

Abhängig vom Werkstück können unterschiedliche Strategien eingesetzt werden.
Spänefluss und Kühlung spielen bei diesen Anwendungen die entscheidende Rolle.

Workpiece Material: 1.2379
Hardness: 62HRc

	Van Hoorn	Competitor
V_c	100 m/min	100 m/min
n	3180 rpm	3180 rpm
F_z	0,08 mm/t	0,05 mm/t
Z	6	6
V_f	1.500 mm/min	1.000 mm/min
a_p	20 mm	20 mm
a_e	0,1 mm	0,1 mm
Coolant	air	air
Q	**3 cm³/min**	**2 cm³/min**

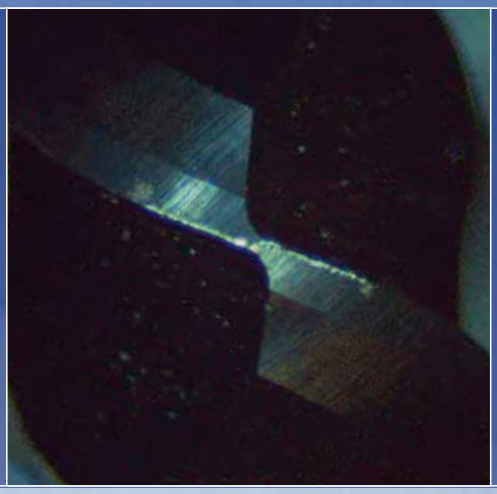
VHPM Material removal rate

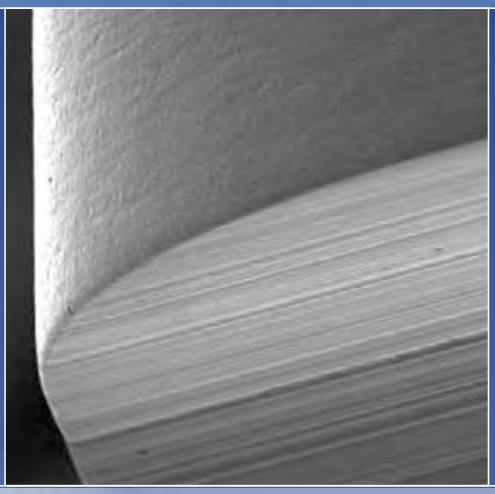


Van Hoorn Carbide's leading technology for hardened materials (55-70 HRc):

Van Hoorn Carbide's Technologievorsprung für gehärtete Werkstoffe (55-70 HRc):

- 2 Flute ball nose geometry VHPK
  2 Schneiden Radiusfräser VHPK
- 4 Flute torus geometry VHPT
  4 Schneiden Torusfräser VHPT
- Micro program shank 4 mm
  Mikro Program schaft 4 mm
- Multiple flute VHPM
  Mehrschneidenfräser VHPM
- Multiple flute with corner radius VHPMR
  Mehrschneidenfräser mit Eckenradius VHPMR



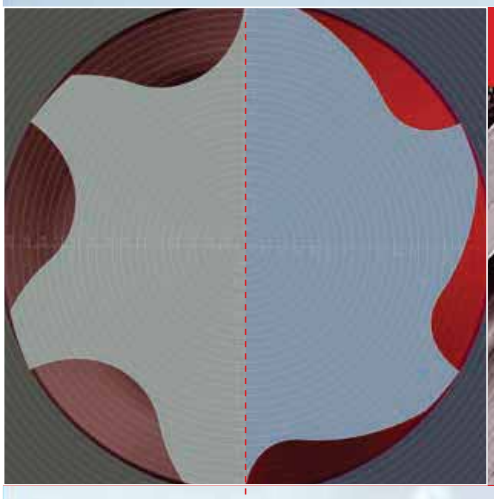


Optimized center
Optimiertes Zentrum

Wear
Verschleiß

Edge preparation
Kanten verrundung

VHPM(R)

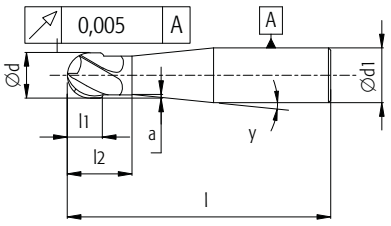


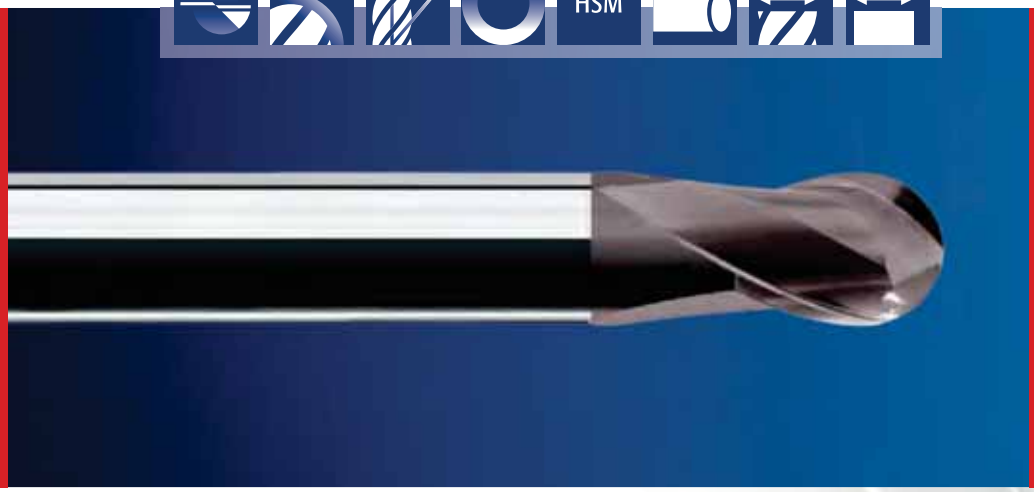
± 0,005 mm radius tolerance / Radiustoleranz

± 0,005 mm corner radius tolerance / Eckenradiustoleranz

old | new geometry
alte | neue Geometrie

Standard





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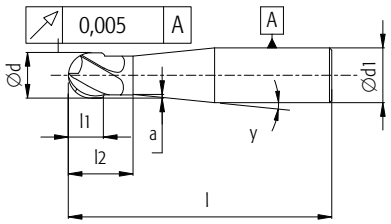
Now available in micro!
Jetzt lieferbar in Mikro!

Remark ∞ = infinity, no collision in projection length area.

Bemerkung ∞ = unendlich, keine Kollision in Länge Projektionsfläche.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
Shank ø4													
VHPK 2 001 051 04 L015	0,10	0,05	4	51	0,15	-	-	2	15	0,684	0,706	0,755	0,812
VHPK 2 001 051 04 L020	0,10	0,05	4	51	0,15	2,00	0,005	2	15	2,357	2,437	2,616	2,825
VHPK 2 002 051 04 L003	0,20	0,10	4	51	0,30	-	-	2	15	0,786	0,810	0,863	0,925
VHPK 2 002 051 04 L020	0,20	0,10	4	51	0,30	2,00	0,005	2	15	2,355	2,434	2,609	2,812
VHPK 2 002 051 04 L040	0,20	0,10	4	51	0,30	4,00	0,005	2	15	4,423	4,573	4,909	5,299
VHPK 2 002 051 04 L060	0,20	0,10	4	51	0,30	6,00	0,005	2	15	6,490	6,713	7,208	7,785
VHPK 2 004 051 04 L005	0,40	0,20	4	51	0,50	-	-	2	15	1,299	1,337	1,423	1,522
VHPK 2 004 051 04 L020	0,40	0,20	4	51	0,50	2,00	0,010	2	15	2,371	2,447	2,615	2,811
VHPK 2 004 051 04 L040	0,40	0,20	4	51	0,50	4,00	0,010	2	15	4,439	4,586	4,915	5,298
VHPK 2 004 051 04 L060	0,40	0,20	4	51	0,50	6,00	0,010	2	15	6,506	6,726	7,215	7,784
VHPK 2 004 051 04 L080	0,40	0,20	4	51	0,50	8,00	0,010	2	15	8,573	8,865	9,515	10,270
VHPK 2 005 051 04 L007	0,50	0,25	4	51	0,70	-	-	2	15	1,504	1,548	1,645	1,758
VHPK 2 005 051 04 L020	0,50	0,25	4	51	0,70	2,00	0,020	2	15	2,408	2,483	2,651	2,846
VHPK 2 005 051 04 L040	0,50	0,25	4	51	0,70	4,00	0,020	2	15	4,476	4,623	4,951	5,332
VHPK 2 005 051 04 L060	0,50	0,25	4	51	0,70	6,00	0,020	2	15	6,543	6,762	7,250	7,818
VHPK 2 005 051 04 L080	0,50	0,25	4	51	0,70	8,00	0,020	2	15	8,610	8,902	9,550	10,304
VHPK 2 006 051 04 L008	0,60	0,30	4	51	0,80	-	-	2	15	2,259	2,327	2,479	2,656
VHPK 2 006 051 04 L020	0,60	0,30	4	51	0,80	2,00	0,020	2	15	2,543	2,621	2,795	2,997
VHPK 2 008 051 04 L010	0,80	0,40	4	51	1,00	-	-	2	15	2,462	2,534	2,694	2,880
VHPK 2 010 051 04 L012	1,00	0,50	4	51	1,20	-	-	2	15	2,665	2,741	2,909	3,104
VHPK 2 010 051 04 L022	1,00	0,50	4	51	1,20	2,20	0,020	2	15	2,743	2,821	2,995	3,197
VHPK 2 010 051 04 L040	1,00	0,50	4	51	1,20	4,00	0,020	2	15	4,603	4,746	5,064	5,435
VHPK 2 010 051 04 L060	1,00	0,50	4	51	1,20	6,00	0,020	2	15	6,671	6,886	7,364	7,921
VHPK 2 010 051 04 L080	1,00	0,50	4	51	1,20	8,00	0,020	2	15	8,738	9,025	9,664	10,407
VHPK 2 010 051 04 L100	1,00	0,50	4	51	1,20	10,00	0,020	2	15	10,805	11,164	11,964	12,894
VHPK 2 015 051 04 L018	1,50	0,75	4	51	1,80	-	-	2	15	4,066	4,182	4,439	4,738
VHPK 2 015 051 04 L033	1,50	0,75	4	51	1,80	3,30	0,025	2	15	4,163	4,282	4,546	4,854
VHPK 2 015 051 04 L040	1,50	0,75	4	51	1,80	4,00	0,025	2	15	4,886	5,030	5,351	5,725
VHPK 2 015 051 04 L060	1,50	0,75	4	51	1,80	6,00	0,025	2	15	6,954	7,170	7,651	8,211
VHPK 2 015 051 04 L080	1,50	0,75	4	51	1,80	8,00	0,025	2	15	9,021	9,309	9,951	10,697
VHPK 2 015 051 04 L100	1,50	0,75	4	51	1,80	10,00	0,025	2	15	11,088	11,448	12,250	13,183
VHPK 2 020 051 04 L025	2,00	1,00	4	51	2,50	-	-	2	15	4,781	4,913	5,206	5,548
VHPK 2 020 051 04 L040	2,00	1,00	4	51	2,50	4,00	0,050	2	15	4,974	5,113	5,421	5,780
VHPK 2 020 051 04 L060	2,00	1,00	4	51	2,50	6,00	0,050	2	15	7,042	7,252	7,721	8,266
VHPK 2 020 051 04 L080	2,00	1,00	4	51	2,50	8,00	0,050	2	15	9,109	9,392	10,020	10,752
VHPK 2 020 051 04 L100	2,00	1,00	4	51	2,50	10,00	0,050	2	15	11,176	11,531	12,320	13,239

Standard



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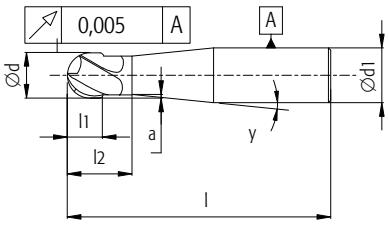
For an extra charge we offer an inspection report of the tool geometry.

Auf Wunsch erhalten Sie zu jedem Werkzeug ein separates Prüfprotokoll (aufpreispflichtig).

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
VHPK 2 025 051 04 L030	2,50	1,25	4	51	3,00	-	-	2	15	5,290	5,431	5,744	6,109
VHPK 2 025 051 04 L045	2,50	1,25	4	51	3,00	4,50	0,050	2	15	5,483	5,630	5,959	6,341
VHPK 2 025 051 04 L060	2,50	1,25	4	51	3,00	6,00	0,050	2	15	7,033	7,235	7,683	8,205
VHPK 2 025 051 04 L080	2,50	1,25	4	51	3,00	8,00	0,050	2	15	9,101	9,374	9,983	10,692
VHPK 2 025 051 04 L100	2,50	1,25	4	51	3,00	10,00	0,050	2	15	11,168	11,513	12,283	13,178
VHPK 2 030 051 04 L035	3,00	1,50	4	51	3,50	-	-	2	15	5,798	5,948	6,281	6,669
VHPK 2 030 051 04 L050	3,00	1,50	4	51	3,50	5,00	0,050	2	15	5,991	6,148	6,496	6,901
VHPK 2 030 051 04 L060	3,00	1,50	4	51	3,50	6,00	0,050	2	15	7,025	7,217	7,646	8,144
VHPK 2 030 051 04 L070	3,00	1,50	4	51	3,50	7,00	0,050	2	15	8,058	8,287	8,796	9,388
VHPK 2 030 051 04 L080	3,00	1,50	4	51	3,50	8,00	0,050	2	15	9,092	9,357	9,946	10,631
VHPK 2 030 051 04 L100	3,00	1,50	4	51	3,50	10,00	0,050	2	15	11,159	11,496	12,245	∞
Shank ø6													
VHPK 2 001 064 06 L015	0,1	0,05	6	64	0,15	-	-	2	15	0,684	0,706	0,755	0,812
VHPK 2 001 064 06 L020	0,1	0,05	6	64	0,15	2,00	0,005	2	15	2,357	2,437	2,616	2,825
VHPK 2 002 064 06 L003	0,2	0,10	6	64	0,30	-	-	2	15	0,786	0,810	0,863	0,925
VHPK 2 002 064 06 L020	0,2	0,10	6	64	0,30	2,00	0,005	2	15	2,355	2,434	2,609	2,812
VHPK 2 002 064 06 L040	0,2	0,10	6	64	0,30	4,00	0,005	2	15	4,423	4,573	4,909	5,299
VHPK 2 002 064 06 L060	0,2	0,10	6	64	0,30	6,00	0,005	2	15	6,490	6,713	7,208	7,785
VHPK 2 004 064 06 L005	0,4	0,20	6	64	0,50	-	-	2	15	1,299	1,337	1,423	1,522
VHPK 2 004 064 06 L020	0,4	0,20	6	64	0,50	2,00	0,010	2	15	2,371	2,447	2,615	2,811
VHPK 2 004 064 06 L040	0,4	0,20	6	64	0,50	4,00	0,010	2	15	4,439	4,586	4,915	5,298
VHPK 2 004 064 06 L060	0,4	0,20	6	64	0,50	6,00	0,010	2	15	6,506	6,726	7,215	7,784
VHPK 2 004 064 06 L080	0,4	0,20	6	64	0,50	8,00	0,010	2	15	8,573	8,865	9,515	10,270
VHPK 2 005 064 06 L007	0,5	0,25	6	64	0,70	-	-	2	15	1,504	1,548	1,645	1,758
VHPK 2 005 064 06 L020	0,5	0,25	6	64	0,70	2,00	0,020	2	15	2,408	2,483	2,651	2,846
VHPK 2 005 064 06 L040	0,5	0,25	6	64	0,70	4,00	0,020	2	15	4,476	4,623	4,951	5,332
VHPK 2 005 064 06 L060	0,5	0,25	6	64	0,70	6,00	0,020	2	15	6,543	6,762	7,250	7,818
VHPK 2 005 064 06 L080	0,5	0,25	6	64	0,70	8,00	0,020	2	15	8,610	8,902	9,550	10,304
VHPK 2 006 064 06 L008	0,6	0,30	6	64	0,80	-	-	2	15	2,259	2,327	2,479	2,656
VHPK 2 006 064 06 L020	0,6	0,30	6	64	0,80	2,00	0,020	2	15	2,543	2,621	2,795	2,997
VHPK 2 008 064 06 L010	0,8	0,40	6	64	1,00	-	-	2	15	2,462	2,534	2,694	2,880
VHPK 2 010 064 06 L012	1,0	0,50	6	64	1,20	-	-	2	15	2,665	2,741	2,909	3,104
VHPK 2 010 064 06 L022	1,0	0,50	6	64	1,20	2,20	0,020	2	15	2,743	2,821	2,995	3,197
VHPK 2 010 064 06 L040	1,0	0,50	6	64	1,20	4,00	0,020	2	15	4,603	4,746	5,064	5,435
VHPK 2 010 064 06 L060	1,0	0,50	6	64	1,20	6,00	0,020	2	15	6,671	6,886	7,364	7,921
VHPK 2 010 064 06 L080	1,0	0,50	6	64	1,20	8,00	0,020	2	15	8,738	9,025	9,664	10,407
VHPK 2 010 064 06 L100	1,0	0,50	6	64	1,20	10,00	0,020	2	15	10,805	11,164	11,964	12,894

Standard



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Remark ∞ = infinity, no collision in projection length area.

Bemerkung ∞ = unendlich, keine Kollision in Länge Projektionsfläche.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°
VHPK 2 015 064 06 L018	1,5	0,75	6	64	1,80	-	-	2	15	4,066	4,182	4,439	4,738
VHPK 2 015 064 06 L033	1,5	0,75	6	64	1,80	3,30	0,025	2	15	4,163	4,282	4,546	4,854
VHPK 2 015 064 06 L040	1,5	0,75	6	64	1,80	4,00	0,025	2	15	4,886	5,030	5,351	5,725
VHPK 2 015 064 06 L060	1,5	0,75	6	64	1,80	6,00	0,025	2	15	6,954	7,170	7,651	8,211
VHPK 2 015 064 06 L080	1,5	0,75	6	64	1,80	8,00	0,025	2	15	9,021	9,309	9,951	10,697
VHPK 2 015 064 06 L100	1,5	0,75	6	64	1,80	10,00	0,025	2	15	11,088	11,448	12,250	13,183
VHPK 2 020 064 06 L025	2,0	1,00	6	64	2,50	-	-	2	15	4,781	4,913	5,206	5,548
VHPK 2 020 064 06 L040	2,0	1,00	6	64	2,50	4,00	0,050	2	15	4,974	5,113	5,421	5,780
VHPK 2 020 064 06 L060	2,0	1,00	6	64	2,50	6,00	0,050	2	15	7,042	7,252	7,721	8,266
VHPK 2 020 064 06 L080	2,0	1,00	6	64	2,50	8,00	0,050	2	15	9,109	9,392	10,020	10,752
VHPK 2 020 064 06 L100	2,0	1,00	6	64	2,50	10,00	0,050	2	15	11,176	11,531	12,320	13,239
VHPK 2 025 064 06 L030	2,5	1,25	6	64	3,00	-	-	2	15	5,290	5,431	5,744	6,109
VHPK 2 025 064 06 L045	2,5	1,25	6	64	3,00	4,50	0,050	2	15	5,483	5,630	5,959	6,341
VHPK 2 025 064 06 L060	2,5	1,25	6	64	3,00	6,00	0,050	2	15	7,033	7,235	7,683	8,205
VHPK 2 025 064 06 L080	2,5	1,25	6	64	3,00	8,00	0,050	2	15	9,101	9,374	9,983	10,692
VHPK 2 025 064 06 L100	2,5	1,25	6	64	3,00	10,00	0,050	2	15	11,168	11,513	12,283	13,178
VHPK 2 030 064 06 L035	3,0	1,50	6	64	3,50	-	-	2	15	5,798	5,948	6,281	6,669
VHPK 2 030 064 06 L050	3,0	1,50	6	64	3,50	5,00	0,050	2	15	5,991	6,148	6,496	6,901
VHPK 2 030 064 06 L060	3,0	1,50	6	64	3,50	6,00	0,050	2	15	7,025	7,217	7,646	8,144
VHPK 2 030 064 06 L070	3,0	1,50	6	64	3,50	7,00	0,050	2	15	8,058	8,287	8,796	9,388
VHPK 2 030 064 06 L080	3,0	1,50	6	64	3,50	8,00	0,050	2	15	9,092	9,357	9,946	10,631
VHPK 2 030 064 06 L100	3,0	1,50	6	64	3,50	10,00	0,050	2	15	11,159	11,496	12,245	13,117
VHPK 2 040 064 06 L045	4,0	2,00	6	64	4,50	-	-	2	15	6,815	6,983	7,356	7,791
VHPK 2 040 064 06 L080	4,0	2,00	6	64	4,50	8,00	0,100	2	15	9,268	9,521	10,085	10,741
VHPK 2 050 064 06 L060	5,0	2,50	6	64	6,00	-	-	2	15	8,349	8,553	9,006	9,534
VHPK 2 050 064 06 L100	5,0	2,50	6	64	6,00	10,00	0,150	2	15	11,512	11,826	12,525	∞
VHPK 2 060 064 06 L070	6,0	3,00	6	64	7,00	-	-	2	-	∞	∞	∞	∞
VHPK 2 060 064 06 L120	6,0	3,00	6	64	7,00	12,00	0,150	2	-	∞	∞	∞	∞
VHPK 2 060 064 06 L250	6,0	3,00	6	64	7,00	25,00	0,150	2	-	∞	∞	∞	∞
VHPK 2 080 064 08 L090	8,0	4,00	8	64	9,00	-	-	2	-	∞	∞	∞	∞
VHPK 2 080 064 08 L160	8,0	4,00	8	64	9,00	16,00	0,200	2	-	∞	∞	∞	∞
VHPK 2 080 064 08 L250	8,0	4,00	8	64	9,00	25,00	0,200	2	-	∞	∞	∞	∞
VHPK 2 100 078 10 L120	10,0	5,00	10	78	12,00	-	-	2	-	∞	∞	∞	∞
VHPK 2 100 078 10 L200	10,0	5,00	10	78	12,00	20,00	0,200	2	-	∞	∞	∞	∞
VHPK 2 120 078 12 L150	12,0	6,00	12	78	15,00	-	-	2	-	∞	∞	∞	∞

Material group	TSR (N/mm²)	Hardness	Cutting speed V_c m/min	Coolant
H2.2		50-55 HRc	**150 - 220**	min.lub.
H2.3		55-70 HRc	**200 - 250**	min.lub.
K4.1			**160 - 240**	emulsion

Milling up to 70 HRc with 0,1 mm end mill!

Fräsen bis 70 HRc mit 0,1 mm Fräser!

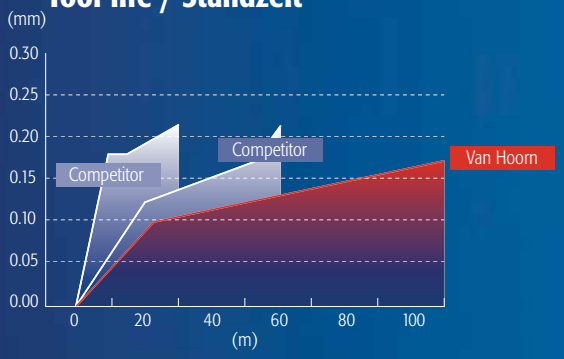
For an extra charge we offer an inspection report of the tool geometry.

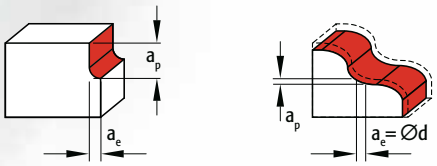
Auf Wunsch erhalten Sie zu jedem Werkzeug ein separates Prüfprotokoll (aufpreispflichtig).

VHPK206006406L070
Workpiece Material: 1.2379
Hardness: 60 HRc

	Van Hoorn	Competitor
V_c	160 m/min	160 m/min
n	8400 rpm	8400 rpm
F_z	0,157 mm/t	0,157 mm/t
V_f	2630 mm/min	2630 mm/min
a_p	0,3 mm	0,3 mm
a_e	1,2 mm	1,2 mm
Coolant	min. lubrication	min. lubrication
Q	**0,95 mm³/min**	**0,95 mm³/min**

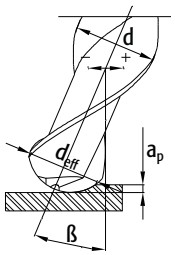
Tool life / Standzeit





Profiling / Profilierung

Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
0,1	< 0,02	< 0,003	0,002 - 0,007
0,2	< 0,04	< 0,006	0,004 - 0,010
0,4	< 0,08	< 0,012	0,006 - 0,013
0,5	< 0,10	< 0,015	0,007 - 0,015
0,6	< 0,12	< 0,018	0,009 - 0,018
0,8	< 0,16	< 0,024	0,012 - 0,021
1,0	< 0,20	< 0,030	0,015 - 0,025
1,5	< 0,30	< 0,045	0,020 - 0,035
2,0	< 0,40	< 0,060	0,030 - 0,050
2,5	< 0,50	< 0,075	0,035 - 0,055
3,0	< 0,60	< 0,090	0,040 - 0,060
4,0	< 0,80	< 0,120	0,050 - 0,080
5,0	< 1,00	< 0,150	0,060 - 0,110
6,0	< 1,20	< 0,180	0,065 - 0,125
8,0	< 1,60	< 0,240	0,080 - 0,130
10,0	< 2,00	< 0,300	0,085 - 0,135
12,0	< 2,40	< 0,360	0,100 - 0,140

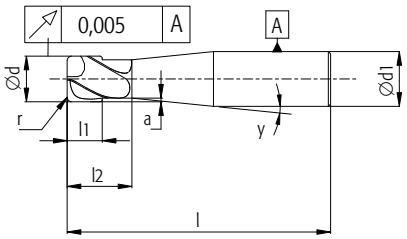


- For the cutting speed V_c calculation the effective cutting diameter d_{eff} has to be taken into account. See formula.

  Für die Berechnung der Schnittgeschwindigkeit muss der effektive Durchmesser d_{eff} berücksichtigt werden (siehe Formel).

$$ß \neq 0: \quad d_{eff} = d \cdot \sin\left[ß \pm \arccos\left(\frac{d - 2a_p}{d}\right)\right]$$

Standard



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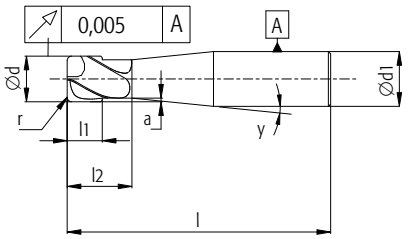
Shank 4 mm
Schaft 4 mm

Remark ∞ = infinity, no collision in projection length area.

Bemerkung ∞ = unendlich, keine Kollision in Länge Projektionsfläche.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
VHPT 4 002 051 04 40 L002	0,2	0,01	4	51	0,20	-	-	4	15	0,685	0,709	0,761	0,822
VHPT 4 002 051 04 40 L004	0,2	0,01	4	51	0,20	0,40	0,010	4	15	0,724	0,749	0,804	0,869
VHPT 4 004 051 04 40 L004	0,4	0,01	4	51	0,40	-	-	4	15	1,202	1,244	1,336	1,444
VHPT 4 004 051 04 40 L009	0,4	0,01	4	51	0,40	0,90	0,010	4	15	1,241	1,284	1,379	1,490
VHPT 4 004 051 04 40 L016	0,4	0,01	4	51	0,40	1,60	0,010	4	15	1,964	2,032	2,184	2,360
VHPT 4 005 051 04 40 L005	0,5	0,03	4	51	0,50	-	-	4	15	1,305	1,349	1,448	1,563
VHPT 4 005 051 04 40 L010	0,5	0,03	4	51	0,50	1,00	0,010	4	15	1,343	1,389	1,491	1,610
VHPT 4 005 051 04 40 L020	0,5	0,03	4	51	0,50	2,00	0,010	4	15	2,377	2,459	2,641	2,853
VHPT 4 006 051 04 40 L006	0,6	0,05	4	51	0,60	-	-	4	15	2,060	2,130	2,286	2,468
VHPT 4 006 051 04 40 L016	0,6	0,05	4	51	0,60	1,60	0,020	4	15	2,138	2,210	2,372	2,561
VHPT 4 006 051 04 40 L024	0,6	0,05	4	51	0,60	2,40	0,020	4	15	2,965	3,066	3,292	3,555
VHPT 4 008 051 04 40 L008	0,8	0,05	4	51	0,80	-	-	4	15	2,267	2,344	2,516	2,716
VHPT 4 008 051 04 40 L018	0,8	0,05	4	51	0,80	1,80	0,020	4	15	2,344	2,424	2,602	2,809
VHPT 4 008 051 04 40 L032	0,8	0,05	4	51	0,80	3,20	0,020	4	15	3,791	3,922	4,212	4,550
VHPT 4 010 051 04 40 L001	1,0	0,05	4	51	1,00	-	-	4	15	2,474	2,558	2,746	2,965
VHPT 4 010 051 04 40 L020	1,0	0,05	4	51	1,00	2,00	0,020	4	15	2,551	2,638	2,832	3,058
VHPT 4 010 051 04 40 L040	1,0	0,05	4	51	1,00	4,00	0,020	4	15	4,618	4,778	5,132	5,544
VHPT 4 010 051 04 40 L060	1,0	0,05	4	51	1,00	6,00	0,020	4	15	6,686	6,917	7,432	8,030
VHPT 4 01A 051 04 40 L010	1,0	0,10	4	51	1,00	-	-	4	15	2,472	2,555	2,739	2,953
VHPT 4 01A 051 04 40 L020	1,0	0,10	4	51	1,00	2,00	0,020	4	15	2,549	2,635	2,825	3,046
VHPT 4 01A 051 04 40 L040	1,0	0,10	4	51	1,00	4,00	0,020	4	15	4,617	4,774	5,124	5,532
VHPT 4 01A 051 04 40 L060	1,0	0,10	4	51	1,00	6,00	0,020	4	15	6,684	6,913	7,424	8,018
VHPT 4 015 051 04 40 L015	1,5	0,10	4	51	1,50	-	-	4	15	3,778	3,906	4,191	4,523
VHPT 4 015 051 04 40 L030	1,5	0,10	4	51	1,50	3,00	0,025	4	15	3,874	4,006	4,299	4,639
VHPT 4 015 051 04 40 L060	1,5	0,10	4	51	1,50	6,00	0,025	4	15	6,975	7,215	7,748	8,369
VHPT 4 015 051 04 40 L090	1,5	0,10	4	51	1,50	9,00	0,025	4	15	10,076	10,424	11,198	12,098
VHPT 4 015 B51 04 40 L015	1,5	0,20	4	51	1,50	-	-	4	15	3,775	3,899	4,177	4,499
VHPT 4 015 B51 04 40 L030	1,5	0,20	4	51	1,50	3,00	0,025	4	15	3,871	3,999	4,284	4,615
VHPT 4 015 B51 04 40 L060	1,5	0,20	4	51	1,50	6,00	0,025	4	15	6,972	7,208	7,733	8,345
VHPT 4 015 B51 04 40 L090	1,5	0,20	4	51	1,50	9,00	0,025	4	15	10,073	10,417	11,183	12,074

Standard



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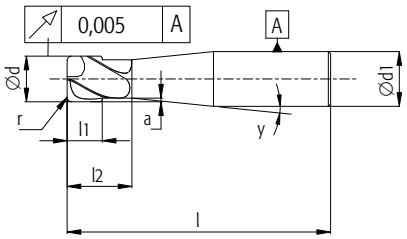
Shank 4 mm
Schaft 4 mm

For an extra charge we offer an inspection report of the tool geometry.

Auf Wunsch erhalten Sie zu jedem Werkzeug ein separates Prüfprotokoll (aufpreispflichtig).

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°
VHPT 4 020 051 04 40 L020	2,0	0,10	4	51	2,00	-	-	4	15	4,295	4,441	4,766	5,145
VHPT 4 020 051 04 40 L040	2,0	0,10	4	51	2,00	4,00	0,050	4	15	5,005	5,175	5,556	5,999
VHPT 4 020 051 04 40 L080	2,0	0,10	4	51	2,00	8,00	0,050	4	15	9,139	9,454	10,155	10,971
VHPT 4 020 051 04 40 L120	2,0	0,10	4	51	2,00	12,00	0,050	4	15	13,274	13,733	14,755	15,944
VHPT 4 02A 051 04 40 L020	2,0	0,30	4	51	2,00	-	-	4	15	4,288	4,427	4,736	5,096
VHPT 4 02A 051 04 40 L040	2,0	0,30	4	51	2,00	4,00	0,050	4	15	4,998	5,162	5,526	5,950
VHPT 4 02A 051 04 40 L080	2,0	0,30	4	51	2,00	8,00	0,050	4	15	9,133	9,440	10,125	10,923
VHPT 4 02A 051 04 40 L120	2,0	0,30	4	51	2,00	12,00	0,050	4	15	13,267	13,719	14,725	15,895
VHPT 4 025 051 04 40 L025	2,5	0,10	4	51	2,50	-	-	4	15	4,812	4,976	5,341	5,767
VHPT 4 025 051 04 40 L050	2,5	0,10	4	51	2,50	5,00	0,050	4	15	6,038	6,245	6,706	7,242
VHPT 4 025 051 04 40 L100	2,5	0,10	4	51	2,50	10,00	0,050	4	15	11,207	11,594	12,455	13,457
VHPT 4 025 051 04 40 L150	2,5	0,10	4	51	2,50	15,00	0,050	4	15	16,375	16,942	18,204	∞
VHPT 4 025 B51 04 40 L025	2,5	0,30	4	51	2,50	-	-	4	15	4,805	4,962	5,311	5,718
VHPT 4 025 B51 04 40 L050	2,5	0,30	4	51	2,50	5,00	0,050	4	15	6,032	6,231	6,676	7,193
VHPT 4 025 B51 04 40 L100	2,5	0,30	4	51	2,50	10,00	0,050	4	15	11,200	11,580	12,425	13,409
VHPT 4 025 B51 04 40 L150	2,5	0,30	4	51	2,50	15,00	0,050	4	15	16,368	16,928	18,174	∞
VHPT 4 030 051 04 40 L030	3,0	0,20	4	51	3,00	-	-	4	15	5,325	5,504	5,901	6,364
VHPT 4 030 051 04 40 L060	3,0	0,20	4	51	3,00	6,00	0,050	4	15	7,069	7,308	7,841	8,461
VHPT 4 030 051 04 40 L120	3,0	0,20	4	51	3,00	12,00	0,050	4	15	13,271	13,726	14,740	∞
VHPT 4 030 051 04 40 L180	3,0	0,20	4	51	3,00	18,00	0,050	4	15	19,473	20,144	∞	∞
VHPT 4 03B 051 04 40 L030	3,0	0,20	4	51	3,00	-	-	4	15	5,325	5,504	5,901	6,364
VHPT 4 03B 051 04 40 L060	3,0	0,50	4	51	3,00	6,00	0,050	4	15	7,058	7,287	7,796	8,388
VHPT 4 03B 051 04 40 L120	3,0	0,50	4	51	3,00	12,00	0,050	4	15	13,260	13,705	14,695	∞
VHPT 4 03B 051 04 40 L180	3,0	0,50	4	51	3,00	18,00	0,050	4	15	19,462	20,123	∞	∞

Standard



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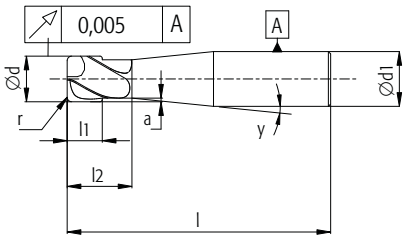
Shank 6 mm
Schaft 6 mm

Remark ∞ = infinity, no collision in projection length area.

Bemerkung ∞ = unendlich, keine Kollision in Länge Projektionsfläche.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
VHPT 4 002 064 06 40 L002	0,2	0,01	6	64	0,20	-	-	4	15	0,685	0,709	0,761	0,822
VHPT 4 002 064 06 40 L004	0,2	0,01	6	64	0,20	0,40	0,010	4	15	0,724	0,749	0,804	0,869
VHPT 4 004 064 06 40 L004	0,4	0,01	6	64	0,40	-	-	4	15	1,202	1,244	1,336	1,444
VHPT 4 004 064 06 40 L009	0,4	0,01	6	64	0,40	0,90	0,010	4	15	1,241	1,284	1,379	1,490
VHPT 4 004 064 06 40 L016	0,4	0,01	6	64	0,40	1,60	0,010	4	15	1,964	2,032	2,184	2,360
VHPT 4 005 064 06 40 L005	0,5	0,03	6	64	0,50	-	-	4	15	1,305	1,349	1,448	1,563
VHPT 4 005 064 06 40 L010	0,5	0,03	6	64	0,50	1,00	0,010	4	15	1,343	1,389	1,491	1,610
VHPT 4 005 064 06 40 L020	0,5	0,03	6	64	0,50	2,00	0,010	4	15	2,377	2,459	2,641	2,853
VHPT 4 006 064 06 40 L006	0,6	0,05	6	64	0,60	-	-	4	15	2,060	2,130	2,286	2,468
VHPT 4 006 064 06 40 L016	0,6	0,05	6	64	0,60	1,60	0,020	4	15	2,138	2,210	2,372	2,561
VHPT 4 006 064 06 40 L024	0,6	0,05	6	64	0,60	2,40	0,020	4	15	2,965	3,066	3,292	3,555
VHPT 4 008 064 06 40 L008	0,8	0,05	6	64	0,80	-	-	4	15	2,267	2,344	2,516	2,716
VHPT 4 008 064 06 40 L018	0,8	0,05	6	64	0,80	1,80	0,020	4	15	2,344	2,424	2,602	2,809
VHPT 4 008 064 06 40 L032	0,8	0,05	6	64	0,80	3,20	0,020	4	15	3,791	3,922	4,212	4,550
VHPT 4 010 064 06 40 L001	1,0	0,05	6	64	1,00	-	-	4	15	2,474	2,558	2,746	2,965
VHPT 4 010 064 06 40 L020	1,0	0,05	6	64	1,00	2,00	0,020	4	15	2,551	2,638	2,832	3,058
VHPT 4 010 064 06 40 L040	1,0	0,05	6	64	1,00	4,00	0,020	4	15	4,618	4,778	5,132	5,544
VHPT 4 010 064 06 40 L060	1,0	0,05	6	64	1,00	6,00	0,020	4	15	6,686	6,917	7,432	8,030
VHPT 4 01A 064 06 40 L001	1,0	0,10	6	64	1,00	-	-	4	15	2,472	2,555	2,739	2,953
VHPT 4 01A 064 06 40 L020	1,0	0,10	6	64	1,00	2,00	0,020	4	15	2,549	2,635	2,825	3,046
VHPT 4 01A 064 06 40 L040	1,0	0,10	6	64	1,00	4,00	0,020	4	15	4,617	4,774	5,124	5,532
VHPT 4 01A 064 06 40 L060	1,0	0,10	6	64	1,00	6,00	0,020	4	15	6,684	6,913	7,424	8,018
VHPT 4 015 064 06 40 L015	1,5	0,10	6	64	1,50	-	-	4	15	3,778	3,906	4,191	4,523
VHPT 4 015 064 06 40 L030	1,5	0,10	6	64	1,50	3,00	0,025	4	15	3,874	4,006	4,299	4,639
VHPT 4 015 064 06 40 L060	1,5	0,10	6	64	1,50	6,00	0,025	4	15	6,975	7,215	7,748	8,369
VHPT 4 015 064 06 40 L090	1,5	0,10	6	64	1,50	9,00	0,025	4	15	10,076	10,424	11,198	12,098
VHPT 4 015 B64 06 40 L015	1,5	0,20	6	64	1,50	-	-	4	15	3,775	3,899	4,177	4,499
VHPT 4 015 B64 06 40 L030	1,5	0,20	6	64	1,50	3,00	0,025	4	15	3,871	3,999	4,284	4,615
VHPT 4 015 B64 06 40 L060	1,5	0,20	6	64	1,50	6,00	0,025	4	15	6,972	7,208	7,733	8,345
VHPT 4 015 B64 06 40 L090	1,5	0,20	6	64	1,50	9,00	0,025	4	15	10,073	10,417	11,183	12,074
VHPT 4 020 064 06 40 L002	2,0	0,10	6	64	2,00	-	-	4	15	4,295	4,441	4,766	5,145
VHPT 4 020 064 06 40 L040	2,0	0,10	6	64	2,00	4,00	0,050	4	15	5,005	5,175	5,556	5,999
VHPT 4 020 064 06 40 L080	2,0	0,10	6	64	2,00	8,00	0,050	4	15	9,139	9,454	10,155	10,971
VHPT 4 020 064 06 40 L120	2,0	0,10	6	64	2,00	12,00	0,050	4	15	13,274	13,733	14,755	15,944
VHPT 4 02A 064 06 40 L002	2,0	0,30	6	64	2,00	-	-	4	15	4,288	4,427	4,736	5,096
VHPT 4 02A 064 06 40 L040	2,0	0,30	6	64	2,00	4,00	0,050	4	15	4,998	5,162	5,526	5,950
VHPT 4 02A 064 06 40 L080	2,0	0,30	6	64	2,00	8,00	0,050	4	15	9,133	9,440	10,125	10,923
VHPT 4 02A 064 06 40 L120	2,0	0,30	6	64	2,00	12,00	0,050	4	15	13,267	13,719	14,725	15,895

Standard



PAGE 16

Shank 6 mm
Schaft 6 mm

For an extra charge we offer an inspection report of the tool geometry.

Auf Wunsch erhalten Sie zu jedem Werkzeug ein separates Prüfprotokoll (aufpreispflichtig).

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
VHPT 4 025 064 06 40 L025	2,5	0,10	6	64	2,50	-	-	4	15	4,812	4,976	5,341	5,767
VHPT 4 025 064 06 40 L050	2,5	0,10	6	64	2,50	5,00	0,050	4	15	6,038	6,245	6,706	7,242
VHPT 4 025 064 06 40 L100	2,5	0,10	6	64	2,50	10,00	0,050	4	15	11,207	11,594	12,455	13,457
VHPT 4 025 064 06 40 L150	2,5	0,10	6	64	2,50	15,00	0,050	4	15	16,375	16,942	18,204	19,673
VHPT 4 025 B64 06 40 L025	2,5	0,30	6	64	2,50	-	-	4	15	4,805	4,962	5,311	5,718
VHPT 4 025 B64 06 40 L050	2,5	0,30	6	64	2,50	5,00	0,050	4	15	6,032	6,231	6,676	7,193
VHPT 4 025 B64 06 40 L100	2,5	0,30	6	64	2,50	10,00	0,050	4	15	11,200	11,580	12,425	13,409
VHPT 4 025 B64 06 40 L150	2,5	0,30	6	64	2,50	15,00	0,050	4	15	16,368	16,928	18,174	19,625
VHPT 4 030 064 06 40 L003	3,0	0,20	6	64	3,00	-	-	4	15	5,325	5,504	5,901	6,364
VHPT 4 030 064 06 40 L060	3,0	0,20	6	64	3,00	6,00	0,050	4	15	7,069	7,308	7,841	8,461
VHPT 4 030 064 06 40 L120	3,0	0,20	6	64	3,00	12,00	0,050	4	15	13,271	13,726	14,740	15,919
VHPT 4 030 064 06 40 L180	3,0	0,20	6	64	3,00	18,00	0,050	4	15	19,473	20,144	21,639	23,378
VHPT 4 03B 064 06 40 L003	3,0	0,50	6	64	3,00	-	-	4	15	5,325	5,504	5,901	6,364
VHPT 4 03B 064 06 40 L060	3,0	0,50	6	64	3,00	6,00	0,050	4	15	7,058	7,287	7,796	8,388
VHPT 4 03B 064 06 40 L120	3,0	0,50	6	64	3,00	12,00	0,050	4	15	13,260	13,705	14,695	15,846
VHPT 4 03B 064 06 40 L180	3,0	0,50	6	64	3,00	18,00	0,050	4	15	19,462	20,123	21,594	23,305
VHPT 4 040 064 06 40 L080	4,0	0,20	6	64	4,00	8,00	0,100	4	15	9,329	9,647	10,355	11,179
VHPT 4 040 064 06 40 L160	4,0	0,20	6	64	4,00	16,00	0,100	4	15	17,598	18,204	19,554	∞
VHPT 4 040 064 06 40 L240	4,0	0,20	6	64	4,00	24,00	0,100	4	15	25,867	26,762	28,753	∞
VHPT 4 04B 064 06 40 L080	4,0	0,50	6	64	4,00	8,00	0,100	4	15	9,319	9,626	10,310	11,106
VHPT 4 04B 064 06 40 L160	4,0	0,50	6	64	4,00	16,00	0,100	4	15	17,588	18,183	19,509	∞
VHPT 4 04B 064 06 40 L240	4,0	0,50	6	64	4,00	24,00	0,100	4	15	25,857	26,741	28,708	∞
VHPT 4 06B 064 06 40 L120	6,0	0,50	6	64	6,00	12,00	0,150	4	-	-	-	-	-
VHPT 4 06B 064 06 40 L240	6,0	0,50	6	64	6,00	24,00	0,150	4	-	-	-	-	-
VHPT 4 06C 064 06 40 L120	6,0	1,00	6	64	6,00	12,00	0,150	4	-	-	-	-	-
VHPT 4 06C 064 06 40 L240	6,0	1,00	6	64	6,00	24,00	0,150	4	-	-	-	-	-
VHPT 4 08B 078 08 40 L160	8,0	0,50	8	78	8,00	16,00	0,200	4	-	-	-	-	-
VHPT 4 08B 078 08 40 L320	8,0	0,50	8	78	8,00	32,00	0,200	4	-	-	-	-	-
VHPT 4 08C 078 08 40 L160	8,0	1,00	8	78	8,00	16,00	0,200	4	-	-	-	-	-
VHPT 4 08C 078 08 40 L320	8,0	1,00	8	78	8,00	32,00	0,200	4	-	-	-	-	-
VHPT 4 10B 100 10 40 L200	10,0	0,50	10	100	10,00	20,00	0,200	4	-	-	-	-	-
VHPT 4 10B 100 10 40 L400	10,0	0,50	10	100	10,00	40,00	0,200	4	-	-	-	-	-
VHPT 4 10C 100 10 40 L200	10,0	1,00	10	100	10,00	20,00	0,200	4	-	-	-	-	-
VHPT 4 10C 100 10 40 L400	10,0	1,00	10	100	10,00	40,00	0,200	4	-	-	-	-	-
VHPT 4 12B 100 12 40 L240	12,0	0,50	12	100	12,00	24,00	0,200	4	-	-	-	-	-
VHPT 4 12B 100 12 40 L480	12,0	0,50	12	100	12,00	48,00	0,200	4	-	-	-	-	-
VHPT 4 12C 100 12 40 L240	12,0	1,00	12	100	12,00	24,00	0,200	4	-	-	-	-	-
VHPT 4 12C 100 12 40 L480	12,0	1,00	12	100	12,00	48,00	0,200	4	-	-	-	-	-

Cutting conditions / Schnittwertempfehlungen VHPT

Material group	TSR (N/mm²)	Hardness	Cutting speed V_c m/min	Coolant
H2.2		50-55 HRc	**150 - 220**	min.lub.
H2.3		55-70 HRc	**200 - 250**	min.lub.
K4.1			**160 - 240**	emulsion

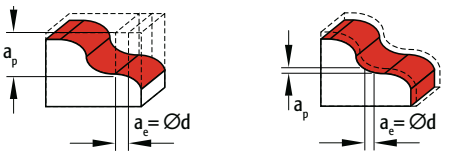
VHPT408B0780840L160
Workpiece Material: 1.2162
Hardness: 60 HRc

	Van Hoorn	Competitor
V_c	200 m/min	25 m/min
n	7958 rpm	995 rpm
F_z	0,079 mm/t	0,038 mm/t
V_f	2500 mm/min	150 mm/min
a_p	3 mm	3 mm
a_e	0,1 mm	0,25 mm
Coolant	air	air
Q	**0,75 mm³/min**	**0,11 mm³/min**

Finishing application / Schlichtbearbeitung
6 times faster than Competitor! / 6-Mal schneller als der Wettbewerb!

VHC Technology for hardened materials (55-70 HRc)
VHC Technologie für gehärtete Werkstoffe (55-70 HRc)

- Consistency of cutting Speeds.
- Gleichbleibende Schnittgeschwindigkeit.
- Optimized performance.
- Optimierte Leistung.
- Significant production time reductions.
- Deutlich verkürzte Fertigungszeiten.

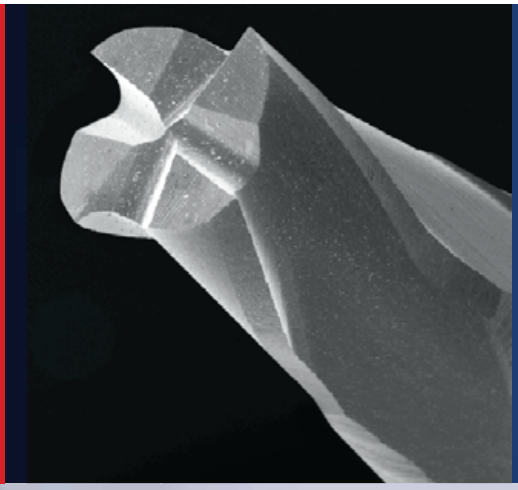


Shoulder milling / Stirnfräsen

Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
0,2	< 0,15	< 0,005	0,004 - 0,010
0,4	< 0,30	< 0,010	0,006 - 0,013
0,5	< 0,38	< 0,013	0,007 - 0,015
0,6	< 0,45	< 0,015	0,009 - 0,018
0,8	< 0,60	< 0,020	0,012 - 0,021
1,0	< 0,75	< 0,025	0,015 - 0,025
1,5	< 1,13	< 0,038	0,020 - 0,035
2,0	< 1,50	< 0,050	0,030 - 0,050
2,5	< 1,88	< 0,063	0,035 - 0,055
3,0	< 2,25	< 0,075	0,040 - 0,060
4,0	< 3,00	< 0,100	0,050 - 0,080
5,0	< 3,75	< 0,125	0,060 - 0,110
6,0	< 4,50	< 0,150	0,065 - 0,125
8,0	< 6,00	< 0,200	0,080 - 0,130
10,0	< 7,50	< 0,250	0,085 - 0,135
12,0	< 9,00	< 0,300	0,100 - 0,140

Materials from 55 until 70 HRc
Materiale von 55 bis 70 HRc

- From 0,1 mm until 3,0 mm micro milling
  Ab 0,1 mm bis zum 3,0 mm Mikro Fräsen
- Shaft 4 and 6 mm
  Schaft 4 und 6 mm
- 2 Flute and 4 flute
  2 Schneiden und 4 Schneiden
- Ball nose
  Kugel
- Torus
  Torus
- Multiple flute
  Mehrschneiderfräsen

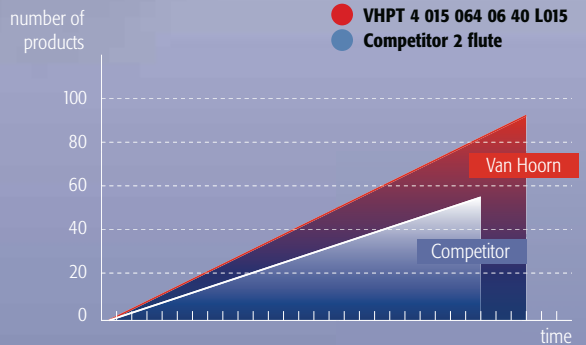


- **Micro 4 flute (0,2 mm)**
  Mikro 4 Schneiden (0,2 mm)
- **Ideal chipflow geometry**
  Ideale Spanfluss Geometrie
- **Optimized for hardened steels**
  Optimiert für gehärteten Stählen

Micro 4 flute
42% higher material removal rate!

Mikro 4 Schneiden
42% höheres Zeitspanvolumen

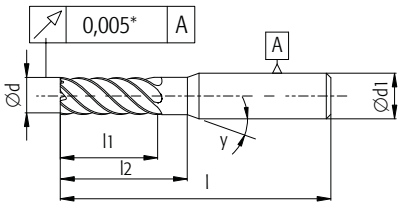
Tool life / number of products
Standzeit / Anzahl Produkten
- **VHPT 4 015 064 06 40 L015**
- **Competitor 2 flute**



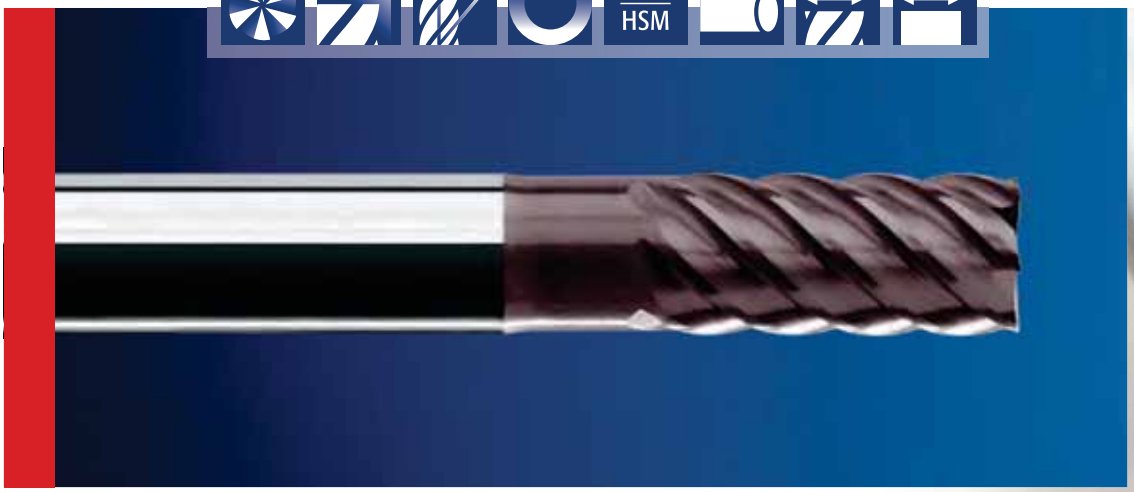
VHPT 4 flute / 4 Schneiden
Workpiece Material: Elmax Hardened
Hardness: 62 HRc

	Van Hoorn	Competitor
ø	1,5 mm	1,5 mm
Z	4 teeth	2 teeth
V_c	85 m/min	85 m/min
n	18000 rpm	18000 rpm
V_f	1440 mm/min	828 mm/min
F_z	0,02 mm/t	0,023 mm/t
a_p	0,65 mm	0,65 mm
a_e	0,04 mm	0,04 mm
Coolant	MMS	MMS
Q	**37,44 mm³/min**	**21,52 mm³/min**

Standard



* For end mills / für Schaftfräser L < 100 mm.



Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHPM 6 030 064 06 40	3,0	-	6	64	8,00	15,00	0,050	6	15
VHPM 6 040 064 06 40	4,0	-	6	64	10,00	16,00	0,100	6	15
VHPM 6 050 064 06 40	5,0	-	6	64	12,00	18,00	0,150	6	15
VHPM 6 060 064 06 40	6,0	-	6	64	14,00	20,00	0,200	6	-
VHPM 6 080 078 08 40	8,0	-	8	78	18,00	25,00	0,200	6	-
VHPM 6 100 078 10 40	10,0	-	10	78	22,00	30,00	0,300	6	-
VHPM 6 120 089 12 40	12,0	-	12	89	26,00	35,00	0,300	6	-
VHPM 6 160 089 16 40	16,0	-	16	89	34,00	40,00	0,300	6	-
VHPM 8 200 102 20 40	20,0	-	20	102	42,00	48,00	0,300	8	-

Also available with extra teeth for higher productivity

Auch lieferbar mit höherer Zähnezahl zur Produktivitätssteigerung.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHPM 8 080 078 08 40	8,0	-	8	78	18,00	25,00	0,200	8	-
VHPM 10 100 078 10 40	10,0	-	10	78	22,00	30,00	0,300	10	-
VHPM 12 120 089 12 40	12,0	-	12	89	26,00	35,00	0,300	12	-
VHPM 16 160 089 16 40	16,0	-	16	89	34,00	40,00	0,300	16	-

Material group	TSR (N/mm²)	Hardness	Cutting speed V_c m/min	Coolant
H2.2		50-55 HRc	**110 - 170**	min.lub.
H2.3		55-70 HRc	**80 - 140**	min.lub.
K4.1			**140 - 200**	emulsion

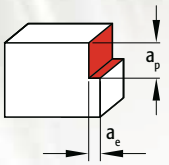
For an extra charge we offer an inspection report of the tool geometry.

Auf Wunsch erhalten Sie zu jedem Werkzeug ein separates Prüfprotokoll (aufpreispflichtig).

Negative rake angle
Negativer Spanwinkel

Workpiece Material: 1.2379
Hardness: 60HRc

	Van Hoorn	Competitor
V_c	101 m/min	101 m/min
n	3200 rpm	3200 rpm
F_z	0,052 mm/t	0,04 mm/t
Z	6	4
V_f	1000 mm/min	512 mm/min
a_p	18 mm	18 mm
a_e	0,1 mm	0,1 mm
Coolant	air	air
Q	**1,8 cm³/min**	**0,9 cm³/min**



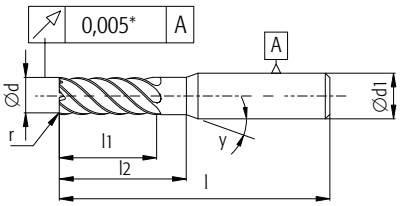
Hardened material
Gehärtete Werkstoffe

a_p up to 2,00 x d
a_e up to 0,02 x d

Shoulder milling / Eckfräsen

Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
3,0	< 3,0	< 0,03	0,020 - 0,035
4,0	< 6,0	< 0,05	0,030 - 0,045
5,0	< 7,5	< 0,07	0,035 - 0,055
6,0	< 12,0	< 0,10	0,045 - 0,065
8,0	< 16,0	< 0,13	0,060 - 0,080
10,0	< 20,0	< 0,17	0,070 - 0,095
12,0	< 24,0	< 0,21	0,085 - 0,110
16,0	< 32,0	< 0,28	0,095 - 0,125
20,0	< 40,0	< 0,35	0,105 - 0,140

Standard



* For end mills / für Schaftfräser L < 100 mm.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHPMR 6 030 064 06 40 030	3,0	0,30	6	64	8,00	15,00	0,050	6	15
VHPMR 6 040 064 06 40 030	4,0	0,30	6	64	10,00	16,00	0,100	6	15
VHPMR 6 050 064 06 40 030	5,0	0,30	6	64	12,00	18,00	0,150	6	15
VHPMR 6 050 064 06 40 050	5,0	0,50	6	64	12,00	18,00	0,150	6	15
VHPMR 6 060 064 06 40 050	6,0	0,50	6	64	14,00	20,00	0,200	6	-
VHPMR 6 060 064 06 40 100	6,0	1,00	6	64	14,00	20,00	0,200	6	-
VHPMR 6 080 070 08 40 050	8,0	0,50	8	70	18,00	25,00	0,200	6	-
VHPMR 6 080 070 08 40 100	8,0	1,00	8	70	18,00	25,00	0,200	6	-
VHPMR 6 100 078 10 40 050	10,0	0,50	10	78	22,00	30,00	0,300	6	-
VHPMR 6 100 078 10 40 100	10,0	1,00	10	78	22,00	30,00	0,300	6	-
VHPMR 6 100 078 10 40 150	10,0	1,50	10	78	22,00	30,00	0,300	6	-
VHPMR 6 120 078 12 40 050	12,0	0,50	12	78	26,00	35,00	0,300	6	-
VHPMR 6 120 078 12 40 100	12,0	1,00	12	78	26,00	35,00	0,300	6	-
VHPMR 6 120 078 12 40 200	12,0	2,00	12	78	26,00	35,00	0,300	6	-
VHPMR 6 160 089 16 40 100	16,0	1,00	16	89	34,00	40,00	0,300	6	-
VHPMR 6 160 089 16 40 200	16,0	2,00	16	89	34,00	40,00	0,300	6	-
VHPMR 8 200 102 20 40 100	20,0	1,00	20	102	42,00	48,00	0,300	8	-
VHPMR 8 200 102 20 40 200	20,0	2,00	20	102	42,00	48,00	0,300	8	-

Also available with extra teeth for higher productivity

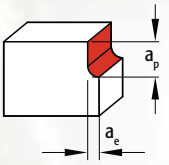
Auch lieferbar mit höherer Zähnezahl zur Produktivitätssteigerung.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHPMR 8 080 078 08 40 050	8,0	0,50	8	78	18,00	25,00	0,200	8	-
VHPMR 10 100 078 10 40 050	10,0	0,50	10	78	22,00	30,00	0,300	10	-
VHPMR 12 120 089 12 40 050	12,0	0,50	12	89	26,00	35,00	0,300	12	-
VHPMR 16 160 089 16 40 050	16,0	0,50	16	89	34,00	40,00	0,300	16	-

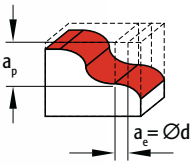
Material group	TSR (N/mm²)	Hardness	Cutting speed V_c m/min	Coolant
H2.2		50-55 HRc	**110 - 170**	min.lub.
H2.3		55-70 HRc	**80 - 140**	min.lub.
K4.1			**140 - 200**	emulsion

For an extra charge we offer an inspection report of the tool geometry.

Auf Wunsch erhalten Sie zu jedem Werkzeug ein separates Prüfprotokoll (aufpreispflichtig).



Hardened material
Gehärtete Werkstoffe
a_p up to 2,00 x d
a_e up to 0,02 x d



Hardened material
Gehärtete Werkstoffe
a_p up to 2,00 x d
a_e up to 0,02 x d

Shoulder milling / Eckfräsen

Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
3,0	< 3,0	< 0,03	0,020 - 0,035
4,0	< 6,0	< 0,05	0,030 - 0,045
5,0	< 7,5	< 0,07	0,035 - 0,055
6,0	< 12,0	< 0,10	0,045 - 0,065
8,0	< 16,0	< 0,13	0,060 - 0,080
10,0	< 20,0	< 0,17	0,070 - 0,095
12,0	< 24,0	< 0,21	0,085 - 0,110
16,0	< 32,0	< 0,28	0,095 - 0,125
20,0	< 40,0	< 0,35	0,105 - 0,140

An optimized combination between geometry, coating and tolerances result in an excellent surface finish and extended tool life.

Eine optimierte Kombination aus Schneidengeometrie, Beschichtung und Toleranzen gewährleisten ausgezeichnete Oberflächen und verlängerte Standzeiten.

VHKF2 / VHKF4

Ball nose geometries
Vollradius Geometrien:

- **Special designed center**
  Spezial entwickeltes Zentrum
- **Smooth surface finish**
  Glatte Oberflächen
- **Optimized coating for tool life improvement**
  Optimierte Beschichtung für Standzeitverbesserung

Micro end mills:

- **Also standard in shank 4!**
  Auch Standard in Schaft 4!
- **Radial runout determines tool life**
  Rundlaufgenauigkeit beeinflusst Standzeit
- **Micro 4 flutes!**
  Mikro 4 Schneiden!
- **New designed ideal clearance**
  Neuer idealer Freilauf

4 Flute! Higher feedrate, higher productivity, better solution!
4 Schneiden! Höhere forschub, höhere Produktivität, bessere Lösung!

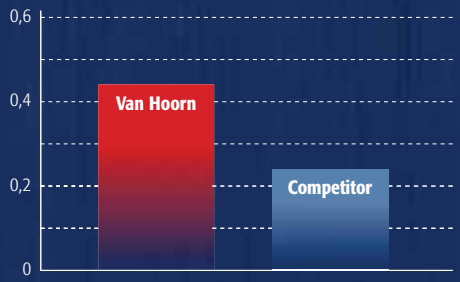
A complete range of high end solutions for typical Mould & Die applications

Ein vollständiges Sortiment an High-End-Produkte für den Werkzeug- und Formenbau.

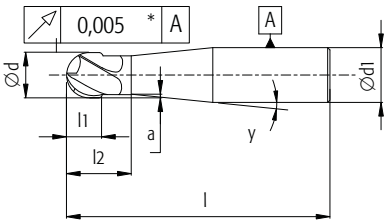
Workpiece Material: 1.2343 (S136)
Hardness: 52 HRc

	Van Hoorn	Competitor
V_c	132 m/min	132 m/min
n	7000 rpm	7000 rpm
F_z	0,036 mm/t	0,029 mm/t
Z	6	4
V_f	1500 mm/min	800 mm/min
a_p	0,1 mm	0,1 mm
a_e	3 mm	3 mm
Coolant	emulsion	emulsion
Q	**0,45 cm³/min**	**0,24 cm³/min**

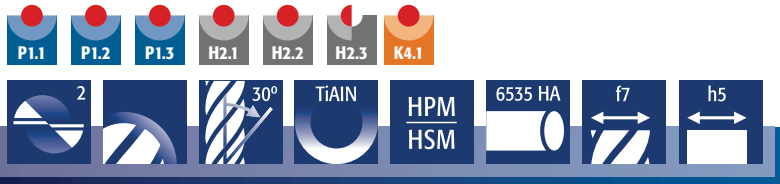
VHMF Material removal rate



Standard

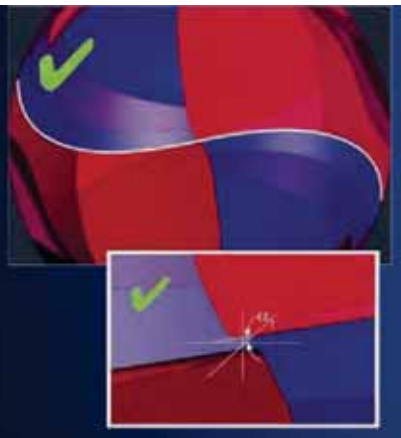


* For end mills / für Schaftfräser L < 100 mm.



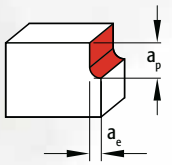
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHKF 2 010 064 06 03	1,0	0,50	6	64	2,00	4,00	0,050	2	7
VHKF 2 010 078 06 03	1,0	0,50	6	78	2,00	4,00	0,050	2	4
VHKF 2 015 064 06 03	1,5	0,75	6	64	2,00	4,00	0,050	2	6
VHKF 2 015 078 06 03	1,5	0,75	6	78	2,00	4,00	0,050	2	4
VHKF 2 020 064 06 03	2,0	1,00	6	64	3,00	5,00	0,050	2	6
VHKF 2 020 064 06 03 L080	2,0	1,00	6	64	3,00	8,00	0,050	2	9
VHKF 2 020 078 06 03 L080	2,0	1,00	6	78	3,00	8,00	0,050	2	4
VHKF 2 020 078 06 03	2,0	1,00	6	78	3,00	15,00	0,050	2	5
VHKF 2 030 064 06 03	3,0	1,50	6	64	4,00	7,00	0,050	2	5
VHKF 2 030 078 06 03	3,0	1,50	6	78	4,00	15,00	0,050	2	4
VHKF 2 030 100 06 03	3,0	1,50	6	100	4,00	7,00	0,050	2	2
VHKF 2 040 064 06 03	4,0	2,00	6	64	5,00	8,00	0,100	2	4
VHKF 2 040 078 06 03	4,0	2,00	6	78	5,00	15,00	0,100	2	3
VHKF 2 040 100 06 03	4,0	2,00	6	100	5,00	8,00	0,100	2	1
VHKF 2 050 064 06 03	5,0	2,50	6	64	5,00	10,00	0,150	2	2
VHKF 2 050 078 06 03	5,0	2,50	6	78	5,00	20,00	0,150	2	2
VHKF 2 060 064 06 03	6,0	3,00	6	64	6,00	25,00	0,200	2	-
VHKF 2 060 078 06 03	6,0	3,00	6	78	6,00	35,00	0,200	2	-
VHKF 2 060 100 08 03	6,0	3,00	8	100	6,00	25,00	0,200	2	2
VHKF 2 080 064 08 03	8,0	4,00	8	64	8,00	25,00	0,300	2	-
VHKF 2 080 078 08 03	8,0	4,00	8	78	8,00	35,00	0,300	2	-
VHKF 2 080 100 08 03	8,0	4,00	8	100	8,00	50,00	0,300	2	-
VHKF 2 080 120 10 03	8,0	4,00	10	120	8,00	30,00	0,300	2	2
VHKF 2 100 078 10 03	10,0	5,00	10	78	10,00	35,00	0,300	2	-
VHKF 2 100 100 10 03	10,0	5,00	10	100	10,00	55,00	0,300	2	-
VHKF 2 100 120 12 03	10,0	5,00	12	120	10,00	30,00	0,300	2	2
VHKF 2 120 078 12 03	12,0	6,00	12	78	12,00	35,00	0,300	2	-
VHKF 2 120 100 12 03	12,0	6,00	12	100	12,00	55,00	0,300	2	-
VHKF 2 120 120 16 03	12,0	6,00	16	120	12,00	40,00	0,300	2	5
VHKF 2 160 100 16 03	16,0	8,00	16	100	20,00	50,00	0,300	2	-
VHKF 2 160 150 16 03	16,0	8,00	16	150	20,00	100,00	0,300	2	-

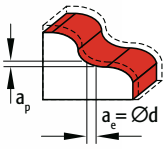
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**150 - 250**	emulsion
P1.2	< 1000	< 300	**120 - 200**	emulsion
P1.3	< 1400	< 400	**100 - 160**	emulsion
H2.1		42-50 HRc	**120 - 180**	min.lub.
H2.2		50-55 HRc	**150 - 200**	min.lub.
H2.3		55-70 HRc	**200 - 250**	min.lub.
K4.1			**100 - 200**	emulsion



Special/ideal ball nose geometry

Spezieller/idealer Kugelgeometrie





- For the cutting speed V_c calculation the effective cutting diameter d_{eff} has to be taken into account. See formula.

  Für die Berechnung der Schnittgeschwindigkeit muss der effektive Durchmesser d_{eff} berücksichtigt werden (siehe Formel).

ß ≠ 0: $d_{eff} = d \cdot \sin\left[ß \pm \arccos\left(\frac{d - 2a_p}{d}\right)\right]$

Roughing / Schruppfräsen

	P1.1 / P1.2 / P1.3		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
1,0	< 1,0	< 0,30	0,015 - 0,025
1,5	< 1,5	< 0,45	0,020 - 0,030
2,0	< 2,0	< 0,60	0,025 - 0,035
3,0	< 3,0	< 0,90	0,028 - 0,040
4,0	< 4,0	< 1,20	0,030 - 0,045
5,0	< 5,0	< 1,50	0,035 - 0,050
6,0	< 6,0	< 1,80	0,040 - 0,055
8,0	< 8,0	< 2,40	0,050 - 0,065
10,0	< 10,0	< 3,00	0,055 - 0,080
12,0	< 12,0	< 3,60	0,065 - 0,090
16,0	< 16,0	< 4,80	0,075 - 0,110

Finishing / Schlichtfräsen

	P1.1 / P1.2 / P1.3		
	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
	< 1,0	< 0,10	0,020 - 0,030
	< 1,5	< 0,15	0,025 - 0,040
	< 2,0	< 0,20	0,030 - 0,050
	< 3,0	< 0,30	0,040 - 0,060
	< 4,0	< 0,40	0,050 - 0,080
	< 5,0	< 0,50	0,060 - 0,110
	< 6,0	< 0,60	0,065 - 0,125
	< 8,0	< 0,80	0,080 - 0,130
	< 10,0	< 1,00	0,085 - 0,135
	< 12,0	< 1,20	0,100 - 0,140
	< 16,0	< 1,60	0,120 - 0,160

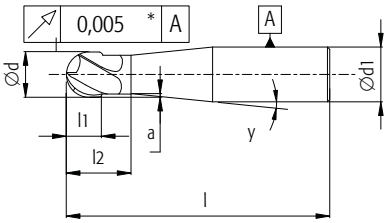
Roughing / Schruppfräsen

	H2.1 / H2.2 / H2.3		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
1,0	< 0,5	< 0,05	0,015 - 0,025
1,5	< 0,75	< 0,08	0,020 - 0,030
2,0	< 1,0	< 0,10	0,025 - 0,035
3,0	< 1,5	< 0,15	0,028 - 0,040
4,0	< 2,0	< 0,20	0,030 - 0,045
5,0	< 2,5	< 0,25	0,035 - 0,050
6,0	< 3,0	< 0,30	0,040 - 0,055
8,0	< 4,0	< 0,40	0,050 - 0,065
10,0	< 5,0	< 0,50	0,055 - 0,080
12,0	< 6,0	< 0,60	0,065 - 0,090
16,0	< 8,0	< 0,80	0,075 - 0,110

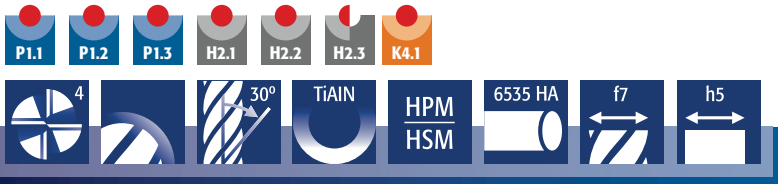
Finishing / Schlichtfräsen

	H2.1 / H2.2 / H2.3		
	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
	< 0,5	< 0,02	0,020 - 0,030
	< 0,75	< 0,03	0,025 - 0,040
	< 1,0	< 0,04	0,030 - 0,050
	< 1,5	< 0,06	0,040 - 0,060
	< 2,0	< 0,08	0,050 - 0,080
	< 2,5	< 0,10	0,060 - 0,110
	< 3,0	< 0,12	0,065 - 0,125
	< 4,0	< 0,16	0,080 - 0,130
	< 5,0	< 0,20	0,085 - 0,135
	< 6,0	< 0,24	0,100 - 0,140
	< 8,0	< 0,32	0,120 - 0,160

Standard



* For end mills / für Schaftfräser L < 100 mm.

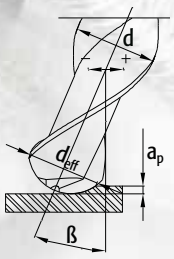


Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHKF 4 060 064 06 03	6,0	3,00	6	64	6,00	25,00	0,200	4	-
VHKF 4 060 078 06 03	6,0	3,00	6	78	6,00	35,00	0,200	4	-
VHKF 4 060 100 08 03	6,0	3,00	8	100	6,00	25,00	0,200	4	2
VHKF 4 080 064 08 03	8,0	4,00	8	64	8,00	25,00	0,300	4	-
VHKF 4 080 078 08 03	8,0	4,00	8	78	8,00	35,00	0,300	4	-
VHKF 4 080 100 08 03	8,0	4,00	8	100	8,00	50,00	0,300	4	-
VHKF 4 080 120 10 03	8,0	4,00	10	120	8,00	30,00	0,300	4	2
VHKF 4 100 078 10 03	10,0	5,00	10	78	10,00	35,00	0,300	4	-
VHKF 4 100 100 10 03	10,0	5,00	10	100	10,00	55,00	0,300	4	-
VHKF 4 100 120 12 03	10,0	5,00	12	120	10,00	30,00	0,300	4	2
VHKF 4 120 078 12 03	12,0	6,00	12	78	12,00	35,00	0,300	4	-
VHKF 4 120 100 12 03	12,0	6,00	12	100	12,00	55,00	0,300	4	-
VHKF 4 120 120 16 03	12,0	6,00	16	120	12,00	40,00	0,300	4	5
VHKF 4 160 100 16 03	16,0	8,00	16	100	20,00	50,00	0,300	4	-
VHKF 4 160 150 16 03	16,0	8,00	16	150	20,00	100,00	0,300	4	-

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**150 - 250**	emulsion
P1.2	< 1000	< 300	**120 - 200**	emulsion
P1.3	< 1400	< 400	**100 - 160**	emulsion
H2.1		42-50 HRc	**120 - 180**	min.lub.
H2.2		50-55 HRc	**150 - 200**	min.lub.
H2.3		55-70 HRc	**200 - 250**	min.lub.
K4.1			**100 - 200**	emulsion

Recommendations: Empfehlungen:

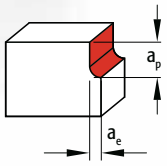
- Down-milling.
  Abwärtsfräsen.
- Inclination angle max. 15 degrees.
  Eintauchwinkel max. 15°.
- Use the effective diameter d_{eff} to calculate cutting speed.
  Effektive Durchmesser d_{eff} bei der Schnittgeschwindigkeitsberechnung berücksichtigen.



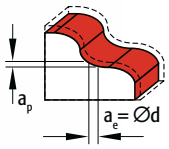
- For the cutting speed V_c calculation the effective cutting diameter d_{eff} has to be taken into account. See formula.

  Für die Berechnung der Schnittgeschwindigkeit muss der effektive Durchmesser d_{eff} berücksichtigt werden (siehe Formel).

ß ≠ 0: $d_{eff} = d \cdot \sin\left[ß \pm \arccos\left(\frac{d - 2a_p}{d}\right)\right]$



Roughing
Schruppen



Finishing
Schlichten

Roughing / Schruppfräsen — P1.1 / P1.2 / P1.3

Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
6,0	< 6,0	< 1,80	0,040 - 0,055
8,0	< 8,0	< 2,40	0,050 - 0,065
10,0	< 10,0	< 3,00	0,055 - 0,080
12,0	< 12,0	< 3,60	0,065 - 0,090
16,0	< 16,0	< 4,80	0,075 - 0,110

Finishing / Schlichtfräsen — P1.1 / P1.2 / P1.3

a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 6,0	< 0,60	0,065 - 0,125
< 8,0	< 0,80	0,080 - 0,130
< 10,0	< 1,00	0,085 - 0,135
< 12,0	< 1,20	0,100 - 0,140
< 16,0	< 1,60	0,120 - 0,160

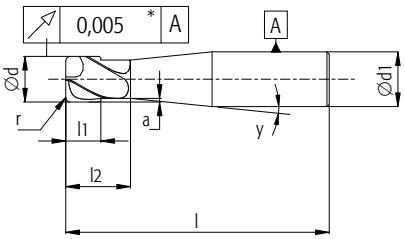
Roughing / Schruppfräsen — H2.1 / H2.2 / H2.3

Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
6,0	< 3,0	< 0,30	0,040 - 0,055
8,0	< 4,0	< 0,40	0,050 - 0,065
10,0	< 5,0	< 0,50	0,055 - 0,080
12,0	< 6,0	< 0,60	0,065 - 0,090
16,0	< 8,0	< 0,80	0,075 - 0,110

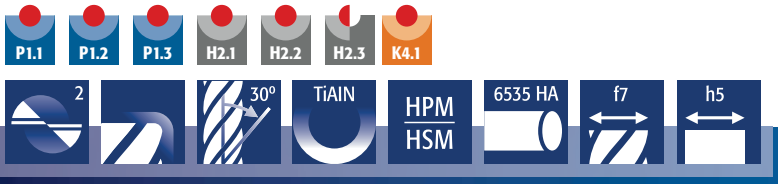
Finishing / Schlichtfräsen — H2.1 / H2.2 / H2.3

a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 3,0	< 0,12	0,065 - 0,125
< 4,0	< 0,16	0,080 - 0,130
< 5,0	< 0,20	0,085 - 0,135
< 6,0	< 0,24	0,100 - 0,140
< 8,0	< 0,32	0,120 - 0,160

Standard



* For end mills / für Schaftfräser L < 100 mm.



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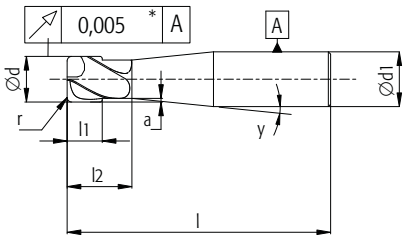
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHTF 2 010 078 06 03 L040	1,0	0,10	6	78	2,00	4,00	0,050	2	-
VHTF 2 015 064 06 03 L050	1,5	0,30	6	64	2,00	5,00	0,050	2	7
VHTF 2 015 064 06 03 L100	1,5	0,30	6	64	2,00	10,00	0,050	2	9
VHTF 2 015 078 06 03 L080	1,5	0,30	6	78	2,00	4,00	0,050	2	9
VHTF 2 020 064 06 03	2,0	0,50	6	64	3,00	5,00	0,050	2	6
VHTF 2 020 064 06 03 L080	2,0	0,50	6	64	3,00	8,00	0,050	2	7
VHTF 2 020 064 06 03 L100	2,0	0,50	6	64	3,00	10,00	0,050	2	8
VHTF 2 020 078 06 03	2,0	0,50	6	78	3,00	15,00	0,050	2	5
VHTF 2 020 078 06 03 L080	2,0	0,50	6	78	3,00	8,00	0,050	2	4
VHTF 2 030 064 06 03	3,0	0,50	6	64	4,00	7,00	0,050	2	5
VHTF 2 030 064 06 03L120	3,0	0,50	6	64	4,00	12,00	0,050	2	5
VHTF 2 030 064 06 03L160	3,0	0,50	6	64	4,00	16,00	0,050	2	5
VHTF 2 030 078 06 03L080	3,0	0,50	6	78	4,00	8,00	0,050	2	5
VHTF 2 030 078 06 03	3,0	0,50	6	78	4,00	15,00	0,050	2	4
VHTF 2 03D 078 06 03	3,0	1,00	6	78	4,00	15,00	0,050	2	4
VHTF 2 040 064 06 03	4,0	0,50	6	64	5,00	8,00	0,100	2	4
VHTF 2 040 064 06 03L120	4,0	0,50	6	64	5,00	12,00	0,100	2	4
VHTF 2 040 064 06 03L160	4,0	0,50	6	64	5,00	16,00	0,100	2	4
VHTF 2 040 064 06 03L200	4,0	0,50	6	64	5,00	20,00	0,100	2	4
VHTF 2 040 064 06 03	4,0	0,50	6	64	5,00	8,00	0,100	2	4
VHTF 2 04B 078 06 03	4,0	0,50	6	78	5,00	15,00	0,100	2	3
VHTF 2 040 078 06 03	4,0	1,00	6	78	5,00	15,00	0,100	2	3
VHTF 2 050 064 06 03	5,0	0,50	6	64	5,00	10,00	0,150	2	3
VHTF 2 05D 064 06 03	5,0	1,00	6	64	5,00	10,00	0,150	2	3
VHTF 2 05B 078 06 03	5,0	0,50	6	78	5,00	20,00	0,150	2	3
VHTF 2 050 078 06 03	5,0	1,00	6	78	5,00	20,00	0,150	2	2
VHTF 2 060 064 06 03	6,0	0,50	6	64	6,00	25,00	0,200	2	-
VHTF 2 06D 064 06 03	6,0	1,00	6	64	6,00	25,00	0,200	2	-
VHTF 2 06F 064 06 03	6,0	1,50	6	64	6,00	25,00	0,200	2	-
VHTF 2 06B 078 06 03	6,0	0,50	6	78	6,00	35,00	0,200	2	-
VHTF 2 06D 078 06 03	6,0	1,00	6	78	6,00	35,00	0,200	2	-
VHTF 2 060 078 06 03	6,0	1,50	6	78	6,00	35,00	0,200	2	-

Standard



* For end mills / für Schaftfräser L < 100 mm.

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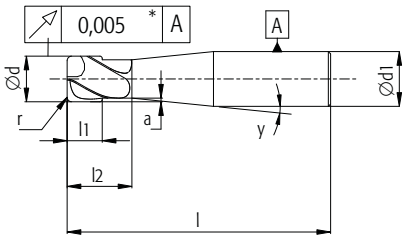
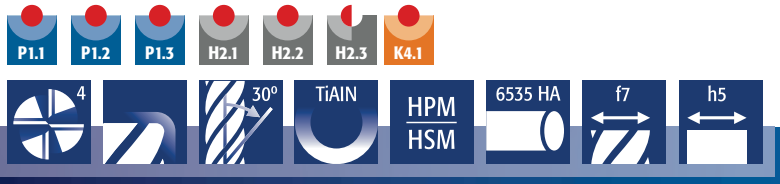
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHTF 2 06B 100 06 03L550	6,0	0,50	6	100	6,00	55,00	0,200	2	2
VHTF 2 06B 100 08 03	6,0	0,50	8	100	6,00	25,00	0,200	2	2
VHTF 2 06D 100 08 03	6,0	1,00	8	100	6,00	25,00	0,200	2	2
VHTF 2 060 100 08 03	6,0	1,50	8	100	6,00	25,00	0,200	2	2
VHTF 2 08B 064 08 03	8,0	0,50	8	64	8,00	25,00	0,300	2	-
VHTF 2 080 064 08 03	8,0	1,00	8	64	8,00	25,00	0,300	2	-
VHTF 2 08H 064 08 03	8,0	2,00	8	64	8,00	25,00	0,300	2	-
VHTF 2 08B 078 08 03	8,0	0,50	8	78	8,00	25,00	0,300	2	-
VHTF 2 08D 078 08 03	8,0	1,00	8	78	8,00	35,00	0,300	2	-
VHTF 2 080 078 08 03	8,0	2,00	8	78	8,00	35,00	0,300	2	-
VHTF 2 08B 100 08 03	8,0	0,50	8	100	8,00	50,00	0,300	2	-
VHTF 2 08D 100 08 03	8,0	1,00	8	100	8,00	50,00	0,300	2	-
VHTF 2 080 100 08 03	8,0	2,00	8	100	8,00	50,00	0,300	2	-
VHTF 2 08D 125 08 03	8,0	1,00	8	125	8,00	55,00	0,300	2	2
VHTF 2 08D 120 10 03	8,0	1,00	10	120	8,00	30,00	0,300	2	2
VHTF 2 080 120 10 03	8,0	2,00	10	120	8,00	30,00	0,300	2	2
VHTF 2 100 078 10 03	10,0	0,50	10	78	10,00	35,00	0,300	2	-
VHTF 2 10D 078 10 03	10,0	1,00	10	78	10,00	35,00	0,300	2	-
VHTF 2 10H 078 10 03	10,0	2,00	10	78	10,00	35,00	0,300	2	-
VHTF 2 100 100 10 03	10,0	1,00	10	100	10,00	55,00	0,300	2	-
VHTF 2 10H 100 10 03	10,0	2,00	10	100	10,00	55,00	0,300	2	-
VHTF 2 10M 100 10 03	10,0	3,00	10	100	10,00	55,00	0,300	2	-
VHTF 2 10D 125 10 03	10,0	1,00	10	125	10,00	55,00	0,300	2	-
VHTF 2 100 120 12 03	10,0	2,00	12	120	10,00	30,00	0,300	2	2
VHTF 2 10M 125 10 03	10,0	3,00	10	125	10,00	55,00	0,300	2	-
VHTF 2 120 078 12 03	12,0	0,50	12	78	12,00	35,00	0,300	2	-
VHTF 2 12H 078 12 03	12,0	2,00	12	78	12,00	35,00	0,300	2	-
VHTF 2 120 100 12 03	12,0	1,00	12	100	12,00	55,00	0,300	2	-
VHTF 2 12H 100 12 03	12,0	2,00	12	100	12,00	55,00	0,300	2	-
VHTF 2 120 120 16 03	12,0	2,00	16	120	12,00	40,00	0,300	2	5
VHTF 2 12D 125 12 03	12,0	1,00	12	125	12,00	55,00	0,300	2	-
VHTF 2 160 100 16 03	16,0	3,50	16	100	20,00	50,00	0,300	2	-
VHTF 2 160 150 16 03	16,0	3,50	16	150	20,00	100,00	0,300	2	-

Standard



* For end mills / für Schaftfräser L < 100 mm.



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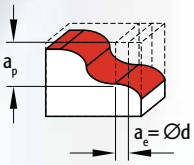
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHTF 4 030 064 06 03 050	3,0	0,50	6	64	4,00	7,00	0,050	4	5
VHTF 4 030 078 06 03 050	3,0	0,50	6	78	4,00	15,00	0,050	4	4
VHTF 4 040 064 06 03 050	4,0	0,50	6	64	5,00	8,00	0,100	4	4
VHTF 4 040 064 06 03 100	4,0	1,00	6	64	5,00	8,00	0,100	4	4
VHTF 4 040 078 06 03 050	4,0	0,50	6	78	5,00	15,00	0,100	4	3
VHTF 4 040 078 06 03 100	4,0	1,00	6	78	5,00	15,00	0,100	4	3
VHTF 4 050 064 06 03 050	5,0	0,50	6	64	5,00	10,00	0,150	4	2
VHTF 4 050 064 06 03 100	5,0	1,00	6	64	5,00	10,00	0,150	4	2
VHTF 4 050 078 06 03 050	5,0	0,50	6	78	5,00	20,00	0,150	4	2
VHTF 4 050 078 06 03 100	5,0	1,00	6	78	5,00	20,00	0,150	4	2
VHTF 4 060 064 06 03 050	6,0	0,50	6	64	6,00	25,00	0,200	4	-
VHTF 4 060 064 06 03 100	6,0	1,00	6	64	6,00	25,00	0,200	4	-
VHTF 4 060 064 06 03 150	6,0	1,50	6	64	6,00	25,00	0,200	4	-
VHTF 4 060 078 06 03 050	6,0	0,50	6	78	6,00	35,00	0,200	4	-
VHTF 4 060 078 06 03 150	6,0	1,50	6	78	6,00	35,00	0,200	4	-
VHTF 4 060 100 08 03 050	6,0	0,50	8	100	6,00	25,00	0,200	4	2
VHTF 4 060 100 08 03 150	6,0	1,50	8	100	6,00	25,00	0,200	4	2
VHTF 4 080 064 08 03 050	8,0	0,50	8	64	8,00	25,00	0,300	4	-
VHTF 4 080 064 08 03 100	8,0	1,00	8	64	8,00	25,00	0,300	4	-
VHTF 4 080 064 08 03 200	8,0	2,00	8	64	8,00	25,00	0,300	4	-
VHTF 4 080 078 08 03 050	8,0	0,50	8	78	8,00	25,00	0,300	4	-
VHTF 4 080 078 08 03 100	8,0	1,00	8	78	8,00	35,00	0,300	4	-
VHTF 4 080 078 08 03 200	8,0	2,00	8	78	8,00	35,00	0,300	4	-
VHTF 4 080 100 08 03 050	8,0	0,50	8	100	8,00	50,00	0,300	4	-
VHTF 4 080 100 08 03 100	8,0	1,00	8	100	8,00	50,00	0,300	4	-
VHTF 4 080 100 08 03 200	8,0	2,00	8	100	8,00	50,00	0,300	4	-
VHTF 4 080 120 10 03 100	8,0	1,00	10	120	8,00	30,00	0,300	4	-
VHTF 4 080 120 10 03 200	8,0	2,00	10	120	8,00	30,00	0,300	4	2
VHTF 4 100 078 10 03 050	10,0	0,50	10	78	10,00	35,00	0,300	4	2
VHTF 4 100 078 10 03 200	10,0	2,00	10	78	10,00	35,00	0,300	4	-
VHTF 4 100 100 10 03 100	10,0	1,00	10	100	10,00	55,00	0,300	4	-
VHTF 4 100 100 10 03 200	10,0	2,00	10	100	10,00	55,00	0,300	4	-
VHTF 4 100 120 12 03 200	10,0	2,00	12	120	10,00	30,00	0,300	4	-
VHTF 4 120 078 12 03 050	12,0	0,50	12	78	12,00	35,00	0,300	4	2
VHTF 4 120 078 12 03 200	12,0	2,00	12	78	12,00	35,00	0,300	4	-
VHTF 4 120 100 12 03 100	12,0	1,00	12	100	12,00	55,00	0,300	4	-
VHTF 4 120 100 12 03 200	12,0	2,00	12	100	12,00	55,00	0,300	4	-
VHTF 4 120 120 16 03 200	12,0	2,00	16	120	12,00	40,00	0,300	4	-
VHTF 4 160 100 16 03 350	16,0	3,50	16	100	20,00	50,00	0,300	4	5
VHTF 4 160 150 16 03 350	16,0	3,50	16	150	20,00	100,00	0,300	4	-

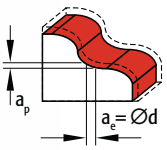
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**150 - 250**	emulsion
P1.2	< 1000	< 300	**120 - 200**	emulsion
P1.3	< 1400	< 400	**100 - 160**	emulsion
H2.1		42-50 HRc	**120 - 180**	min.lub.
H2.2		50-55 HRc	**150 - 200**	min.lub.
H2.3		55-70 HRc	**200 - 250**	min.lub.
K4.1			**100 - 200**	emulsion

Torus end mills:
Torusfräser:

- High effective cutting speed
  Hohe Schnittgeschwindigkeit
- Optimized surface finish
  Optimale Oberflächenqualität
- 2 Flute and 4 flute
  2 Schneiden und 4 Schneiden
- Finishing – Semi finishing (- Roughing)
  Schlicht-, Semi- und Schruppbearbeitung



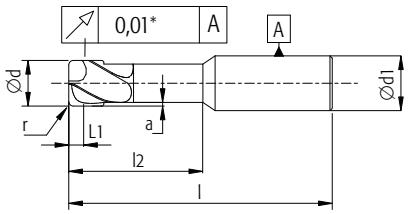
Roughing
Schruppen



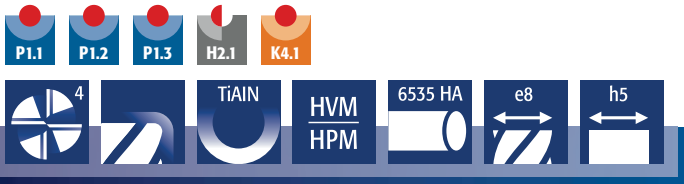
Finishing
Schlichten

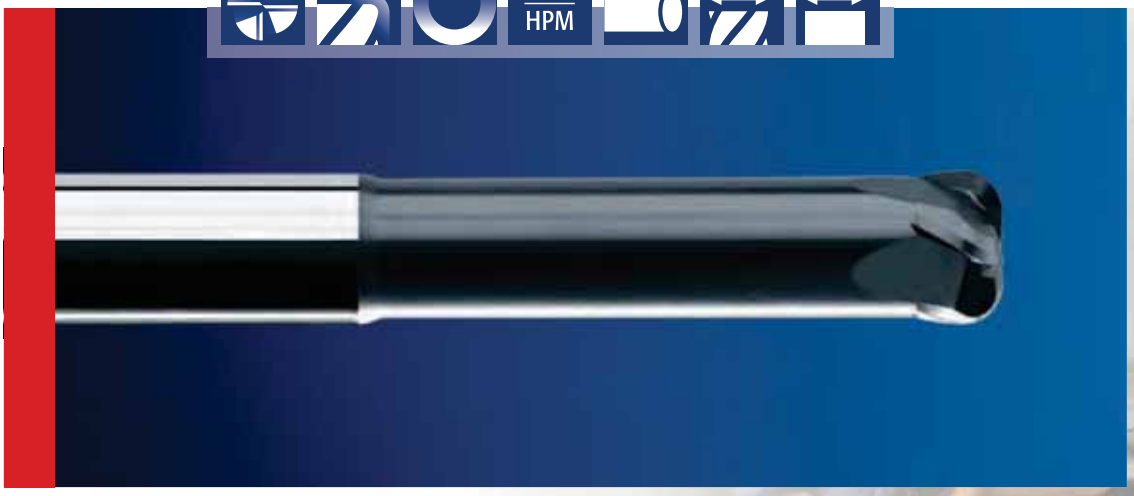
	Shoulder milling / Eckfräsen P1.1 / P1.2 / P1.3			Shoulder milling / Eckfräsen H2.1 / H2.2 / H2.3		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
1,5	< 1,5	< 0,15	0,025 - 0,040	< 0,7	< 0,03	0,025 - 0,040
2	< 2,0	< 0,2	0,030 - 0,050	< 1,0	< 0,04	0,030 - 0,050
3,0	< 3,0	< 0,30	0,040 - 0,060	< 1,5	< 0,06	0,040 - 0,060
4,0	< 4,0	< 0,40	0,050 - 0,080	< 2,0	< 0,10	0,050 - 0,080
5,0	< 5,0	< 0,50	0,060 - 0,110	< 2,5	< 0,13	0,060 - 0,110
6,0	< 6,0	< 0,60	0,065 - 0,125	< 3,0	< 0,18	0,065 - 0,125
8,0	< 8,0	< 0,80	0,080 - 0,130	< 4,0	< 0,24	0,080 - 0,130
10,0	< 10,0	< 1,00	0,085 - 0,135	< 5,0	< 0,30	0,085 - 0,135
12,0	< 12,0	< 1,20	0,100 - 0,140	< 6,0	< 0,36	0,100 - 0,140
16,0	< 16,0	< 1,60	0,100 - 0,150	< 8,0	< 0,50	0,100 - 0,150

Standard



* For end mills / für Schaftfräser L < 100 mm.

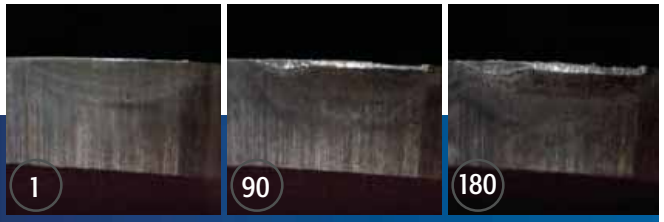




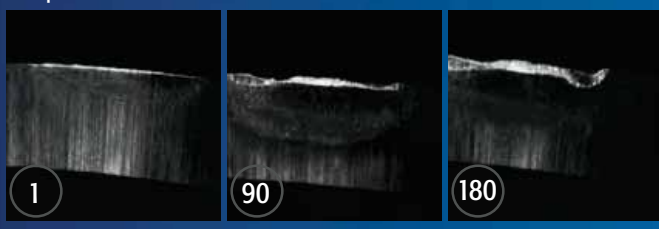
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHDR 4 020 060 06 03 L04	2,0	0,50	6	60	1,00	4,00	0,100	4	15
VHDR 4 020 060 06 03 L08	2,0	0,50	6	60	1,00	8,00	0,100	4	15
VHDR 4 030 060 06 03 L06	3,0	0,75	6	60	1,50	6,00	0,150	4	15
VHDR 4 030 060 06 03 L12	3,0	0,75	6	60	1,50	12,00	0,150	4	15
VHDR 4 040 060 06 03 L08	4,0	1,00	6	60	2,00	8,00	0,200	4	15
VHDR 4 040 060 06 03 L16	4,0	1,00	6	60	2,00	16,00	0,200	4	15
VHDR 4 060 080 06 03 L12	6,0	1,50	6	80	3,00	12,00	0,250	4	-
VHDR 4 060 080 06 03 L24	6,0	1,50	6	80	3,00	24,00	0,250	4	-
VHDR 4 080 090 08 03 L16	8,0	2,00	8	90	4,00	16,00	0,300	4	-
VHDR 4 080 090 08 03 L32	8,0	2,00	8	90	4,00	32,00	0,300	4	-
VHDR 4 100 100 10 03 L20	10,0	2,50	10	100	5,00	20,00	0,400	4	-
VHDR 4 100 100 10 03 L40	10,0	2,50	10	100	5,00	40,00	0,400	4	-
VHDR 4 120 110 12 03 L24	12,0	3,00	12	110	6,00	24,00	0,500	4	-
VHDR 4 120 110 12 03 L48	12,0	3,00	12	110	6,00	48,00	0,500	4	-

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**230 - 330**	min.lub.
P1.2	< 1000	< 300	**200 - 250**	min.lub.
P1.3	< 1400	< 400	**140 - 180**	min.lub.
H2.1		42-50 HRc	**80 - 120**	min.lub.
K4.1		< 260	**100 - 200**	min.lub.

Van Hoorn Carbide



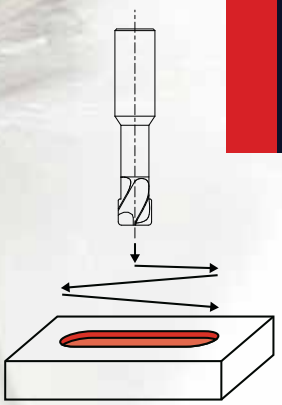
Competitor

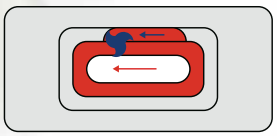


Wear after 1, 90 and 180 metres
Verschleiß nach 1, 90 und 180 Meter

VHDR40800900803L16
Material 1.2311

V_c	150 m/min
n	6000 rpm
F_z	0,70 mm/t
V_f	**16800 mm/min**
a_p	0,5 mm
a_e	8,0 mm
Coolant	emulsion
Q	**67,2 cm³/min**



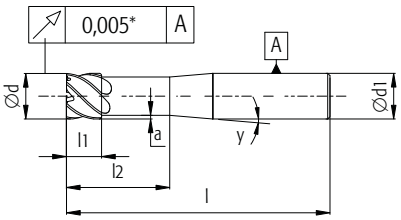


This end mill can be used for pocket milling; for strategy see drawings above. Always mill from inside to outside. If possible use helicoidal down-milling, otherwise ramping down.

Dieser Fräser kann zum Taschenfräsen eingesetzt werden; entsprechende Frässtrategie entnehmen Sie von obenstehenden Zeichnungen. Fräsen Sie stets von Innen nach Außen. Wenn möglich zirkular Abwärtsfräsen oder Schrägeintauchen.

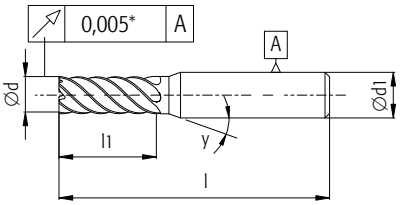
	Shoulder milling / Eckfräsen			Slot milling / Nutfräsen		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
2,0	< 0,1	< 1,2	0,1 - 0,14	< 0,1	2	0,07 - 0,1
3,0	< 0,16	< 1,8	0,15 - 0,22	< 0,16	3	0,12 - 0,19
4,0	< 0,2	< 2,4	0,22 - 0,3	< 0,2	4	0,18 - 0,25
6,0	< 0,3	< 4,0	0,34 - 0,5	< 0,3	6	0,28 - 0,4
8,0	< 0,38	< 5,5	0,45 - 0,6	< 0,38	8	0,4 - 0,55
10,0	< 0,43	< 7,0	0,56 - 0,75	< 0,42	10	0,5 - 0,7
12,0	< 0,46	< 8,4	0,67 - 0,84	< 0,46	12	0,6 - 0,8

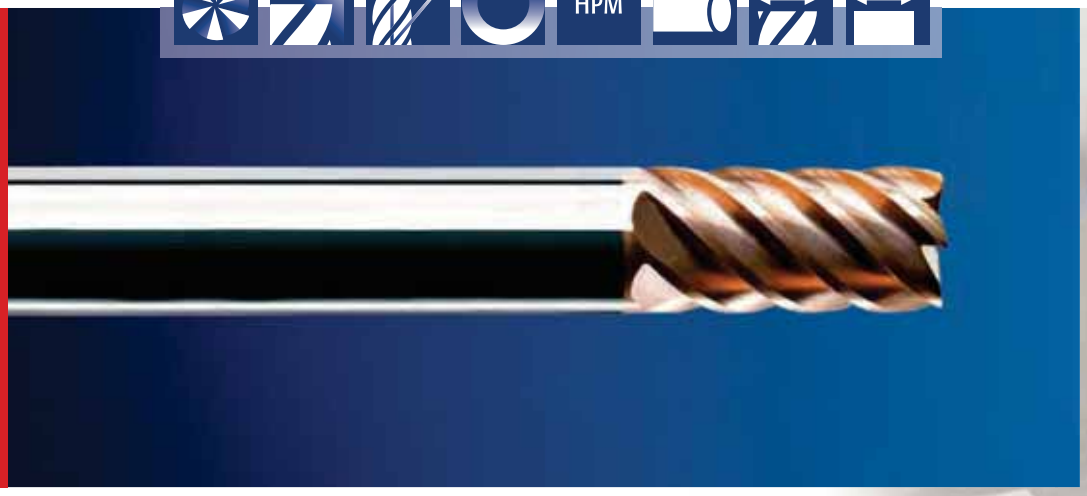
Short / Kurze Ausführung



* For end mills / für Schaftfräser L < 100 mm.

Standard / Standard Ausführung





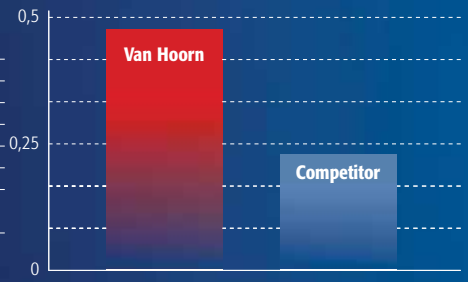
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
Short / Kurze Ausführung									
VHMF 6 030 064 06 03 S	3,0	-	6	64	3,00	10,00	0,050	6	15
VHMF 6 040 064 06 03 S	4,0	-	6	64	4,00	10,00	0,100	6	15
VHMF 6 050 064 06 03 S	5,0	-	6	64	5,00	15,00	0,150	6	15
VHMF 6 060 064 06 03 S	6,0	-	6	64	6,00	20,00	0,200	6	-
VHMF 6 080 064 08 03 S	8,0	-	8	64	8,00	20,00	0,300	6	-
VHMF 6 100 070 10 03 S	10,0	-	10	70	10,00	25,00	0,300	6	-
VHMF 6 120 078 12 03 S	12,0	-	12	78	12,00	25,00	0,300	6	-
VHMF 6 160 089 16 03 S	16,0	-	16	89	16,00	35,00	0,300	6	-
VHMF 8 200 102 20 03 S	20,0	-	20	102	20,00	40,00	0,300	8	-
Standard / Standard Ausführung									
VHMF 6 030 064 06 03	3,0	-	6	64	10,00	-	-	6	15
VHMF 6 040 064 06 03	4,0	-	6	64	10,00	-	-	6	15
VHMF 6 050 064 06 03	5,0	-	6	64	15,00	-	-	6	15
VHMF 6 060 064 06 03	6,0	-	6	64	20,00	-	-	6	15
VHMF 6 080 064 08 03	8,0	-	8	64	20,00	-	-	6	-
VHMF 6 100 070 10 03	10,0	-	10	70	25,00	-	-	6	-
VHMF 6 120 078 12 03	12,0	-	12	78	25,00	-	-	6	-
VHMF 6 160 089 16 03	16,0	-	16	89	35,00	-	-	6	-
VHMF 8 200 102 20 03	20,0	-	20	102	40,00	-	-	8	-

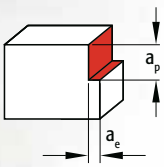
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**130 - 180**	emulsion
P1.2	< 1000	< 300	**100 - 160**	emulsion
P1.3	< 1400	< 400	**90 - 140**	emulsion
H2.1		42-50 HRc	**150 - 200**	min.lub.
H2.2		50-55 HRc	**120 - 180**	min.lub.
H2.3		55-70 HRc	**80 - 150**	min.lub.
K4.1			**100 - 200**	emulsion

VHMF60600640603
Workpiece Material: 1.2343
Hardness: 52 HRc

	Van Hoorn	Competitor
V_c	132 m/min	132 m/min
n	7000 rpm	7000 rpm
F_z	0,036 mm/t	0,029 mm/t
V_f	1500 mm/min	800 mm/min
a_p	0,1 mm	0,1 mm
a_e	3,0 mm	3,0 mm
Coolant	min. lubrication	min. lubrication
Q	**0,45 mm³/min**	**0,24 mm³/min**

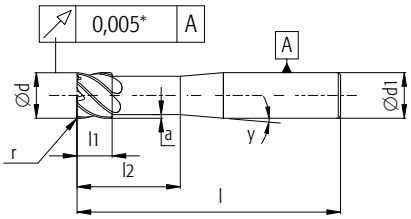
Material removal rate
Zerspanungsleistung





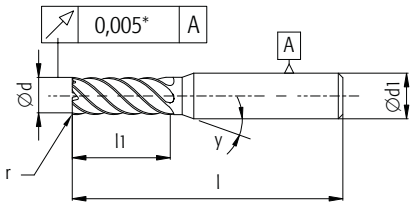
	Shoulder milling / Eckfräsen P1.1 / P1.2 / P1.3			Shoulder milling / Eckfräsen H2.1 / H2.2 / H2.3		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
3,0	< 6,0	< 0,30	0,020 - 0,035	< 6,0	< 0,06	0,020 - 0,035
4,0	< 8,0	< 0,40	0,030 - 0,045	< 8,0	< 0,10	0,030 - 0,045
5,0	< 10,0	< 0,50	0,035 - 0,055	< 10,0	< 0,12	0,035 - 0,055
6,0	< 12,0	< 0,60	0,045 - 0,065	< 12,0	< 0,18	0,045 - 0,065
8,0	< 16,0	< 0,80	0,060 - 0,080	< 16,0	< 0,24	0,060 - 0,080
10,0	< 20,0	< 1,00	0,070 - 0,095	< 20,0	< 0,30	0,070 - 0,095
12,0	< 24,0	< 1,20	0,085 - 0,110	< 24,0	< 0,36	0,085 - 0,110
16,0	< 32,0	< 1,60	0,095 - 0,125	< 32,0	< 0,48	0,095 - 0,125
20,0	< 40,0	< 2,00	0,105 - 0,140	< 40,0	< 0,60	0,105 - 0,140

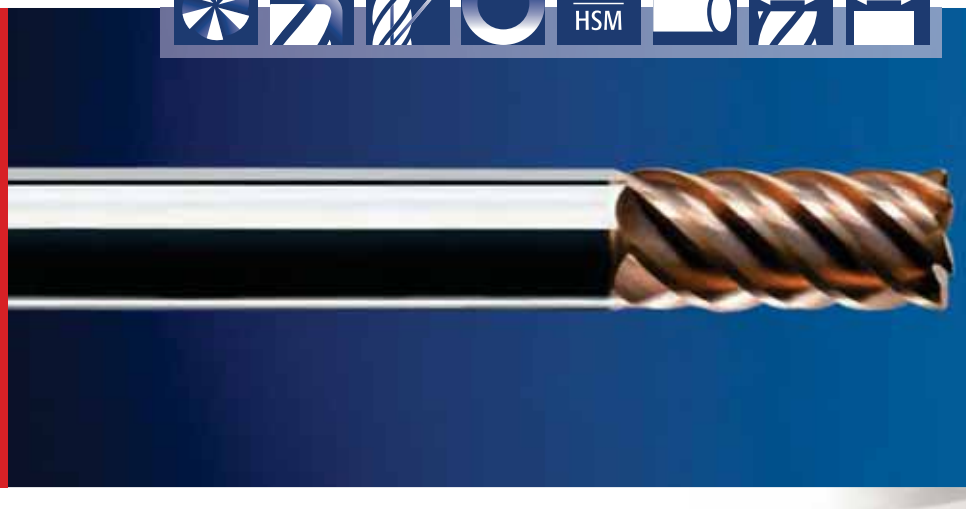
Short / Kurze Ausführung



* For end mills / für Schaftfräser L < 100 mm.

Standard / Standard Ausführung



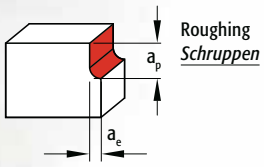


Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
Short / Kurze Ausführung									
VHMFR 6 030 064 06 03 030 S	3,0	0,30	6	64	3,00	10,00	0,050	6	15
VHMFR 6 040 064 06 03 030 S	4,0	0,30	6	64	4,00	10,00	0,100	6	15
VHMFR 6 050 064 06 03 030 S	5,0	0,30	6	64	5,00	15,00	0,150	6	15
VHMFR 6 050 064 06 03 050 S	5,0	0,50	6	64	5,00	15,00	0,150	6	15
VHMFR 6 060 064 06 03 050 S	6,0	0,50	6	64	6,00	20,00	0,200	6	-
VHMFR 6 060 064 06 03 100 S	6,0	1,00	6	64	6,00	20,00	0,200	6	-
VHMFR 6 080 064 08 03 050 S	8,0	0,50	8	64	8,00	20,00	0,300	6	-
VHMFR 6 080 064 08 03 100 S	8,0	1,00	8	64	8,00	20,00	0,300	6	-
VHMFR 6 100 070 10 03 050 S	10,0	0,50	10	70	10,00	25,00	0,300	6	-
VHMFR 6 100 070 10 03 100 S	10,0	1,00	10	70	10,00	25,00	0,300	6	-
VHMFR 6 100 070 10 03 150 S	10,0	1,50	10	70	10,00	25,00	0,300	6	-
VHMFR 6 120 078 12 03 050 S	12,0	0,50	12	78	12,00	25,00	0,300	6	-
VHMFR 6 120 078 12 03 100 S	12,0	1,00	12	78	12,00	25,00	0,300	6	-
VHMFR 6 120 078 12 03 200 S	12,0	2,00	12	78	12,00	25,00	0,300	6	-
VHMFR 6 160 089 16 03 100 S	16,0	1,00	16	89	16,00	35,00	0,300	6	-
VHMFR 6 160 089 16 03 200 S	16,0	2,00	16	89	16,00	35,00	0,300	6	-
VHMFR 8 200 102 20 03 100 S	20,0	1,00	20	102	20,00	40,00	0,300	8	-
VHMFR 8 200 102 20 03 200 S	20,0	2,00	20	102	20,00	40,00	0,300	8	-
Standard / Standard Ausführung									
VHMFR 6 030 064 06 03 030	3,0	0,30	6	64	10,00	-	-	6	15
VHMFR 6 040 064 06 03 030	4,0	0,30	6	64	10,00	-	-	6	15
VHMFR 6 050 064 06 03 030	5,0	0,30	6	64	15,00	-	-	6	15
VHMFR 6 050 064 06 03 050	5,0	0,50	6	64	15,00	-	-	6	15
VHMFR 6 060 064 06 03 050	6,0	0,50	6	64	20,00	-	-	6	-
VHMFR 6 060 064 06 03 100	6,0	1,00	6	64	20,00	-	-	6	-
VHMFR 6 080 064 08 03 050	8,0	0,50	8	64	20,00	-	-	6	-
VHMFR 6 080 064 08 03 100	8,0	1,00	8	64	20,00	-	-	6	-
VHMFR 6 100 070 10 03 050	10,0	0,50	10	70	25,00	-	-	6	-
VHMFR 6 100 070 10 03 100	10,0	1,00	10	70	25,00	-	-	6	-
VHMFR 6 100 070 10 03 150	10,0	1,50	10	70	25,00	-	-	6	-
VHMFR 6 120 078 12 03 050	12,0	0,50	12	78	25,00	-	-	6	-
VHMFR 6 120 078 12 03 100	12,0	1,00	12	78	25,00	-	-	6	-
VHMFR 6 120 078 12 03 200	12,0	2,00	12	78	25,00	-	-	6	-
VHMFR 6 160 089 16 03 100	16,0	1,00	16	89	35,00	-	-	6	-
VHMFR 6 160 089 16 03 200	16,0	2,00	16	89	35,00	-	-	6	-
VHMFR 8 200 102 20 03 100	20,0	1,00	20	102	40,00	-	-	8	-
VHMFR 8 200 102 20 03 200	20,0	2,00	20	102	40,00	-	-	8	-

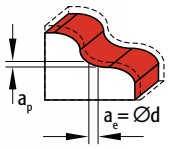
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**130 - 180**	emulsion
P1.2	< 1000	< 300	**100 - 160**	emulsion
P1.3	< 1400	< 400	**90 - 140**	emulsion
H2.1		42-50 HRc	**150 - 200**	min.lub.
H2.2		50-55 HRc	**120 - 180**	min.lub.
H2.3		55-70 HRc	**80 - 150**	min.lub.
K4.1			**100 - 200**	emulsion

VHMF
Recommended for Side milling.
Empfohlen für Stirnfräsen.

VHMFR
Recommended for Shoulder milling.
Empfohlen für Eckfräsen.



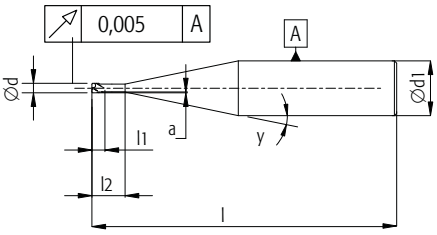
Roughing
Schruppen



Finishing
Schlichten

	Shoulder milling / Eckfräsen			Shoulder milling / Eckfräsen		
	P1.1 / P1.2 / P1.3			H2.1 / H2.2 / H2.3		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
3,0	< 6,0	< 0,30	0,020 - 0,035	< 6,0	< 0,06	0,020 - 0,035
4,0	< 8,0	< 0,40	0,030 - 0,045	< 8,0	< 0,10	0,030 - 0,045
5,0	< 10,0	< 0,50	0,035 - 0,055	< 10,0	< 0,12	0,035 - 0,055
6,0	< 12,0	< 0,60	0,045 - 0,065	< 12,0	< 0,18	0,045 - 0,065
8,0	< 16,0	< 0,80	0,060 - 0,080	< 16,0	< 0,24	0,060 - 0,080
10,0	< 20,0	< 1,00	0,070 - 0,095	< 20,0	< 0,30	0,070 - 0,095
12,0	< 24,0	< 1,20	0,085 - 0,110	< 24,0	< 0,36	0,085 - 0,110
16,0	< 32,0	< 1,60	0,095 - 0,125	< 32,0	< 0,48	0,095 - 0,125
20,0	< 40,0	< 2,00	0,105 - 0,140	< 40,0	< 0,60	0,105 - 0,140

Standard



PAGE 54

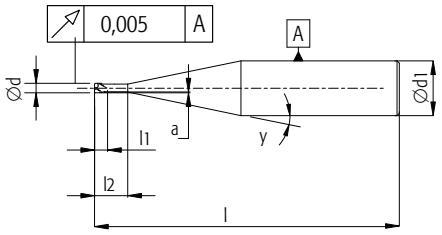
Shank 4 mm
Schaft 4 mm

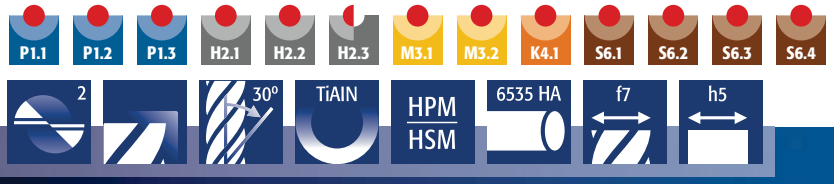
Remark ∞ = infinity, no collision in projection length area.

Bemerkung ∞ = unendlich, keine Kollision in Länge Projektionsfläche.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
VHMS 2 001 051 04 03 L0015	0,1	-	4	51	0,15	-	-	2	15	0,634	0,656	0,705	0,762
VHMS 2 002 051 04 03 L0025	0,2	-	4	51	0,25	-	-	2	15	0,737	0,763	0,820	0,887
VHMS 2 003 051 04 03 L003	0,3	-	4	51	0,30	-	-	2	15	1,099	1,137	1,223	1,322
VHMS 2 003 051 04 03 L015	0,3	-	4	51	0,30	1,50	0,010	2	15	1,861	1,926	2,070	2,238
VHMS 2 003 051 04 03 L030	0,3	-	4	51	0,30	3,00	0,010	2	15	3,412	3,531	3,795	4,103
VHMS 2 004 051 04 03 L004	0,4	-	4	51	0,40	-	-	2	15	1,202	1,244	1,338	1,446
VHMS 2 004 051 04 03 L020	0,4	-	4	51	0,40	2,00	0,010	2	15	2,378	2,461	2,645	2,860
VHMS 2 004 051 04 03 L040	0,4	-	4	51	0,40	4,00	0,010	2	15	4,445	4,600	4,945	5,346
VHMS 2 005 051 04 03 L005	0,5	-	4	51	0,50	-	-	2	15	1,306	1,351	1,453	1,570
VHMS 2 005 051 04 03 L030	0,5	-	4	51	0,50	3,00	0,015	2	15	3,431	3,551	3,817	4,126
VHMS 2 005 051 04 03 L060	0,5	-	4	51	0,50	6,00	0,015	2	15	6,532	6,760	7,266	7,856
VHMS 2 005 051 04 03 L080	0,5	-	4	51	0,50	8,00	0,015	2	15	8,599	8,899	9,566	10,342
VHMS 2 005 051 04 03 L100	0,5	-	4	51	0,50	10,00	0,015	2	15	10,667	11,038	11,866	12,828
VHMS 2 006 051 04 03 L006	0,6	-	4	51	0,60	-	-	2	15	2,062	2,134	2,294	2,480
VHMS 2 006 051 04 03 L020	0,6	-	4	51	0,60	2,00	0,025	2	15	2,572	2,662	2,861	3,093
VHMS 2 006 051 04 03 L040	0,6	-	4	51	0,60	4,00	0,025	2	15	4,639	4,801	5,161	5,580
VHMS 2 006 051 04 03 L060	0,6	-	4	51	0,60	6,00	0,025	2	15	6,707	6,940	7,461	8,066
VHMS 2 006 051 04 03 L080	0,6	-	4	51	0,60	8,00	0,025	2	15	8,774	9,080	9,760	10,552
VHMS 2 006 051 04 03 L100	0,6	-	4	51	0,60	10,00	0,025	2	15	10,841	11,219	12,060	13,038
VHMS 2 008 051 04 03 L008	0,8	-	4	51	0,80	-	-	2	15	2,269	2,348	2,524	2,729
VHMS 2 008 051 04 03 L025	0,8	-	4	51	0,80	2,50	0,025	2	15	3,089	3,196	3,436	3,715
VHMS 2 008 051 04 03 L050	0,8	-	4	51	0,80	5,00	0,025	2	15	5,673	5,871	6,311	6,823
VHMS 2 008 051 04 03 L080	0,8	-	4	51	0,80	8,00	0,025	2	15	8,774	9,080	9,760	10,552
VHMS 2 008 051 04 03 L100	0,8	-	4	51	0,80	10,00	0,025	2	15	10,841	11,219	12,060	13,038
VHMS 2 010 051 04 03 L010	1,0	-	4	51	1,00	-	-	2	15	2,476	2,562	2,754	2,977
VHMS 2 010 051 04 03 L040	1,0	-	4	51	1,00	4,00	0,025	2	15	4,639	4,801	5,161	5,580
VHMS 2 010 051 04 03 L060	1,0	-	4	51	1,00	6,00	0,025	2	15	6,707	6,940	7,461	8,066
VHMS 2 010 051 04 03 L080	1,0	-	4	51	1,00	8,00	0,025	2	15	8,774	9,080	9,760	10,552
VHMS 2 010 051 04 03 L100	1,0	-	4	51	1,00	10,00	0,025	2	15	10,841	11,219	12,060	13,038
VHMS 2 010 051 04 03 L120	1,0	-	4	51	1,00	12,00	0,025	2	15	12,909	13,358	14,360	15,525
VHMS 2 010 051 04 03 L150	1,0	-	4	51	1,00	15,00	0,025	2	15	16,010	16,568	17,809	19,254
VHMS 2 010 060 04 03 L200	1,0	-	4	60	1,00	20,00	0,025	2	15	21,178	21,916	23,559	25,470
VHMS 2 010 060 04 03 L250	1,0	-	4	60	1,00	25,00	0,025	2	15	26,346	27,264	29,308	∞
VHMS 2 012 051 04 03 L012	1,2	-	4	51	1,20	-	-	2	15	3,471	3,592	3,862	4,175
VHMS 2 012 051 04 03 L040	1,2	-	4	51	1,20	4,00	0,025	2	15	4,912	5,083	5,464	5,907
VHMS 2 012 051 04 03 L060	1,2	-	4	51	1,20	6,00	0,025	2	15	6,979	7,222	7,763	8,393
VHMS 2 012 051 04 03 L080	1,2	-	4	51	1,20	8,00	0,025	2	15	9,046	9,361	10,063	10,879
VHMS 2 012 051 04 03 L120	1,2	-	4	51	1,20	12,00	0,025	2	15	13,181	13,640	14,662	15,852
VHMS 2 012 051 04 03 L160	1,2	-	4	51	1,20	16,00	0,025	2	15	17,316	17,919	19,262	20,825

Standard





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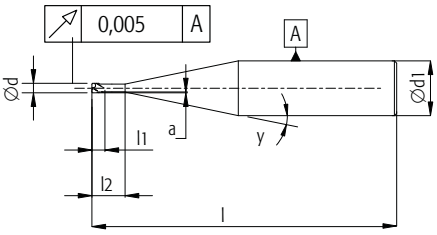
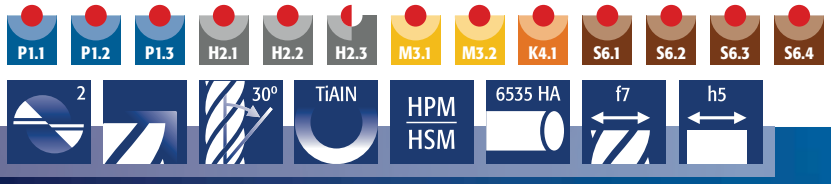
Shank 4 mm
Schaft 4 mm

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°
VHMS 2 015 051 04 03 L015	1,5	-	4	51	1,50	-	-	2	15	3,781	3,913	4,206	4,548
VHMS 2 015 051 04 03 L040	1,5	-	4	51	1,50	4,00	0,025	2	15	4,912	5,083	5,464	5,907
VHMS 2 015 051 04 03 L060	1,5	-	4	51	1,50	6,00	0,025	2	15	6,979	7,222	7,763	8,393
VHMS 2 015 051 04 03 L080	1,5	-	4	51	1,50	8,00	0,025	2	15	9,046	9,361	10,063	10,879
VHMS 2 015 051 04 03 L100	1,5	-	4	51	1,50	10,00	0,025	2	15	11,114	11,501	12,363	13,366
VHMS 2 015 051 04 03 L120	1,5	-	4	51	1,50	12,00	0,025	2	15	13,181	13,640	14,662	15,852
VHMS 2 015 051 04 03 L150	1,5	-	4	51	1,50	15,00	0,025	2	15	16,282	16,849	18,112	19,581
VHMS 2 015 060 04 03 L200	1,5	-	4	60	1,50	20,00	0,025	2	15	21,450	22,198	23,861	∞
VHMS 2 015 060 04 03 L250	1,5	-	4	60	1,50	25,00	0,025	2	15	26,619	27,546	29,611	∞
VHMS 2 020 051 04 03 L020	2,0	-	4	51	2,00	-	-	2	15	4,298	4,448	4,781	5,169
VHMS 2 020 051 04 03 L060	2,0	-	4	51	2,00	6,00	0,050	2	15	7,075	7,322	7,871	8,509
VHMS 2 020 051 04 03 L080	2,0	-	4	51	2,00	8,00	0,050	2	15	9,143	9,461	10,170	10,995
VHMS 2 020 051 04 03 L100	2,0	-	4	51	2,00	10,00	0,050	2	15	11,210	11,601	12,470	13,482
VHMS 2 020 051 04 03 L120	2,0	-	4	51	2,00	12,00	0,050	2	15	13,277	13,740	14,770	15,968
VHMS 2 020 051 04 03 L160	2,0	-	4	51	2,00	16,00	0,050	2	15	17,412	18,019	19,369	∞
VHMS 2 020 060 04 03 L200	2,0	-	4	60	2,00	20,00	0,050	2	15	21,547	22,297	23,969	∞
VHMS 2 020 060 04 03 L250	2,0	-	4	60	2,00	25,00	0,050	2	15	26,715	27,646	∞	∞
VHMS 2 020 064 04 03 L300	2,0	-	4	64	2,00	30,00	0,050	2	15	31,883	32,994	∞	∞
VHMS 2 025 051 04 03 L025	2,5	-	4	51	2,50	-	-	2	15	4,815	4,983	5,356	5,791
VHMS 2 025 051 04 03 L060	2,5	-	4	51	2,50	6,00	0,050	2	15	7,075	7,322	7,871	8,509
VHMS 2 025 051 04 03 L080	2,5	-	4	51	2,50	8,00	0,050	2	15	9,143	9,461	10,170	10,995
VHMS 2 025 051 04 03 L100	2,5	-	4	51	2,50	10,00	0,050	2	15	11,210	11,601	12,470	13,482
VHMS 2 025 051 04 03 L120	2,5	-	4	51	2,50	12,00	0,050	2	15	13,277	13,740	14,770	∞
VHMS 2 025 051 04 03 L160	2,5	-	4	51	2,50	16,00	0,050	2	15	17,412	18,019	19,369	∞
VHMS 2 025 060 04 03 L200	2,5	-	4	60	2,50	20,00	0,050	2	15	21,547	22,297	∞	∞
VHMS 2 025 060 04 03 L250	2,5	-	4	60	2,50	25,00	0,050	2	15	26,715	27,646	∞	∞
VHMS 2 025 064 04 03 L300	2,5	-	4	64	2,50	30,00	0,050	2	15	31,883	32,994	∞	∞
VHMS 2 030 051 04 03 L030	3,0	-	4	51	3,00	-	-	2	15	5,332	5,518	5,931	6,412
VHMS 2 030 051 04 03 L060	3,0	-	4	51	3,00	6,00	0,050	2	15	7,075	7,322	7,871	8,509
VHMS 2 030 051 04 03 L080	3,0	-	4	51	3,00	8,00	0,050	2	15	9,143	9,461	10,170	∞
VHMS 2 030 051 04 03 L100	3,0	-	4	51	3,00	10,00	0,050	2	15	11,210	11,601	12,470	∞
VHMS 2 030 051 04 03 L120	3,0	-	4	51	3,00	12,00	0,050	2	15	13,277	13,740	∞	∞
VHMS 2 030 051 04 03 L160	3,0	-	4	51	3,00	16,00	0,050	2	15	17,412	18,019	∞	∞
VHMS 2 030 060 04 03 L200	3,0	-	4	60	3,00	20,00	0,050	2	15	21,547	22,297	∞	∞
VHMS 2 030 060 04 03 L250	3,0	-	4	60	3,00	25,00	0,050	2	15	26,715	27,646	∞	∞
VHMS 2 030 064 04 03 L300	3,0	-	4	64	3,00	30,00	0,050	2	15	31,883	-	∞	∞

Standard





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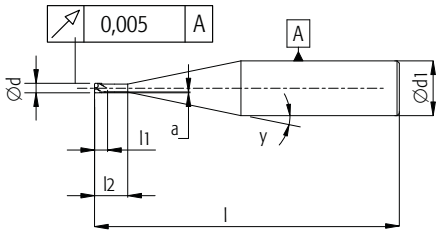
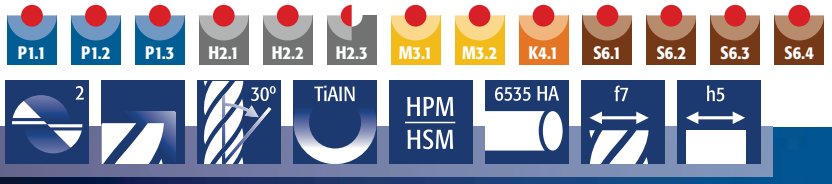
Shank 6 mm
Schaft 6 mm

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°	
VHMS 2 001 064 06 03 L0015	0,1	-	6	64	0,15	-	-	2	10	0,552	0,583	0,655	0,747	
VHMS 2 002 064 06 03 L003	0,2	-	6	64	0,30	-	-	2	10	0,710	0,749	0,842	0,960	new/neu
VHMS 2 003 064 06 03 L005	0,3	-	6	64	0,50	-	-	2	10	1,236	1,304	1,465	1,672	
VHMS 2 003 064 06 03 L015	0,3	-	6	64	0,50	1,50	0,010	2	11	1,826	1,916	2,126	2,388	
VHMS 2 003 064 06 03 L030	0,3	-	6	64	0,50	3,00	0,010	2	12	3,397	3,549	3,898	4,323	
VHMS 2 004 064 06 03 L006	0,4	-	6	64	0,60	-	-	2	10	1,341	1,415	1,590	1,814	
VHMS 2 004 064 06 03 L020	0,4	-	6	64	0,60	2,00	0,010	2	11	2,350	2,465	2,735	3,072	
VHMS 2 004 064 06 03 L040	0,4	-	6	64	0,60	4,00	0,010	2	13	4,439	4,621	5,032	5,525	
VHMS 2 005 064 06 03 L008	0,5	-	6	64	0,80	-	-	2	10	1,552	1,637	1,839	2,099	
VHMS 2 005 064 06 03 L030	0,5	-	6	64	0,80	3,00	0,015	2	12	3,421	3,574	3,926	4,354	
VHMS 2 005 064 06 03 L060	0,5	-	6	64	0,80	6,00	0,015	2	15	6,532	6,760	7,266	7,856	
VHMS 2 005 064 06 03 L080	0,5	-	6	64	0,80	8,00	0,015	2	15	8,599	8,899	9,566	10,342	
VHMS 2 005 064 06 03 L100	0,5	-	6	64	0,80	10,00	0,015	2	15	10,667	11,038	11,866	12,828	
VHMS 2 006 064 06 03 L009	0,6	-	6	64	0,90	-	-	2	10	1,749	1,845	2,073	2,366	
VHMS 2 006 064 06 03 L020	0,6	-	6	64	0,90	2,00	0,025	2	11	2,531	2,656	2,947	3,310	
VHMS 2 006 064 06 03 L040	0,6	-	6	64	0,90	4,00	0,025	2	12	4,623	4,830	5,304	5,884	
VHMS 2 006 064 06 03 L060	0,6	-	6	64	0,90	6,00	0,025	2	15	6,707	6,940	7,461	8,066	
VHMS 2 006 064 06 03 L080	0,6	-	6	64	0,90	8,00	0,025	2	15	8,774	9,080	9,760	10,552	
VHMS 2 006 064 06 03 L100	0,6	-	6	64	0,90	10,00	0,025	2	15	10,841	11,219	12,060	13,038	
VHMS 2 008 064 06 03 L012	0,8	-	6	64	1,20	-	-	2	10	2,591	2,733	3,071	3,504	
VHMS 2 008 064 06 03 L025	0,8	-	6	64	1,20	2,50	0,025	2	11	3,055	3,205	3,556	3,994	
VHMS 2 008 064 06 03 L050	0,8	-	6	64	1,20	5,00	0,025	2	13	5,664	5,896	6,421	7,051	
VHMS 2 008 064 06 03 L080	0,8	-	6	64	1,20	8,00	0,025	2	15	8,774	9,080	9,760	10,552	
VHMS 2 008 064 06 03 L100	0,8	-	6	64	1,20	10,00	0,025	2	15	10,841	11,219	12,060	13,038	
VHMS 2 010 064 06 03 L015	1,0	-	6	64	1,50	-	-	2	10	2,906	3,066	3,445	3,931	
VHMS 2 010 064 06 03 L040	1,0	-	6	64	1,50	4,00	0,025	2	11	4,625	4,853	5,385	6,048	
VHMS 2 010 064 06 03 L060	1,0	-	6	64	1,50	6,00	0,025	2	14	6,703	6,956	7,522	8,190	
VHMS 2 010 064 06 03 L080	1,0	-	6	64	1,50	8,00	0,025	2	15	8,774	9,080	9,760	10,552	
VHMS 2 010 064 06 03 L100	1,0	-	6	64	1,50	10,00	0,025	2	15	10,841	11,219	12,060	13,038	
VHMS 2 010 064 06 03 L120	1,0	-	6	64	1,50	12,00	0,025	2	15	12,909	13,358	14,360	15,525	
VHMS 2 010 064 06 03 L150	1,0	-	6	64	1,50	15,00	0,025	2	15	16,010	16,568	17,809	19,254	
VHMS 2 010 064 06 03 L200	1,0	-	6	64	1,50	20,00	0,025	2	15	21,178	21,916	23,559	25,470	
VHMS 2 010 064 06 03 L250	1,0	-	6	64	1,50	25,00	0,025	2	15	26,346	27,264	29,308	31,686	
VHMS 2 012 064 06 03 L018	1,2	-	6	64	1,80	-	-	2	10	3,932	4,148	4,660	5,318	
VHMS 2 012 064 06 03 L040	1,2	-	6	64	1,80	4,00	0,025	2	11	4,827	5,065	5,620	6,312	
VHMS 2 012 064 06 03 L060	1,2	-	6	64	1,80	6,00	0,025	2	13	6,940	7,224	7,868	8,639	
VHMS 2 012 064 06 03 L080	1,2	-	6	64	1,80	8,00	0,025	2	15	9,046	9,361	10,063	10,879	
VHMS 2 012 064 06 03 L120	1,2	-	6	64	1,80	12,00	0,025	2	15	13,181	13,640	14,662	15,852	
VHMS 2 012 064 06 03 L160	1,2	-	6	64	1,80	16,00	0,025	2	15	17,316	17,919	19,262	20,825	

Standard





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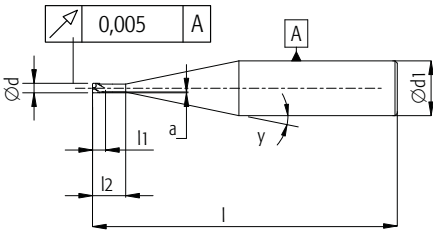
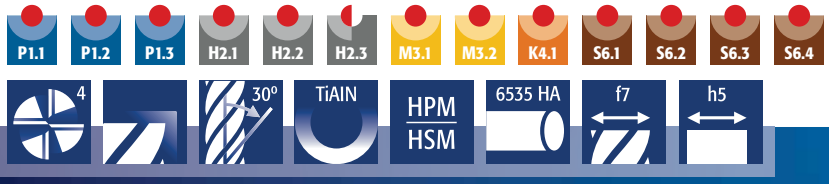
Shank 6 mm
Schaft 6 mm

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°
VHMS 2 015 064 06 03 L023	1,5	-	6	64	2,30	-	-	2	9	4,438	4,713	5,380	6,267
VHMS 2 015 064 06 03 L040	1,5	-	6	64	2,30	4,00	0,025	2	10	4,818	5,082	5,710	6,516
VHMS 2 015 064 06 03 L060	1,5	-	6	64	2,30	6,00	0,025	2	12	6,928	7,237	7,949	8,817
VHMS 2 015 064 06 03 L080	1,5	-	6	64	2,30	8,00	0,025	2	15	9,046	9,361	10,063	10,879
VHMS 2 015 064 06 03 L100	1,5	-	6	64	2,30	10,00	0,025	2	15	11,114	11,501	12,363	13,366
VHMS 2 015 064 06 03 L120	1,5	-	6	64	2,30	12,00	0,025	2	15	13,181	13,640	14,662	15,852
VHMS 2 015 064 06 03 L150	1,5	-	6	64	2,30	15,00	0,025	2	15	16,282	16,849	18,112	19,581
VHMS 2 015 064 06 03 L200	1,5	-	6	64	2,30	20,00	0,025	2	15	21,450	22,198	23,861	25,797
VHMS 2 015 064 06 03 L250	1,5	-	6	64	2,30	25,00	0,025	2	15	26,619	27,546	29,611	32,013
VHMS 2 020 064 06 03 L030	2,0	-	6	64	3,00	-	-	2	8	5,171	5,537	6,453	7,733
VHMS 2 020 064 06 03 L060	2,0	-	6	64	3,00	6,00	0,050	2	11	7,055	7,403	8,214	9,226
VHMS 2 020 064 06 03 L080	2,0	-	6	64	3,00	8,00	0,050	2	14	9,134	9,478	10,250	11,160
VHMS 2 020 064 06 03 L100	2,0	-	6	64	3,00	10,00	0,050	2	15	11,210	11,601	12,470	13,482
VHMS 2 020 064 06 03 L120	2,0	-	6	64	3,00	12,00	0,050	2	15	13,277	13,740	14,770	15,968
VHMS 2 020 064 06 03 L160	2,0	-	6	64	3,00	16,00	0,050	2	15	17,412	18,019	19,369	20,941
VHMS 2 020 064 06 03 L200	2,0	-	6	64	3,00	20,00	0,050	2	15	21,547	22,297	23,969	25,913
VHMS 2 020 064 06 03 L250	2,0	-	6	64	3,00	25,00	0,050	2	15	26,715	27,646	29,718	32,129
VHMS 2 020 064 06 03 L300	2,0	-	6	64	3,00	30,00	0,050	2	15	31,883	32,994	35,467	38,345
VHMS 2 025 064 06 03 L030	2,5	-	6	64	3,00	-	-	2	8	5,171	5,537	6,453	7,733
VHMS 2 025 064 06 03 L060	2,5	-	6	64	3,00	6,00	0,050	2	10	7,071	7,459	8,381	9,563
VHMS 2 025 064 06 03 L080	2,5	-	6	64	3,00	8,00	0,050	2	12	9,136	9,545	10,483	11,628
VHMS 2 025 064 06 03 L100	2,5	-	6	64	3,00	10,00	0,050	2	15	11,210	11,601	12,470	13,482
VHMS 2 025 064 06 03 L120	2,5	-	6	64	3,00	12,00	0,050	2	15	13,277	13,740	14,770	15,968
VHMS 2 025 064 06 03 L160	2,5	-	6	64	3,00	16,00	0,050	2	15	17,412	18,019	19,369	20,941
VHMS 2 025 064 06 03 L200	2,5	-	6	64	3,00	20,00	0,050	2	15	21,547	22,297	23,969	25,913
VHMS 2 025 064 06 03 L250	2,5	-	6	64	3,00	25,00	0,050	2	15	26,715	27,646	29,718	32,129
VHMS 2 025 064 06 03 L300	2,5	-	6	64	3,00	30,00	0,050	2	15	31,883	32,994	35,467	38,345
VHMS 2 030 064 06 03 L030	3,0	-	6	64	3,00	-	-	2	7	5,174	5,602	6,716	8,385
VHMS 2 030 064 06 03 L060	3,0	-	6	64	3,00	6,00	0,050	2	8	7,149	7,656	8,922	10,693
VHMS 2 030 064 06 03 L080	3,0	-	6	64	3,00	8,00	0,050	2	10	9,175	9,679	10,875	12,409
VHMS 2 030 064 06 03 L100	3,0	-	6	64	3,00	10,00	0,050	2	13	11,210	11,668	12,709	13,954
VHMS 2 030 064 06 03 L120	3,0	-	6	64	3,00	12,00	0,050	2	15	13,277	13,740	14,770	15,968
VHMS 2 030 064 06 03 L160	3,0	-	6	64	3,00	16,00	0,050	2	15	17,412	18,019	19,369	20,941
VHMS 2 030 064 06 03 L200	3,0	-	6	64	3,00	20,00	0,050	2	15	21,547	22,297	23,969	25,913
VHMS 2 030 064 06 03 L250	3,0	-	6	64	3,00	25,00	0,050	2	15	26,715	27,646	29,718	∞
VHMS 2 030 064 06 03 L300	3,0	-	6	64	3,00	30,00	0,050	2	15	31,883	32,994	35,467	∞

Standard





PAGE 54

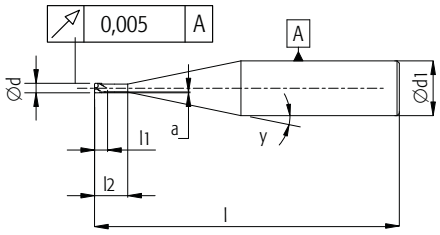
Shank 4 mm
Schaft 4 mm
4 Flute
4 Schneiden

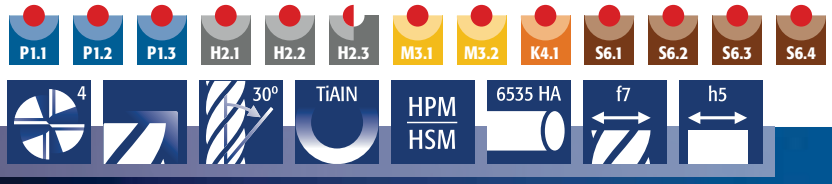
Remark ∞ = infinity, no collision in projection length area.

Bemerkung ∞ = unendlich, keine Kollision in Länge Projektionsfläche.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°
VHMS 4 002 051 04 03 L020	0,2	-	4	51	0,25	2,0	0,010	4	15	2,378	2,461	2,645	2,860
VHMS 4 002 051 04 03 L040	0,2	-	4	51	0,25	4,0	0,010	4	15	4,445	4,600	4,945	5,346
VHMS 4 004 051 04 03 L020	0,4	-	4	51	0,40	2,0	0,010	4	15	2,378	2,461	2,645	2,860
VHMS 4 004 051 04 03 L040	0,4	-	4	51	0,40	4,0	0,010	4	15	4,445	4,600	4,945	5,346
VHMS 4 004 051 04 03 L060	0,4	-	4	51	0,40	6,0	0,010	4	15	6,513	6,740	7,245	7,833
VHMS 4 004 051 04 03 L080	0,4	-	4	51	0,40	8,0	0,010	4	15	8,580	8,879	9,545	10,319
VHMS 4 004 051 04 03 L100	0,4	-	4	51	0,40	10,0	0,010	4	15	10,647	11,018	11,844	12,805
VHMS 4 005 051 04 03 L020	0,5	-	4	51	0,50	2,0	0,015	4	15	2,397	2,481	2,667	2,883
VHMS 4 005 051 04 03 L040	0,5	-	4	51	0,50	4,0	0,015	4	15	4,465	4,620	4,967	5,369
VHMS 4 005 051 04 03 L060	0,5	-	4	51	0,50	6,0	0,015	4	15	6,532	6,760	7,266	7,856
VHMS 4 005 051 04 03 L080	0,5	-	4	51	0,50	8,0	0,015	4	15	8,599	8,899	9,566	10,342
VHMS 4 005 051 04 03 L100	0,5	-	4	51	0,50	10,0	0,015	4	15	10,667	11,038	11,866	12,828
VHMS 4 010 051 04 03 L020	1,0	-	4	51	1,00	2,0	0,025	4	15	2,572	2,662	2,861	3,093
VHMS 4 010 051 04 03 L040	1,0	-	4	51	1,00	4,0	0,025	4	15	4,639	4,801	5,161	5,580
VHMS 4 010 051 04 03 L060	1,0	-	4	51	1,00	6,0	0,025	4	15	6,707	6,940	7,461	8,066
VHMS 4 010 051 04 03 L080	1,0	-	4	51	1,00	8,0	0,025	4	15	8,774	9,080	9,760	10,552
VHMS 4 010 051 04 03 L100	1,0	-	4	51	1,00	10,0	0,025	4	15	10,841	11,219	12,060	13,038
VHMS 4 015 051 04 03 L015	1,5	-	4	51	1,50	-	-	4	15	3,781	3,913	4,206	4,548
VHMS 4 015 051 04 03 L040	1,5	-	4	51	1,50	4,0	0,025	4	15	4,912	5,083	5,464	5,907
VHMS 4 015 051 04 03 L060	1,5	-	4	51	1,50	6,0	0,025	4	15	6,979	7,222	7,763	8,393
VHMS 4 015 051 04 03 L080	1,5	-	4	51	1,50	8,0	0,025	4	15	9,046	9,361	10,063	10,879
VHMS 4 015 051 04 03 L100	1,5	-	4	51	1,50	10,0	0,025	4	15	11,114	11,501	12,363	13,366
VHMS 4 020 051 04 03 L020	2,0	-	4	51	2,00	-	-	4	15	4,298	4,448	4,781	5,169
VHMS 4 020 051 04 03 L040	2,0	-	4	51	2,00	4,0	0,050	4	15	5,008	5,182	5,571	6,023
VHMS 4 020 051 04 03 L060	2,0	-	4	51	2,00	6,0	0,050	4	15	7,075	7,322	7,871	8,509
VHMS 4 020 051 04 03 L080	2,0	-	4	51	2,00	8,0	0,050	4	15	9,143	9,461	10,170	10,995
VHMS 4 020 051 04 03 L100	2,0	-	4	51	2,00	10,0	0,050	4	15	11,210	11,601	12,470	13,482
VHMS 4 025 051 04 03 L025	2,5	-	4	51	2,50	-	-	4	15	4,815	4,983	5,356	5,791
VHMS 4 025 051 04 03 L040	2,5	-	4	51	2,50	4,0	0,050	4	15	5,008	5,182	5,571	6,023
VHMS 4 025 051 04 03 L060	2,5	-	4	51	2,50	6,0	0,050	4	15	7,075	7,322	7,871	8,509
VHMS 4 025 051 04 03 L080	2,5	-	4	51	2,50	8,0	0,050	4	15	9,143	9,461	10,170	10,995
VHMS 4 025 051 04 03 L100	2,5	-	4	51	2,50	10,0	0,050	4	15	11,210	11,601	12,470	13,482
VHMS 4 030 051 04 03 L030	3,0	-	4	51	3,00	-	-	4	15	5,332	5,518	5,931	6,412
VHMS 4 030 051 04 03 L045	3,0	-	4	51	3,00	4,5	0,050	4	15	5,525	5,717	6,146	6,644
VHMS 4 030 051 04 03 L060	3,0	-	4	51	3,00	6,0	0,050	4	15	7,075	7,322	7,871	8,509
VHMS 4 030 051 04 03 L080	3,0	-	4	51	3,00	8,0	0,050	4	15	9,143	9,461	10,170	∞
VHMS 4 030 051 04 03 L100	3,0	-	4	51	3,00	10,0	0,050	4	15	11,210	11,601	12,470	∞

Standard



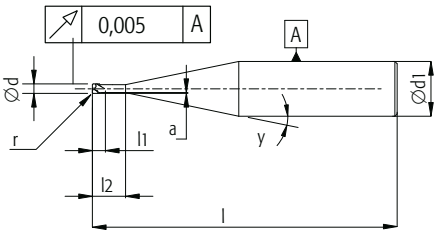


PAGE 54

Shank 6 mm
Schaft 6 mm
4 Flute
4 Schneiden

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
VHMS 4 002 064 06 03 L020	0,2	-	6	64	0,30	2,0	0,010	4	11	2,350	2,465	2,735	3,072
VHMS 4 002 064 06 03 L040	0,2	-	6	64	0,30	4,0	0,010	4	13	4,439	4,621	5,032	5,525
VHMS 4 004 064 06 03 L020	0,4	-	6	64	0,60	2,0	0,010	4	11	2,350	2,465	2,735	3,072
VHMS 4 004 064 06 03 L040	0,4	-	6	64	0,60	4,0	0,010	4	13	4,439	4,621	5,032	5,525
VHMS 4 004 064 06 03 L060	0,4	-	6	64	0,60	6,0	0,010	4	15	6,513	6,740	7,245	7,833
VHMS 4 004 064 06 03 L080	0,4	-	6	64	0,60	8,0	0,010	4	15	8,580	8,879	9,545	10,319
VHMS 4 004 064 06 03 L100	0,4	-	6	64	0,60	10,0	0,010	4	15	10,647	11,018	11,844	12,805
VHMS 4 005 064 06 03 L020	0,5	-	6	64	0,80	2,0	0,015	4	11	2,376	2,494	2,767	3,108
VHMS 4 005 064 06 03 L040	0,5	-	6	64	0,80	4,0	0,015	4	12	4,464	4,664	5,122	5,682
VHMS 4 005 064 06 03 L060	0,5	-	6	64	0,80	6,0	0,015	4	15	6,532	6,760	7,266	7,856
VHMS 4 005 064 06 03 L080	0,5	-	6	64	0,80	8,0	0,015	4	15	8,599	8,899	9,566	10,342
VHMS 4 005 064 06 03 L100	0,5	-	6	64	0,80	10,0	0,015	4	15	10,667	11,038	11,866	12,828
VHMS 4 010 064 06 03 L015	1,0	-	6	64	1,50	-	-	4	10	3,055	3,223	3,621	4,133
VHMS 4 010 064 06 03 L040	1,0	-	6	64	1,50	4,0	0,025	4	11	4,625	4,853	5,385	6,048
VHMS 4 010 064 06 03 L060	1,0	-	6	64	1,50	6,0	0,025	4	14	6,703	6,956	7,522	8,190
VHMS 4 010 064 06 03 L080	1,0	-	6	64	1,50	8,0	0,025	4	15	8,774	9,080	9,760	10,552
VHMS 4 010 064 06 03 L100	1,0	-	6	64	1,50	10,0	0,025	4	15	10,841	11,219	12,060	13,038
VHMS 4 015 064 06 03 L023	1,5	-	6	64	2,30	-	-	4	9	4,438	4,713	5,380	6,267
VHMS 4 015 064 06 03 L040	1,5	-	6	64	2,30	4,0	0,025	4	10	4,818	5,082	5,710	6,516
VHMS 4 015 064 06 03 L060	1,5	-	6	64	2,30	6,0	0,025	4	12	6,928	7,237	7,949	8,817
VHMS 4 015 064 06 03 L080	1,5	-	6	64	2,30	8,0	0,025	4	15	9,046	9,361	10,063	10,879
VHMS 4 015 064 06 03 L100	1,5	-	6	64	2,30	10,0	0,025	4	15	11,114	11,501	12,363	13,366
VHMS 4 020 064 06 03 L030	2,0	-	6	64	3,00	-	-	4	8	5,171	5,537	6,453	7,733
VHMS 4 020 064 06 03 L045	2,0	-	6	64	3,00	4,5	0,050	4	9	5,513	5,854	6,683	7,785
VHMS 4 020 064 06 03 L060	2,0	-	6	64	3,00	6,0	0,050	4	11	7,055	7,403	8,214	9,226
VHMS 4 020 064 06 03 L080	2,0	-	6	64	3,00	8,0	0,050	4	14	9,134	9,478	10,250	11,160
VHMS 4 020 064 06 03 L100	2,0	-	6	64	3,00	10,0	0,050	4	15	11,210	11,601	12,470	13,482
VHMS 4 025 064 06 03 L030	2,5	-	6	64	3,00	-	-	4	8	5,171	5,537	6,453	7,733
VHMS 4 025 064 06 03 L045	2,5	-	6	64	3,00	4,5	0,050	4	9	5,513	5,854	6,683	7,785
VHMS 4 025 064 06 03 L060	2,5	-	6	64	3,00	6,0	0,050	4	11	7,055	7,403	8,214	9,226
VHMS 4 025 064 06 03 L080	2,5	-	6	64	3,00	8,0	0,050	4	14	9,134	9,478	10,250	11,160
VHMS 4 025 064 06 03 L100	2,5	-	6	64	3,00	10,0	0,050	4	15	11,210	11,601	12,470	13,482
VHMS 4 030 064 06 03 L030	3,0	-	6	64	3,00	-	-	4	6	5,193	5,710	7,131	9,498
VHMS 4 030 064 06 03 L045	3,0	-	6	64	3,00	4,5	0,050	4	7	5,612	6,077	7,285	9,095
VHMS 4 030 064 06 03 L060	3,0	-	6	64	3,00	6,0	0,050	4	8	7,149	7,656	8,922	10,693
VHMS 4 030 064 06 03 L080	3,0	-	6	64	3,00	8,0	0,050	4	10	9,175	9,679	10,875	12,409
VHMS 4 030 064 06 03 L100	3,0	-	6	64	3,00	10,0	0,050	4	13	11,210	11,668	12,709	13,954

Standard



PAGE 54

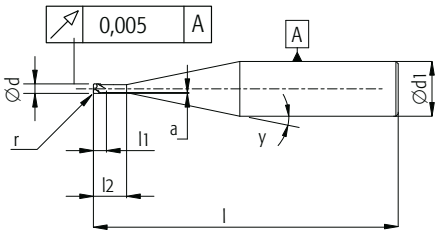
Shank 4 mm
Schaft 4 mm

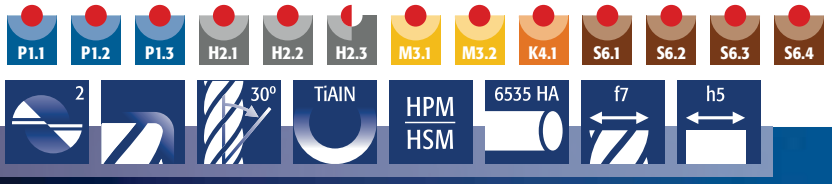
Remark ∞ = infinity, no collision in projection length area.

Bemerkung ∞ = unendlich, keine Kollision in Länge Projektionsfläche.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
VHMSR 2 001 051 04 03 L0015	0,1	0,03	4	51	0,15	-	-	2	15	0,633	0,654	0,701	0,755
VHMSR 2 001 051 04 03 L002	0,1	0,03	4	51	0,20	-	-	2	7	0,560	0,604	0,718	0,889
VHMSR 2 002 051 04 03 L0025	0,2	0,03	4	51	0,25	-	-	2	15	0,736	0,761	0,816	0,879
VHMSR 2 003 051 04 03 L003	0,3	0,05	4	51	0,30	-	-	2	15	1,097	1,134	1,215	1,310
VHMSR 2 003 051 04 03 L015	0,3	0,05	4	51	0,30	1,5	0,010	2	15	1,860	1,923	2,063	2,226
VHMSR 2 003 051 04 03 L030	0,3	0,05	4	51	0,30	3,0	0,010	2	15	3,410	3,527	3,788	4,091
VHMSR 2 004 051 04 03 L004	0,4	0,05	4	51	0,40	-	-	2	15	1,201	1,241	1,330	1,434
VHMSR 2 004 051 04 03 L020	0,4	0,05	4	51	0,40	2,0	0,010	2	15	2,376	2,457	2,638	2,848
VHMSR 2 004 051 04 03 L040	0,4	0,05	4	51	0,40	4,0	0,010	2	15	4,444	4,597	4,938	5,334
VHMSR 2 005 051 04 03 L005	0,5	0,05	4	51	0,50	-	-	2	15	1,304	1,348	1,445	1,558
VHMSR 2 005 051 04 03 L010	0,5	0,05	4	51	0,50	1,0	0,015	2	15	1,362	1,408	1,509	1,628
VHMSR 2 005 051 04 03 L030	0,5	0,05	4	51	0,50	3,0	0,015	2	15	3,429	3,547	3,809	4,114
VHMSR 2 005 051 04 03 L060	0,5	0,05	4	51	0,50	6,0	0,015	2	15	6,530	6,756	7,259	7,844
VHMSR 2 005 051 04 03 L080	0,5	0,05	4	51	0,50	8,0	0,015	2	15	8,598	8,896	9,558	10,330
VHMSR 2 005 051 04 03 L100	0,5	0,05	4	51	0,50	10,0	0,015	2	15	10,665	11,035	11,858	12,816
VHMSR 2 006 051 04 03 L006	0,6	0,05	4	51	0,60	-	-	2	15	2,060	2,130	2,286	2,468
VHMSR 2 006 051 04 03 L020	0,6	0,05	4	51	0,60	2,0	0,025	2	15	2,570	2,658	2,854	3,081
VHMSR 2 006 051 04 03 L040	0,6	0,05	4	51	0,60	4,0	0,025	2	15	4,638	4,798	5,153	5,567
VHMSR 2 006 051 04 03 L060	0,6	0,05	4	51	0,60	6,0	0,025	2	15	6,705	6,937	7,453	8,054
VHMSR 2 006 051 04 03 L080	0,6	0,05	4	51	0,60	8,0	0,025	2	15	8,772	9,076	9,753	10,540
VHMSR 2 006 051 04 03 L100	0,6	0,05	4	51	0,60	10,00	0,025	2	15	10,840	11,216	12,052	13,026
VHMSR 2 008 051 04 03 L008	0,8	0,05	4	51	0,80	-	-	2	15	2,267	2,344	2,516	2,716
VHMSR 2 008 051 04 03 L025	0,8	0,05	4	51	0,80	2,5	0,025	2	15	3,087	3,193	3,429	3,703
VHMSR 2 008 051 04 03 L050	0,8	0,05	4	51	0,80	5,0	0,025	2	15	5,671	5,867	6,303	6,811
VHMSR 2 008 051 04 03 L080	0,8	0,05	4	51	0,80	8,0	0,025	2	15	8,772	9,076	9,753	10,540
VHMSR 2 008 051 04 03 L100	0,8	0,05	4	51	0,80	10,0	0,025	2	15	10,840	11,216	12,052	13,026
VHMSR 2 010 051 04 03 L010	1,0	0,10	4	51	1,00	-	-	2	15	2,472	2,555	2,739	2,953
VHMSR 2 010 051 04 03 L020	1,0	0,10	4	51	1,00	2,0	0,025	2	15	2,569	2,655	2,846	3,069
VHMSR 2 010 051 04 03 L040	1,0	0,10	4	51	1,00	4,0	0,025	2	15	4,636	4,794	5,146	5,555
VHMSR 2 010 051 04 03 L060	1,0	0,10	4	51	1,00	6,0	0,025	2	15	6,703	6,933	7,446	8,042
VHMSR 2 010 051 04 03 L080	1,0	0,10	4	51	1,00	8,0	0,025	2	15	8,771	9,073	9,745	10,528
VHMSR 2 010 051 04 03 L100	1,0	0,10	4	51	1,00	10,0	0,025	2	15	10,838	11,212	12,045	13,014
VHMSR 2 010 051 04 03 L120	1,0	0,10	4	51	1,00	12,0	0,025	2	15	12,905	13,352	14,345	15,500
VHMSR 2 010 051 04 03 L150	1,0	0,10	4	51	1,00	15,0	0,025	2	15	16,006	16,561	17,794	19,230
VHMSR 2 010 060 04 03 L200	1,0	0,10	4	60	1,00	20,0	0,025	2	15	21,175	21,909	23,544	25,446
VHMSR 2 010 060 04 03 L250	1,0	0,10	4	60	1,00	25,0	0,025	2	15	26,343	27,257	29,293	∞
VHMSR 2 012 051 04 03 L012	1,2	0,10	4	51	1,20	-	-	2	15	3,468	3,585	3,847	4,150
VHMSR 2 012 051 04 03 L040	1,2	0,10	4	51	1,20	4,0	0,025	2	15	4,908	5,076	5,449	5,883
VHMSR 2 012 051 04 03 L060	1,2	0,10	4	51	1,20	6,0	0,025	2	15	6,975	7,215	7,748	8,369
VHMSR 2 012 051 04 03 L080	1,2	0,10	4	51	1,20	8,0	0,025	2	15	9,043	9,354	10,048	10,855
VHMSR 2 012 051 04 03 L120	1,2	0,10	4	51	1,20	12,0	0,025	2	15	13,177	13,633	14,647	15,828
VHMSR 2 012 051 04 03 L160	1,2	0,10	4	51	1,20	16,0	0,025	2	15	17,312	17,912	19,247	20,800

Standard



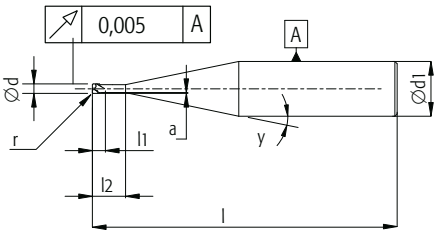


PAGE 54

Shank 4 mm
Schaft 4 mm

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
VHMSR 2 015 051 04 03 L015	1,5	0,15	4	51	1,50	-	-	2	15	3,776	3,903	4,184	4,511
VHMSR 2 015 051 04 03 L030	1,5	0,15	4	51	1,50	3,0	0,025	2	15	3,873	4,003	4,291	4,627
VHMSR 2 015 051 04 03 L040	1,5	0,15	4	51	1,50	4,0	0,025	2	15	4,906	5,072	5,441	5,870
VHMSR 2 015 051 04 03 L060	1,5	0,15	4	51	1,50	6,0	0,025	2	15	6,974	7,212	7,741	8,357
VHMSR 2 015 051 04 03 L080	1,5	0,15	4	51	1,50	8,0	0,025	2	15	9,041	9,351	10,041	10,843
VHMSR 2 015 051 04 03 L100	1,5	0,15	4	51	1,50	10,0	0,025	2	15	11,108	11,490	12,340	13,329
VHMSR 2 015 051 04 03 L120	1,5	0,15	4	51	1,50	12,0	0,025	2	15	13,176	13,630	14,640	15,816
VHMSR 2 015 051 04 03 L150	1,5	0,15	4	51	1,50	15,0	0,025	2	15	16,277	16,839	18,090	19,545
VHMSR 2 015 060 04 03 L200	1,5	0,15	4	60	1,50	20,0	0,025	2	15	21,445	22,187	23,839	∞
VHMSR 2 015 060 04 03 L250	1,5	0,15	4	60	1,50	25,0	0,025	2	15	26,613	27,536	29,588	∞
VHMSR 2 020 051 04 03 L020	2,0	0,20	4	51	2,00	-	-	2	15	4,292	4,434	4,751	5,121
VHMSR 2 020 051 04 03 L040	2,0	0,20	4	51	2,00	4,0	0,050	2	15	5,001	5,169	5,541	5,974
VHMSR 2 020 051 04 03 L060	2,0	0,20	4	51	2,00	6,0	0,050	2	15	7,069	7,308	7,841	8,461
VHMSR 2 020 051 04 03 L080	2,0	0,20	4	51	2,00	8,0	0,050	2	15	9,136	9,447	10,140	10,947
VHMSR 2 020 051 04 03 L100	2,0	0,20	4	51	2,00	10,0	0,050	2	15	11,203	11,587	12,440	13,433
VHMSR 2 020 051 04 03 L120	2,0	0,20	4	51	2,00	12,0	0,050	2	15	13,271	13,726	14,740	15,919
VHMSR 2 020 051 04 03 L160	2,0	0,20	4	51	2,00	16,0	0,050	2	15	17,405	18,005	19,339	∞
VHMSR 2 020 060 04 03 L200	2,0	0,20	4	60	2,00	20,0	0,050	2	15	21,540	22,283	23,939	∞
VHMSR 2 020 060 04 03 L250	2,0	0,20	4	60	2,00	25,0	0,050	2	15	26,708	27,632	∞	∞
VHMSR 2 020 064 04 03 L300	2,0	0,20	4	64	2,00	30,0	0,050	2	15	31,877	32,980	∞	∞
VHMSR 2 025 051 04 03 L025	2,5	0,20	4	51	2,50	-	-	2	15	4,808	4,969	5,326	5,742
VHMSR 2 025 051 04 03 L040	2,5	0,20	4	51	2,50	4,0	0,050	2	15	5,001	5,169	5,541	5,974
VHMSR 2 025 051 04 03 L060	2,5	0,20	4	51	2,50	6,0	0,050	2	15	7,069	7,308	7,841	8,461
VHMSR 2 025 051 04 03 L080	2,5	0,20	4	51	2,50	8,0	0,050	2	15	9,136	9,447	10,140	10,947
VHMSR 2 025 051 04 03 L100	2,5	0,20	4	51	2,50	10,0	0,050	2	15	11,203	11,587	12,440	13,433
VHMSR 2 025 051 04 03 L120	2,5	0,20	4	51	2,50	12,0	0,050	2	15	13,271	13,726	14,740	∞
VHMSR 2 025 051 04 03 L160	2,5	0,20	4	51	2,50	16,0	0,050	2	15	17,405	18,005	19,339	∞
VHMSR 2 025 060 04 03 L200	2,5	0,20	4	60	2,50	20,0	0,050	2	15	21,540	22,283	∞	∞
VHMSR 2 025 060 04 03 L250	2,5	0,20	4	60	2,50	25,0	0,050	2	15	26,708	27,632	∞	∞
VHMSR 2 025 064 04 03 L300	2,5	0,20	4	64	2,50	30,0	0,050	2	15	31,877	32,980	∞	∞
VHMSR 2 030 051 04 03 L030	3,0	0,30	4	51	3,00	-	-	2	15	5,322	5,497	5,886	6,340
VHMSR 2 030 051 04 03 L060	3,0	0,30	4	51	3,00	6,0	0,050	2	15	7,065	7,301	7,826	∞
VHMSR 2 030 051 04 03 L080	3,0	0,30	4	51	3,00	8,0	0,050	2	15	9,133	9,440	10,125	∞
VHMSR 2 030 051 04 03 L100	3,0	0,30	4	51	3,00	10,0	0,050	2	15	11,200	11,580	12,425	∞
VHMSR 2 030 051 04 03 L120	3,0	0,30	4	51	3,00	12,0	0,050	2	15	13,267	13,719	14,725	∞
VHMSR 2 030 051 04 03 L160	3,0	0,30	4	51	3,00	16,0	0,050	2	15	17,402	17,998	∞	∞
VHMSR 2 030 060 04 03 L200	3,0	0,30	4	60	3,00	20,0	0,050	2	15	21,537	22,276	∞	∞
VHMSR 2 030 060 04 03 L250	3,0	0,30	4	60	3,00	25,0	0,050	2	15	26,705	27,625	∞	∞
VHMSR 2 030 064 04 03 L300	3,0	0,30	4	64	3,00	30,0	0,050	2	15	31,873	∞	∞	∞

Standard



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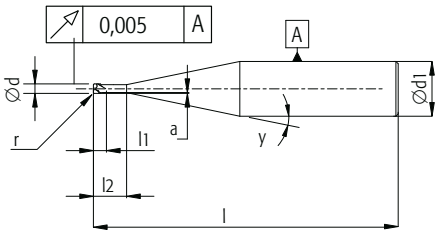
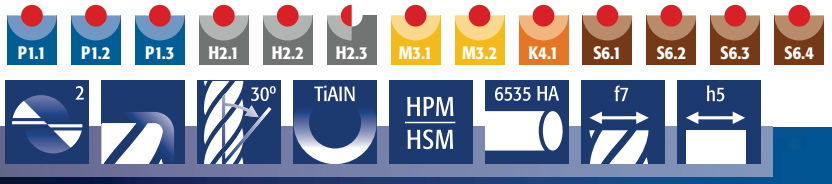
Shank 6 mm
Schaft 6 mm

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°
VHMSR 2 002 Z64 06 03 L003	0,2	0,03	6	64	0,30	-	-	2	10	0,709	0,746	0,834	0,948
VHMSR 2 003 Z64 06 03 L005	0,3	0,05	6	64	0,50	-	-	2	10	1,234	1,299	1,453	1,651
VHMSR 2 003 Z64 06 03 L015	0,3	0,05	6	64	0,50	1,5	0,010	2	11	1,824	1,911	2,115	2,369
VHMSR 2 003 Z64 06 03 L030	0,3	0,05	6	64	0,50	3,0	0,010	2	12	3,395	3,544	3,888	4,307
VHMSR 2 004 Z64 06 03 L006	0,4	0,05	6	64	0,60	-	-	2	10	1,339	1,410	1,577	1,793
VHMSR 2 004 Z64 06 03 L020	0,4	0,05	6	64	0,60	2,0	0,010	2	11	2,347	2,460	2,725	3,054
VHMSR 2 004 Z64 06 03 L040	0,4	0,05	6	64	0,60	4,0	0,010	2	13	4,437	4,616	5,023	5,511
VHMSR 2 005 Z64 06 03 L008	0,5	0,05	6	64	0,80	-	-	2	10	1,549	1,632	1,827	2,078
VHMSR 2 005 Z64 06 03 L030	0,5	0,05	6	64	0,80	3,0	0,015	2	12	3,419	3,570	3,916	4,338
VHMSR 2 005 Z64 06 03 L060	0,5	0,05	6	64	0,80	6,0	0,015	2	15	6,530	6,756	7,259	7,844
VHMSR 2 005 Z64 06 03 L080	0,5	0,05	6	64	0,80	8,0	0,015	2	15	8,598	8,896	9,558	10,330
VHMSR 2 005 Z64 06 03 L100	0,5	0,05	6	64	0,80	10,0	0,015	2	15	10,665	11,035	11,858	12,816
VHMSR 2 006 Z64 06 03 L009	0,6	0,05	6	64	0,90	-	-	2	10	2,272	2,395	2,684	3,056
VHMSR 2 006 Z64 06 03 L020	0,6	0,05	6	64	0,90	2,0	0,025	2	11	2,529	2,651	2,936	3,291
VHMSR 2 006 Z64 06 03 L040	0,6	0,05	6	64	0,90	4,0	0,025	2	12	4,621	4,825	5,295	5,867
VHMSR 2 006 Z64 06 03 L060	0,6	0,05	6	64	0,90	6,0	0,025	2	15	6,705	6,937	7,453	8,054
VHMSR 2 006 Z64 06 03 L080	0,6	0,05	6	64	0,90	8,0	0,025	2	15	8,772	9,076	9,753	10,540
VHMSR 2 006 Z64 06 03 L100	0,6	0,05	6	64	0,90	10,0	0,025	2	15	10,840	11,216	12,052	13,026
VHMSR 2 008 Z64 06 03 L012	0,8	0,05	6	64	1,20	-	-	2	10	2,588	2,728	3,058	3,483
VHMSR 2 008 Z64 06 03 L025	0,8	0,05	6	64	1,20	2,5	0,025	2	11	3,052	3,200	3,545	3,976
VHMSR 2 008 Z64 06 03 L050	0,8	0,05	6	64	1,20	5,0	0,025	2	13	5,662	5,892	6,412	7,036
VHMSR 2 008 Z64 06 03 L080	0,8	0,05	6	64	1,20	8,0	0,025	2	15	8,772	9,076	9,753	10,540
VHMSR 2 008 Z64 06 03 L100	0,8	0,05	6	64	1,20	10,0	0,025	2	15	10,840	11,216	12,052	13,026
VHMSR 2 010 Y64 06 03 L015	1,0	0,10	6	64	1,50	-	-	2	9	2,890	3,063	3,482	4,040
VHMSR 2 010 Y64 06 03 L040	1,0	0,10	6	64	1,50	4,0	0,025	2	11	4,620	4,843	5,363	6,011
VHMSR 2 010 Y64 06 03 L060	1,0	0,10	6	64	1,50	6,0	0,025	2	14	6,700	6,948	7,506	8,164
VHMSR 2 010 Y64 06 03 L080	1,0	0,10	6	64	1,50	8,0	0,025	2	15	8,771	9,073	9,745	10,528
VHMSR 2 010 Y64 06 03 L100	1,0	0,10	6	64	1,50	10,0	0,025	2	15	10,838	11,212	12,045	13,014
VHMSR 2 010 Y64 06 03 L120	1,0	0,10	6	64	1,50	12,0	0,025	2	15	12,905	13,352	14,345	15,500
VHMSR 2 010 Y64 06 03 L150	1,0	0,10	6	64	1,50	15,0	0,025	2	15	16,006	16,561	17,794	19,230
VHMSR 2 010 Y64 06 03 L200	1,0	0,10	6	64	1,50	20,0	0,025	2	15	21,175	21,909	23,544	25,446
VHMSR 2 010 Y64 06 03 L250	1,0	0,10	6	64	1,50	25,0	0,025	2	15	26,343	27,257	29,293	31,661
VHMSR 2 012 Y64 06 03 L018	1,2	0,10	6	64	1,80	-	-	2	9	3,903	4,139	4,710	5,471
VHMSR 2 012 Y64 06 03 L040	1,2	0,10	6	64	1,80	4,0	0,025	2	11	4,822	5,055	5,598	6,275
VHMSR 2 012 Y64 06 03 L060	1,2	0,10	6	64	1,80	6,0	0,025	2	13	6,936	7,216	7,850	8,610
VHMSR 2 012 Y64 06 03 L080	1,2	0,10	6	64	1,80	8,0	0,025	2	15	9,043	9,354	10,048	10,855
VHMSR 2 012 Y64 06 03 L120	1,2	0,10	6	64	1,80	12,0	0,025	2	15	13,177	13,633	14,647	15,828
VHMSR 2 012 Y64 06 03 L160	1,2	0,10	6	64	1,80	16,0	0,025	2	15	17,312	17,912	19,247	20,800

Standard



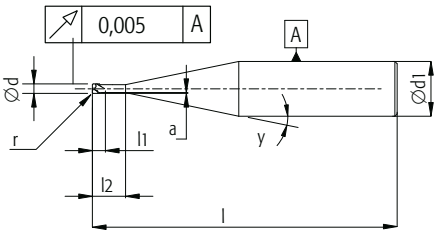


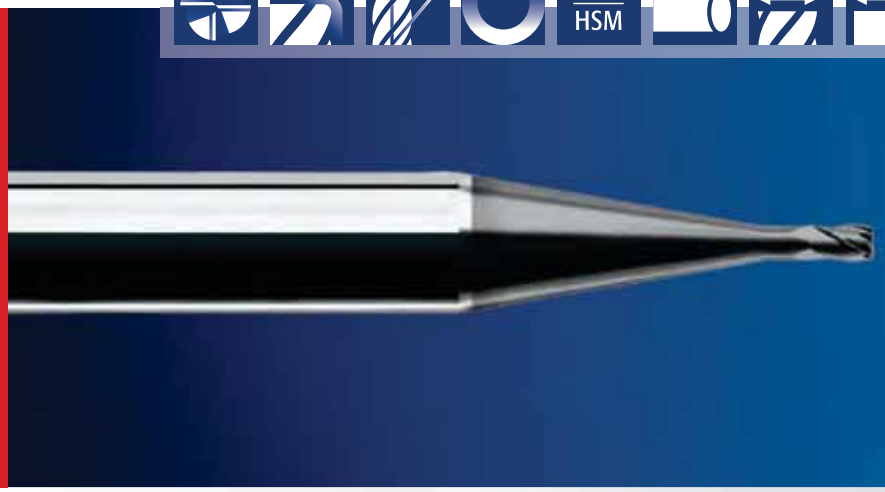
PAGE 54

Shank 6 mm
Schaft 6 mm

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
VHMSR 2 015 X64 06 03 L023	1,5	0,15	6	64	2,30	-	-	2	9	4,429	4,694	5,337	6,193
VHMSR 2 015 X64 06 03 L040	1,5	0,15	6	64	2,30	4,0	0,025	2	10	4,810	5,066	5,673	6,452
VHMSR 2 015 X64 06 03 L060	1,5	0,15	6	64	2,30	6,0	0,025	2	12	6,921	7,224	7,920	8,768
VHMSR 2 015 X64 06 03 L080	1,5	0,15	6	64	2,30	8,0	0,025	2	15	9,041	9,351	10,041	10,843
VHMSR 2 015 X64 06 03 L100	1,5	0,15	6	64	2,30	10,0	0,025	2	15	11,108	11,490	12,340	13,329
VHMSR 2 015 X64 06 03 L120	1,5	0,15	6	64	2,30	12,0	0,025	2	15	13,176	13,630	14,640	15,816
VHMSR 2 015 X64 06 03 L150	1,5	0,15	6	64	2,30	15,0	0,025	2	15	16,277	16,839	18,090	19,545
VHMSR 2 015 X64 06 03 L200	1,5	0,15	6	64	2,30	20,0	0,025	2	15	21,445	22,187	23,839	25,761
VHMSR 2 015 X64 06 03 L250	1,5	0,15	6	64	2,30	25,0	0,025	2	15	26,613	27,536	29,588	31,976
VHMSR 2 020 W64 06 03 L030	2,0	0,20	6	64	3,00	-	-	2	8	5,157	5,509	6,387	7,615
VHMSR 2 020 W64 06 03 L040	2,0	0,20	6	64	3,00	4,0	0,050	2	9	4,972	5,268	5,985	6,939
VHMSR 2 020 W64 06 03 L060	2,0	0,20	6	64	3,00	6,0	0,050	2	11	7,046	7,384	8,171	9,152
VHMSR 2 020 W64 06 03 L080	2,0	0,20	6	64	3,00	8,0	0,050	2	14	9,127	9,463	10,218	11,107
VHMSR 2 020 W64 06 03 L100	2,0	0,20	6	64	3,00	10,0	0,050	2	15	11,203	11,587	12,440	13,433
VHMSR 2 020 W64 06 03 L120	2,0	0,20	6	64	3,00	12,0	0,050	2	15	13,271	13,726	14,740	15,919
VHMSR 2 020 W64 06 03 L160	2,0	0,20	6	64	3,00	16,0	0,050	2	15	17,405	18,005	19,339	20,892
VHMSR 2 020 W64 06 03 L200	2,0	0,20	6	64	3,00	20,0	0,050	2	15	21,540	22,283	23,939	25,865
VHMSR 2 020 W64 06 03 L250	2,0	0,20	6	64	3,00	25,0	0,050	2	15	26,708	27,632	29,688	32,080
VHMSR 2 020 W64 06 03 L300	2,0	0,20	6	64	3,00	30,0	0,050	2	15	31,877	32,980	35,437	38,296
VHMSR 2 025 W64 06 03 L030	2,5	0,20	6	64	3,00	-	-	2	7	5,158	5,569	6,636	8,236
VHMSR 2 025 W64 06 03 L060	2,5	0,20	6	64	3,00	6,0	0,050	2	10	7,061	7,437	8,331	9,479
VHMSR 2 025 W64 06 03 L080	2,5	0,20	6	64	3,00	8,0	0,050	2	12	9,127	9,527	10,444	11,562
VHMSR 2 025 W64 06 03 L100	2,5	0,20	6	64	3,00	10,0	0,050	2	15	11,203	11,587	12,440	13,433
VHMSR 2 025 W64 06 03 L120	2,5	0,20	6	64	3,00	12,0	0,050	2	15	13,271	13,726	14,740	15,919
VHMSR 2 025 W64 06 03 L160	2,5	0,20	6	64	3,00	16,0	0,050	2	15	17,405	18,005	19,339	20,892
VHMSR 2 025 W64 06 03 L200	2,5	0,20	6	64	3,00	20,0	0,050	2	15	21,540	22,283	23,939	25,865
VHMSR 2 025 W64 06 03 L250	2,5	0,20	6	64	3,00	25,0	0,050	2	15	26,708	27,632	29,688	32,080
VHMSR 2 025 W64 06 03 L300	2,5	0,20	6	64	3,00	30,0	0,050	2	15	31,877	32,980	35,437	38,296
VHMSR 2 030 U64 06 03 L030	3,0	0,30	6	64	3,00	-	-	2	6	5,166	5,651	6,982	9,200
VHMSR 2 030 U64 06 03 L060	3,0	0,30	6	64	3,00	6,0	0,050	2	8	7,129	7,614	8,823	10,514
VHMSR 2 030 U64 06 03 L080	3,0	0,30	6	64	3,00	8,0	0,050	2	10	9,159	9,646	10,801	12,282
VHMSR 2 030 U64 06 03 L100	3,0	0,30	6	64	3,00	10,0	0,050	2	13	11,198	11,644	12,655	13,866
VHMSR 2 030 U64 06 03 L120	3,0	0,30	6	64	3,00	12,0	0,050	2	15	13,267	13,719	14,725	15,895
VHMSR 2 030 U64 06 03 L160	3,0	0,30	6	64	3,00	16,0	0,050	2	15	17,402	17,998	19,324	20,868
VHMSR 2 030 U64 06 03 L200	3,0	0,30	6	64	3,00	20,0	0,050	2	15	21,537	22,276	23,924	25,840
VHMSR 2 030 U64 06 03 L250	3,0	0,30	6	64	3,00	25,0	0,050	2	15	26,705	27,625	29,673	32,056
VHMSR 2 030 U64 06 03 L300	3,0	0,30	6	64	3,00	30,0	0,050	2	15	31,873	32,973	35,422	38,272

Standard





PAGE 54

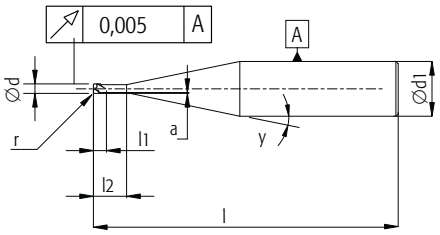
Shank 4 mm
Schaft 4 mm
4 Flute
4 Schneiden

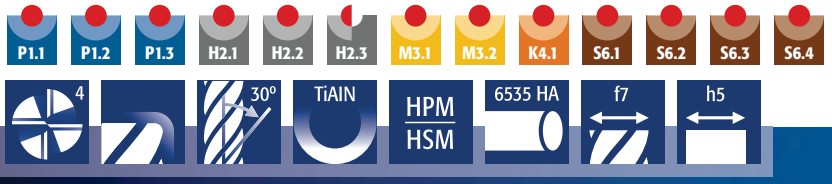
Remark ∞ = infinity, no collision in projection length area.

Bemerkung ∞ = unendlich, keine Kollision in Länge Projektionsfläche.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°
VHMSR 4 002 051 04 03 L020	0,2	0,03	4	51	0,25	2,0	0,010	4	15	2,377	2,459	2,641	2,853
VHMSR 4 002 051 04 03 L040	0,2	0,03	4	51	0,25	4,0	0,010	4	15	4,444	4,598	4,941	5,339
VHMSR 4 004 051 04 03 L020	0,4	0,05	4	51	0,40	2,0	0,010	4	15	2,376	2,457	2,638	2,848
VHMSR 4 004 051 04 03 L040	0,4	0,05	4	51	0,40	4,0	0,010	4	15	4,444	4,597	4,938	5,334
VHMSR 4 004 051 04 03 L060	0,4	0,05	4	51	0,40	6,0	0,010	4	15	6,511	6,736	7,237	7,820
VHMSR 4 004 051 04 03 L080	0,4	0,05	4	51	0,40	8,0	0,010	4	15	8,578	8,876	9,537	10,307
VHMSR 4 004 051 04 03 L100	0,4	0,05	4	51	0,40	10,0	0,010	4	15	10,646	11,015	11,837	12,793
VHMSR 4 005 051 04 03 L020	0,5	0,05	4	51	0,50	2,0	0,015	4	15	2,396	2,477	2,659	2,871
VHMSR 4 005 051 04 03 L040	0,5	0,05	4	51	0,50	4,0	0,015	4	15	4,463	4,617	4,959	5,357
VHMSR 4 005 051 04 03 L060	0,5	0,05	4	51	0,50	6,0	0,015	4	15	6,530	6,756	7,259	7,844
VHMSR 4 005 051 04 03 L080	0,5	0,05	4	51	0,50	8,0	0,015	4	15	8,598	8,896	9,558	10,330
VHMSR 4 005 051 04 03 L100	0,5	0,05	4	51	0,50	10,0	0,015	4	15	10,665	11,035	11,858	12,816
VHMSR 4 010 051 04 03 L020	1,0	0,10	4	51	1,00	2,0	0,025	4	15	2,569	2,655	2,846	3,069
VHMSR 4 010 051 04 03 L040	1,0	0,10	4	51	1,00	4,0	0,025	4	15	4,636	4,794	5,146	5,555
VHMSR 4 010 051 04 03 L060	1,0	0,10	4	51	1,00	6,0	0,025	4	15	6,703	6,933	7,446	8,042
VHMSR 4 010 051 04 03 L080	1,0	0,10	4	51	1,00	8,0	0,025	4	15	8,771	9,073	9,745	10,528
VHMSR 4 010 051 04 03 L100	1,0	0,10	4	51	1,00	10,0	0,025	4	15	10,838	11,212	12,045	13,014
VHMSR 4 015 051 04 03 L015	1,5	0,15	4	51	1,50	-	-	4	15	3,776	3,903	4,184	4,511
VHMSR 4 015 051 04 03 L040	1,5	0,15	4	51	1,50	4,0	0,025	4	15	4,906	5,072	5,441	5,870
VHMSR 4 015 051 04 03 L060	1,5	0,15	4	51	1,50	6,0	0,025	4	15	6,974	7,212	7,741	8,357
VHMSR 4 015 051 04 03 L080	1,5	0,15	4	51	1,50	8,0	0,025	4	15	9,041	9,351	10,041	10,843
VHMSR 4 015 051 04 03 L100	1,5	0,15	4	51	1,50	10,0	0,025	4	15	11,108	11,490	12,340	13,329
VHMSR 4 020 051 04 03 L020	2,0	0,20	4	51	2,00	-	-	4	15	4,292	4,434	4,751	5,121
VHMSR 4 020 051 04 03 L040	2,0	0,20	4	51	2,00	4,0	0,050	4	15	5,001	5,169	5,541	5,974
VHMSR 4 020 051 04 03 L060	2,0	0,20	4	51	2,00	6,0	0,050	4	15	7,069	7,308	7,841	8,461
VHMSR 4 020 051 04 03 L080	2,0	0,20	4	51	2,00	8,0	0,050	4	15	9,136	9,447	10,140	10,947
VHMSR 4 020 051 04 03 L100	2,0	0,20	4	51	2,00	10,0	0,050	4	15	11,203	11,587	12,440	13,433
VHMSR 4 025 051 04 03 L025	2,5	0,20	4	51	2,50	-	-	4	15	4,808	4,969	5,326	5,742
VHMSR 4 025 051 04 03 L040	2,5	0,20	4	51	2,50	4,0	0,050	4	15	5,001	5,169	5,541	5,974
VHMSR 4 025 051 04 03 L060	2,5	0,20	4	51	2,50	6,0	0,050	4	15	7,069	7,308	7,841	8,461
VHMSR 4 025 051 04 03 L080	2,5	0,20	4	51	2,50	8,0	0,050	4	15	9,136	9,447	10,140	10,947
VHMSR 4 025 051 04 03 L100	2,5	0,20	4	51	2,50	10,0	0,050	4	15	11,203	11,587	12,440	13,433
VHMSR 4 030 051 04 03 L030	3,0	0,30	4	51	3,00	-	-	4	15	5,322	5,497	5,886	6,340
VHMSR 4 030 051 04 03 L040	3,0	0,30	4	51	3,00	4,0	0,050	4	15	4,998	5,162	5,526	5,950
VHMSR 4 030 051 04 03 L060	3,0	0,30	4	51	3,00	6,0	0,050	4	15	7,065	7,301	7,826	8,436
VHMSR 4 030 051 04 03 L080	3,0	0,30	4	51	3,00	8,0	0,050	4	15	9,133	9,440	10,125	∞
VHMSR 4 030 051 04 03 L100	3,0	0,30	4	51	3,00	10,0	0,050	4	15	11,200	11,580	12,425	∞

Standard





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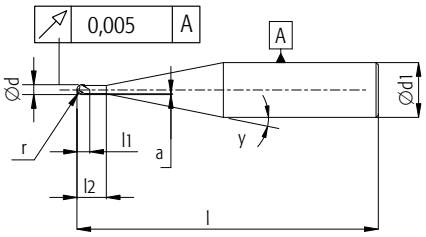
Shank 6 mm
Schaft 6 mm
4 Flute
4 Schneiden

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°
VHMSR 4 002 064 06 03 L020	0,2	0,03	6	64	0,30	2,0	0,010	4	11	2,348	2,462	2,729	3,061
VHMSR 4 002 064 06 03 L040	0,2	0,03	6	64	0,30	4,0	0,010	4	13	4,438	4,618	5,027	5,517
VHMSR 4 004 064 06 03 L020	0,4	0,05	6	64	0,60	2,0	0,010	4	11	2,347	2,460	2,725	3,054
VHMSR 4 004 064 06 03 L040	0,4	0,05	6	64	0,60	4,0	0,010	4	13	4,437	4,616	5,023	5,511
VHMSR 4 004 064 06 03 L060	0,4	0,05	6	64	0,60	6,0	0,010	4	15	6,511	6,736	7,237	7,820
VHMSR 4 004 064 06 03 L080	0,4	0,05	6	64	0,60	8,0	0,010	4	15	8,578	8,876	9,537	10,307
VHMSR 4 004 064 06 03 L100	0,4	0,05	6	64	0,60	10,0	0,010	4	15	10,646	11,015	11,837	12,793
VHMSR 4 005 064 06 03 L020	0,5	0,05	6	64	0,80	2,0	0,015	4	11	2,374	2,489	2,756	3,089
VHMSR 4 005 064 06 03 L040	0,5	0,05	6	64	0,80	4,0	0,015	4	12	4,462	4,659	5,112	5,665
VHMSR 4 005 064 06 03 L060	0,5	0,05	6	64	0,80	6,0	0,015	4	15	6,530	6,756	7,259	7,844
VHMSR 4 005 064 06 03 L080	0,5	0,05	6	64	0,80	8,0	0,015	4	15	8,598	8,896	9,558	10,330
VHMSR 4 005 064 06 03 L100	0,5	0,05	6	64	0,80	10,0	0,015	4	15	10,665	11,035	11,858	12,816
VHMSR 4 010 064 06 03 L015	1,0	0,10	6	64	1,50	-	-	4	10	3,050	3,212	3,597	4,090
VHMSR 4 010 064 06 03 L040	1,0	0,10	6	64	1,50	4,0	0,025	4	11	4,620	4,843	5,363	6,011
VHMSR 4 010 064 06 03 L060	1,0	0,10	6	64	1,50	6,0	0,025	4	14	6,700	6,948	7,506	8,164
VHMSR 4 010 064 06 03 L080	1,0	0,10	6	64	1,50	8,0	0,025	4	15	8,771	9,073	9,745	10,528
VHMSR 4 010 064 06 03 L100	1,0	0,10	6	64	1,50	10,0	0,025	4	15	10,838	11,212	12,045	13,014
VHMSR 4 015 064 06 03 L023	1,5	0,15	6	64	2,30	-	-	4	9	4,429	4,694	5,337	6,193
VHMSR 4 015 064 06 03 L040	1,5	0,15	6	64	2,30	4,0	0,025	4	10	4,810	5,066	5,673	6,452
VHMSR 4 015 064 06 03 L060	1,5	0,15	6	64	2,30	6,0	0,025	4	12	6,921	7,224	7,920	8,768
VHMSR 4 015 064 06 03 L080	1,5	0,15	6	64	2,30	8,0	0,025	4	15	9,041	9,351	10,041	10,843
VHMSR 4 015 064 06 03 L100	1,5	0,15	6	64	2,30	10,0	0,025	4	15	11,108	11,490	12,340	13,329
VHMSR 4 020 064 06 03 L030	2,0	0,20	6	64	3,00	-	-	4	8	5,157	5,509	6,387	7,615
VHMSR 4 020 064 06 03 L045	2,0	0,20	6	64	3,00	4,5	0,050	4	9	5,501	5,830	6,626	7,686
VHMSR 4 020 064 06 03 L060	2,0	0,20	6	64	3,00	6,0	0,050	4	11	7,046	7,384	8,171	9,152
VHMSR 4 020 064 06 03 L080	2,0	0,20	6	64	3,00	8,0	0,050	4	14	9,127	9,463	10,218	11,107
VHMSR 4 020 064 06 03 L100	2,0	0,20	6	64	3,00	10,0	0,050	4	15	11,203	11,587	12,440	13,433
VHMSR 4 025 064 06 03 L030	2,5	0,20	6	64	3,00	-	-	4	8	5,157	5,509	6,387	7,615
VHMSR 4 025 064 06 03 L045	2,5	0,20	6	64	3,00	4,5	0,050	4	9	5,501	5,830	6,626	7,686
VHMSR 4 025 064 06 03 L060	2,5	0,20	6	64	3,00	6,0	0,050	4	11	7,046	7,384	8,171	9,152
VHMSR 4 025 064 06 03 L080	2,5	0,20	6	64	3,00	8,0	0,050	4	14	9,127	9,463	10,218	11,107
VHMSR 4 025 064 06 03 L100	2,5	0,20	6	64	3,00	10,0	0,050	4	15	11,203	11,587	12,440	13,433
VHMSR 4 030 064 06 03 L030	3,0	0,30	6	64	3,00	-	-	4	6	5,166	5,651	6,982	9,200
VHMSR 4 030 064 06 03 L045	3,0	0,30	6	64	3,00	4,5	0,050	4	7	5,589	6,027	7,166	8,872
VHMSR 4 030 064 06 03 L060	3,0	0,30	6	64	3,00	6,0	0,050	4	8	7,129	7,614	8,823	10,514
VHMSR 4 030 064 06 03 L080	3,0	0,30	6	64	3,00	8,0	0,050	4	10	9,159	9,646	10,801	12,282
VHMSR 4 030 064 06 03 L100	3,0	0,30	6	64	3,00	10,0	0,050	4	13	11,198	11,644	12,655	13,866

Standard



PAGE 54

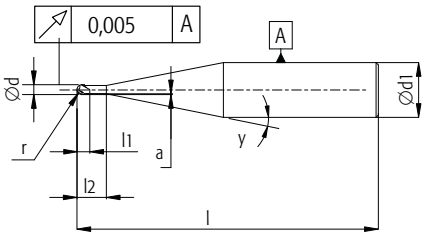
Shank 4 mm
Schaft 4 mm

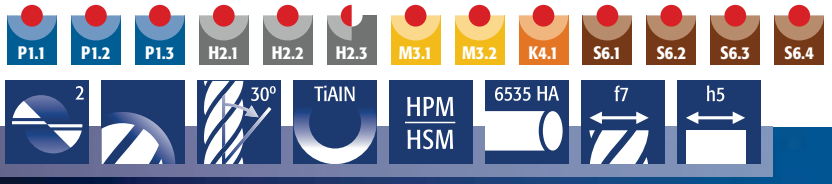
Remark ∞ = infinity, no collision in projection length area.

Bemerkung ∞ = unendlich, keine Kollision in Länge Projektionsfläche.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
VHMSK 2 001 051 04 03 L002	0,1	0,05	4	51	0,20	-	-	2	15	0,684	0,706	0,755	0,812
VHMSK 2 001 060 04 03 L002	0,1	0,05	4	60	0,20	-	-	2	10	0,602	0,633	0,705	0,797
VHMSK 2 002 051 04 03 L003	0,2	0,10	4	51	0,30	-	-	2	15	0,786	0,810	0,863	0,925
VHMSK 2 003 051 04 03 L004	0,3	0,15	4	51	0,40	-	-	2	15	1,197	1,234	1,315	1,410
VHMSK 2 003 051 04 03 L015	0,3	0,15	4	51	0,40	1,50	0,010	2	15	1,856	1,916	2,048	2,202
VHMSK 2 003 051 04 03 L030	0,3	0,15	4	51	0,40	3,00	0,010	2	15	3,407	3,520	3,773	4,067
VHMSK 2 004 051 04 03 L005	0,4	0,20	4	51	0,50	-	-	2	15	1,299	1,337	1,423	1,522
VHMSK 2 004 051 04 03 L020	0,4	0,20	4	51	0,50	2,00	0,010	2	15	2,371	2,447	2,615	2,811
VHMSK 2 004 051 04 03 L040	0,4	0,20	4	51	0,50	4,00	0,010	2	15	4,439	4,586	4,915	5,298
VHMSK 2 005 051 04 03 L007	0,5	0,25	4	51	0,70	-	-	2	15	1,504	1,548	1,645	1,758
VHMSK 2 005 051 04 03 L030	0,5	0,25	4	51	0,70	3,00	0,015	2	15	3,423	3,533	3,779	4,066
VHMSK 2 005 051 04 03 L060	0,5	0,25	4	51	0,70	6,00	0,015	2	15	6,524	6,742	7,229	7,795
VHMSK 2 005 051 04 03 L080	0,5	0,25	4	51	0,70	8,00	0,015	2	15	8,591	8,882	9,529	10,281
VHMSK 2 005 051 04 03 L100	0,5	0,25	4	51	0,70	10,00	0,015	2	15	10,658	11,021	11,828	12,768
VHMSK 2 006 051 04 03 L008	0,6	0,30	4	51	0,80	-	-	2	15	2,259	2,327	2,479	2,656
VHMSK 2 006 051 04 03 L020	0,6	0,30	4	51	0,80	2,00	0,025	2	15	2,562	2,641	2,816	3,020
VHMSK 2 006 051 04 03 L040	0,6	0,30	4	51	0,80	4,00	0,025	2	15	4,629	4,780	5,116	5,507
VHMSK 2 006 051 04 03 L060	0,6	0,30	4	51	0,80	6,00	0,025	2	15	6,697	6,919	7,416	7,993
VHMSK 2 006 051 04 03 L080	0,6	0,30	4	51	0,80	8,00	0,025	2	15	8,764	9,059	9,715	10,479
VHMSK 2 006 051 04 03 L100	0,6	0,30	4	51	0,80	10,00	0,025	2	15	10,831	11,198	12,015	12,965
VHMSK 2 008 051 04 03 L010	0,8	0,40	4	51	1,00	-	-	2	15	2,462	2,534	2,694	2,880
VHMSK 2 008 051 04 03 L025	0,8	0,40	4	51	1,00	2,50	0,025	2	15	3,075	3,169	3,376	3,618
VHMSK 2 008 051 04 03 L050	0,8	0,40	4	51	1,00	5,00	0,025	2	15	5,660	5,843	6,251	6,725
VHMSK 2 008 051 04 03 L080	0,8	0,40	4	51	1,00	8,00	0,025	2	15	8,761	9,052	9,700	10,455
VHMSK 2 008 051 04 03 L100	0,8	0,40	4	51	1,00	10,00	0,025	2	15	10,828	11,191	12,000	12,941
VHMSK 2 010 051 04 03 L012	1,0	0,50	4	51	1,20	-	-	2	15	2,665	2,741	2,909	3,104
VHMSK 2 010 051 04 03 L040	1,0	0,50	4	51	1,20	4,00	0,025	2	15	4,623	4,766	5,086	5,458
VHMSK 2 010 051 04 03 L060	1,0	0,50	4	51	1,20	6,00	0,025	2	15	6,690	6,906	7,386	7,944
VHMSK 2 010 051 04 03 L080	1,0	0,50	4	51	1,20	8,00	0,025	2	15	8,757	9,045	9,685	10,431
VHMSK 2 010 051 04 03 L100	1,0	0,50	4	51	1,20	10,00	0,025	2	15	10,825	11,184	11,985	12,917
VHMSK 2 010 051 04 03 L120	1,0	0,50	4	51	1,20	12,00	0,025	2	15	12,892	13,324	14,285	15,403
VHMSK 2 010 051 04 03 L150	1,0	0,50	4	51	1,20	15,00	0,025	2	15	15,993	16,533	17,734	19,133
VHMSK 2 010 060 04 03 L200	1,0	0,50	4	60	1,20	20,00	0,025	2	15	21,161	21,881	23,484	25,348
VHMSK 2 010 060 04 03 L250	1,0	0,50	4	60	1,20	25,00	0,025	2	15	26,330	27,230	29,233	∞
VHMSK 2 012 051 04 03 L014	1,2	0,60	4	51	1,40	-	-	2	15	3,658	3,764	4,002	4,278
VHMSK 2 012 051 04 03 L040	1,2	0,60	4	51	1,40	4,00	0,025	2	15	4,891	5,041	5,374	5,761
VHMSK 2 012 051 04 03 L060	1,2	0,60	4	51	1,40	6,00	0,025	2	15	6,959	7,180	7,673	8,247
VHMSK 2 012 051 04 03 L080	1,2	0,60	4	51	1,40	8,00	0,025	2	15	9,026	9,320	9,973	10,734
VHMSK 2 012 051 04 03 L120	1,2	0,60	4	51	1,40	12,00	0,025	2	15	13,161	13,598	14,573	15,706
VHMSK 2 012 051 04 03 L160	1,2	0,60	4	51	1,40	16,00	0,025	2	15	17,295	17,877	19,172	20,679

Standard



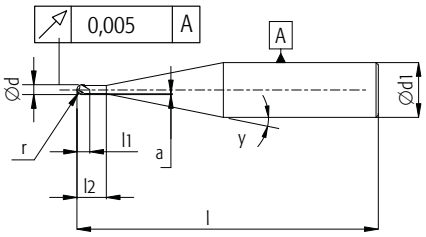


PAGE 54

Shank 4 mm
Schaft 4 mm

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
VHMSK 2 015 051 04 03 L018	1,5	0,75	4	51	1,80	-	-	2	15	4,066	4,182	4,439	4,738
VHMSK 2 015 051 04 03 L040	1,5	0,75	4	51	1,80	4,00	0,020	2	15	4,867	5,010	5,330	5,701
VHMSK 2 015 051 04 03 L060	1,5	0,75	4	51	1,80	6,00	0,025	2	15	6,954	7,170	7,651	8,211
VHMSK 2 015 051 04 03 L080	1,5	0,75	4	51	1,80	8,00	0,025	2	15	9,021	9,309	9,951	10,697
VHMSK 2 015 051 04 03 L100	1,5	0,75	4	51	1,80	10,00	0,025	2	15	11,088	11,448	12,250	13,183
VHMSK 2 015 051 04 03 L120	1,5	0,75	4	51	1,80	12,00	0,025	2	15	13,156	13,588	14,550	15,670
VHMSK 2 015 051 04 03 L150	1,5	0,75	4	51	1,80	15,00	0,025	2	15	16,257	16,797	18,000	19,399
VHMSK 2 015 060 04 03 L200	1,5	0,75	4	60	1,80	20,00	0,025	2	15	21,425	22,145	23,749	∞
VHMSK 2 015 060 04 03 L250	1,5	0,75	4	60	1,80	25,00	0,025	2	15	26,593	27,494	29,498	∞
VHMSK 2 020 051 04 03 L025	2,0	1,00	4	51	2,50	-	-	2	15	4,781	4,913	5,206	5,548
VHMSK 2 020 051 04 03 L040	2,0	1,00	4	51	2,50	4,00	0,050	2	15	4,974	5,113	5,421	5,780
VHMSK 2 020 051 04 03 L060	2,0	1,00	4	51	2,50	6,00	0,050	2	15	7,042	7,252	7,721	8,266
VHMSK 2 020 051 04 03 L080	2,0	1,00	4	51	2,50	8,00	0,050	2	15	9,109	9,392	10,020	10,752
VHMSK 2 020 051 04 03 L100	2,0	1,00	4	51	2,50	10,00	0,050	2	15	11,176	11,531	12,320	13,239
VHMSK 2 020 051 04 03 L120	2,0	1,00	4	51	2,50	12,00	0,050	2	15	13,244	13,670	14,620	15,725
VHMSK 2 020 051 04 03 L160	2,0	1,00	4	51	2,50	16,00	0,050	2	15	17,378	17,949	19,219	∞
VHMSK 2 020 060 04 03 L200	2,0	1,00	4	60	2,50	20,00	0,050	2	15	21,513	22,228	23,819	∞
VHMSK 2 020 060 04 03 L250	2,0	1,00	4	60	2,50	25,00	0,050	2	15	26,681	27,576	29,568	∞
VHMSK 2 020 064 04 03 L300	2,0	1,00	4	64	2,50	30,00	0,050	2	15	31,850	32,925	∞	∞
VHMSK 2 025 051 04 03 L035	2,5	1,25	4	51	3,50	-	-	2	15	5,807	5,965	6,319	6,730
VHMSK 2 025 051 04 03 L060	2,5	1,25	4	51	3,50	6,00	0,050	2	15	7,033	7,235	7,683	8,205
VHMSK 2 025 051 04 03 L080	2,5	1,25	4	51	3,50	8,00	0,050	2	15	9,101	9,374	9,983	10,692
VHMSK 2 025 051 04 03 L100	2,5	1,25	4	51	3,50	10,00	0,050	2	15	11,168	11,513	12,283	13,178
VHMSK 2 025 051 04 03 L120	2,5	1,25	4	51	3,50	12,00	0,050	2	15	13,235	13,653	14,582	15,664
VHMSK 2 025 051 04 03 L160	2,5	1,25	4	51	3,50	16,00	0,050	2	15	17,370	17,932	19,182	∞
VHMSK 2 025 060 04 03 L200	2,5	1,25	4	60	3,50	20,00	0,050	2	15	21,505	22,210	∞	∞
VHMSK 2 025 060 04 03 L250	2,5	1,25	4	60	3,50	25,00	0,050	2	15	26,673	27,559	∞	∞
VHMSK 2 025 064 04 03 L300	2,5	1,25	4	64	3,50	30,00	0,050	2	15	31,841	32,907	∞	∞
VHMSK 2 030 051 04 03 L035	3,0	1,50	4	51	3,50	-	-	2	15	5,798	5,948	6,281	6,669
VHMSK 2 030 051 04 03 L060	3,0	1,50	4	51	3,50	6,00	0,050	2	15	7,025	7,217	7,646	8,144
VHMSK 2 030 051 04 03 L080	3,0	1,50	4	51	3,50	8,00	0,050	2	15	9,092	9,357	9,946	10,631
VHMSK 2 030 051 04 03 L100	3,0	1,50	4	51	3,50	10,00	0,050	2	15	11,159	11,496	12,245	∞
VHMSK 2 030 051 04 03 L120	3,0	1,50	4	51	3,50	12,00	0,050	2	15	13,227	13,635	14,545	∞
VHMSK 2 030 051 04 03 L160	3,0	1,50	4	51	3,50	16,00	0,050	2	15	17,361	17,914	∞	∞
VHMSK 2 030 060 04 03 L200	3,0	1,50	4	60	3,50	20,00	0,050	2	15	21,496	22,193	∞	∞
VHMSK 2 030 060 04 03 L250	3,0	1,50	4	60	3,50	25,00	0,050	2	15	26,664	27,541	∞	∞
VHMSK 2 030 064 04 03 L300	3,0	1,50	4	64	3,50	30,00	0,050	2	15	31,833	∞	∞	∞

Standard



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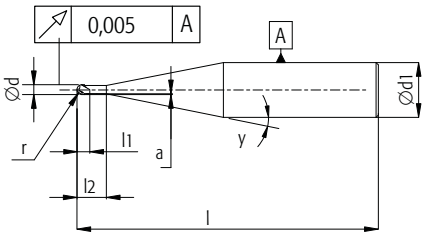
Shank 6 mm
Schaft 6 mm

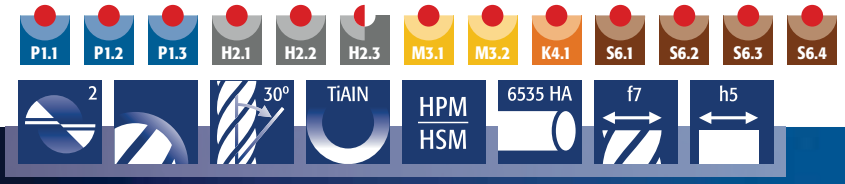
Remark ∞ = infinity, no collision in projection length area.

Bemerkung ∞ = unendlich, keine Kollision in Länge Projektionsfläche.

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	1°	2°	3°
VHMSK 2 002 064 06 03 L003	0,2	0,10	6	64	0,30	-	-	2	10	0,705	0,738	0,817	0,918
VHMSK 2 003 064 06 03 L005	0,3	0,15	6	64	0,50	-	-	2	10	1,228	1,288	1,428	1,608
VHMSK 2 003 064 06 03 L015	0,3	0,15	6	64	0,50	1,50	0,010	2	11	1,819	1,901	2,093	2,332
VHMSK 2 003 064 06 03 L030	0,3	0,15	6	64	0,50	3,00	0,010	2	12	3,390	3,535	3,868	4,274
VHMSK 2 004 064 06 03 L006	0,4	0,20	6	64	0,60	-	-	2	10	1,331	1,393	1,540	1,730
VHMSK 2 004 064 06 03 L020	0,4	0,20	6	64	0,60	2,00	0,010	2	11	2,340	2,446	2,692	2,999
VHMSK 2 004 064 06 03 L040	0,4	0,20	6	64	0,60	4,00	0,010	2	13	4,431	4,604	4,997	5,467
VHMSK 2 005 064 06 03 L008	0,5	0,25	6	64	0,80	-	-	2	10	1,539	1,610	1,777	1,993
VHMSK 2 005 064 06 03 L030	0,5	0,25	6	64	0,80	3,00	0,015	2	12	3,411	3,552	3,877	4,273
VHMSK 2 005 064 06 03 L060	0,5	0,25	6	64	0,80	6,00	0,015	2	15	6,524	6,742	7,229	7,795
VHMSK 2 005 064 06 03 L080	0,5	0,25	6	64	0,80	8,00	0,015	2	15	8,591	8,882	9,529	10,281
VHMSK 2 005 064 06 03 L100	0,5	0,25	6	64	0,80	10,00	0,015	2	15	10,658	11,021	11,828	12,768
VHMSK 2 006 064 06 03 L009	0,6	0,30	6	64	0,90	-	-	2	10	2,259	2,367	2,622	2,950
VHMSK 2 006 064 06 03 L020	0,6	0,30	6	64	0,90	2,00	0,025	2	11	2,517	2,626	2,881	3,199
VHMSK 2 006 064 06 03 L040	0,6	0,30	6	64	0,90	4,00	0,025	2	12	4,610	4,803	5,245	5,785
VHMSK 2 006 064 06 03 L060	0,6	0,30	6	64	0,90	6,00	0,025	2	15	6,697	6,919	7,416	7,993
VHMSK 2 006 064 06 03 L080	0,6	0,30	6	64	0,90	8,00	0,025	2	15	8,764	9,059	9,715	10,479
VHMSK 2 006 064 06 03 L100	0,6	0,30	6	64	0,90	10,00	0,025	2	15	10,831	11,198	12,015	12,965
VHMSK 2 008 064 06 03 L012	0,8	0,40	6	64	1,20	-	-	2	10	2,570	2,689	2,972	3,335
VHMSK 2 008 064 06 03 L025	0,8	0,40	6	64	1,20	2,50	0,025	2	11	3,036	3,166	3,469	3,847
VHMSK 2 008 064 06 03 L050	0,8	0,40	6	64	1,20	5,00	0,025	2	13	5,648	5,863	6,350	6,933
VHMSK 2 008 064 06 03 L080	0,8	0,40	6	64	1,20	8,00	0,025	2	15	8,761	9,052	9,700	10,455
VHMSK 2 008 064 06 03 L100	0,8	0,40	6	64	1,20	10,00	0,025	2	15	10,828	11,191	12,000	12,941
VHMSK 2 010 064 06 03 L015	1,0	0,50	6	64	1,50	-	-	2	9	2,866	3,013	3,369	3,842
VHMSK 2 010 064 06 03 L040	1,0	0,50	6	64	1,50	4,00	0,025	2	11	4,602	4,804	5,275	5,864
VHMSK 2 010 064 06 03 L060	1,0	0,50	6	64	1,50	6,00	0,025	2	14	6,685	6,918	7,441	8,057
VHMSK 2 010 064 06 03 L080	1,0	0,50	6	64	1,50	8,00	0,025	2	15	8,757	9,045	9,685	10,431
VHMSK 2 010 064 06 03 L100	1,0	0,50	6	64	1,50	10,00	0,025	2	15	10,825	11,184	11,985	12,917
VHMSK 2 010 064 06 03 L120	1,0	0,50	6	64	1,50	12,00	0,025	2	15	12,892	13,324	14,285	15,403
VHMSK 2 010 064 06 03 L150	1,0	0,50	6	64	1,50	15,00	0,025	2	15	15,993	16,533	17,734	19,133
VHMSK 2 010 064 06 03 L200	1,0	0,50	6	64	1,50	20,00	0,025	2	15	21,161	21,881	23,484	25,348
VHMSK 2 010 064 06 03 L250	1,0	0,50	6	64	1,50	25,00	0,025	2	15	26,330	27,230	29,233	31,564
VHMSK 2 012 064 06 03 L018	1,2	0,60	6	64	1,80	-	-	2	9	3,874	4,077	4,568	5,223
VHMSK 2 012 064 06 03 L040	1,2	0,60	6	64	1,80	4,00	0,025	2	11	4,799	5,006	5,488	6,090
VHMSK 2 012 064 06 03 L060	1,2	0,60	6	64	1,80	6,00	0,025	2	13	6,917	7,175	7,761	8,463
VHMSK 2 012 064 06 03 L080	1,2	0,60	6	64	1,80	8,00	0,025	2	15	9,026	9,320	9,973	10,734
VHMSK 2 012 064 06 03 L120	1,2	0,60	6	64	1,80	12,00	0,025	2	15	13,161	13,598	14,573	15,706
VHMSK 2 012 064 06 03 L160	1,2	0,60	6	64	1,80	16,00	0,025	2	15	17,295	17,877	19,172	20,679

Standard





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Shank 6 mm
Schaft 6 mm

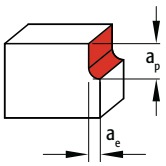
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°
VHMSK 2 015 064 06 03 L023	1,5	0,75	6	64	2,30	-	-	2	9	4,394	4,620	5,167	5,896
VHMSK 2 015 064 06 03 L040	1,5	0,75	6	64	2,30	4,00	0,020	2	10	4,749	4,968	5,490	6,158
VHMSK 2 015 064 06 03 L060	1,5	0,75	6	64	2,30	6,00	0,025	2	12	6,895	7,170	7,802	8,572
VHMSK 2 015 064 06 03 L080	1,5	0,75	6	64	2,30	8,00	0,025	2	15	9,021	9,309	9,951	10,697
VHMSK 2 015 064 06 03 L100	1,5	0,75	6	64	2,30	10,00	0,025	2	15	11,088	11,448	12,250	13,183
VHMSK 2 015 064 06 03 L120	1,5	0,75	6	64	2,30	12,00	0,025	2	15	13,156	13,588	14,550	15,670
VHMSK 2 015 064 06 03 L150	1,5	0,75	6	64	2,30	15,00	0,025	2	15	16,257	16,797	18,000	19,399
VHMSK 2 015 064 06 03 L200	1,5	0,75	6	64	2,30	20,00	0,025	2	15	21,425	22,145	23,749	25,615
VHMSK 2 015 064 06 03 L250	1,5	0,75	6	64	2,30	25,00	0,025	2	15	26,593	27,494	29,498	31,831
VHMSK 2 020 064 06 03 L030	2,0	1,00	6	64	3,00	-	-	2	8	5,105	5,396	6,122	7,139
VHMSK 2 020 064 06 03 L045	2,0	1,00	6	64	3,00	4,50	0,050	2	9	5,455	5,731	6,400	7,291
VHMSK 2 020 064 06 03 L060	2,0	1,00	6	64	3,00	6,00	0,050	2	11	7,008	7,305	7,995	8,857
VHMSK 2 020 064 06 03 L080	2,0	1,00	6	64	3,00	8,00	0,050	2	14	9,098	9,403	10,087	10,894
VHMSK 2 020 064 06 03 L100	2,0	1,00	6	64	3,00	10,00	0,050	2	15	11,176	11,531	12,320	13,239
VHMSK 2 020 064 06 03 L120	2,0	1,00	6	64	3,00	12,00	0,050	2	15	13,244	13,670	14,620	15,725
VHMSK 2 020 064 06 03 L160	2,0	1,00	6	64	3,00	16,00	0,050	2	15	17,378	17,949	19,219	20,697
VHMSK 2 020 064 06 03 L200	2,0	1,00	6	64	3,00	20,00	0,050	2	15	21,513	22,228	23,819	25,670
VHMSK 2 020 064 06 03 L250	2,0	1,00	6	64	3,00	25,00	0,050	2	15	26,681	27,576	29,568	31,886
VHMSK 2 020 064 06 03 L300	2,0	1,00	6	64	3,00	30,00	0,050	2	15	31,850	32,925	35,317	38,101
VHMSK 2 025 064 06 03 L030	2,5	1,25	6	64	3,00	-	-	2	7	5,078	5,395	6,219	7,454
VHMSK 2 025 064 06 03 L060	2,5	1,25	6	64	3,00	6,00	0,050	2	10	7,006	7,322	8,072	9,035
VHMSK 2 025 064 06 03 L080	2,5	1,25	6	64	3,00	8,00	0,050	2	12	9,082	9,433	10,237	11,219
VHMSK 2 025 064 06 03 L100	2,5	1,25	6	64	3,00	10,00	0,050	2	15	11,168	11,513	12,283	13,178
VHMSK 2 025 064 06 03 L120	2,5	1,25	6	64	3,00	12,00	0,050	2	15	13,235	13,653	14,582	15,664
VHMSK 2 025 064 06 03 L160	2,5	1,25	6	64	3,00	16,00	0,050	2	15	17,370	17,932	19,182	20,637
VHMSK 2 025 064 06 03 L200	2,5	1,25	6	64	3,00	20,00	0,050	2	15	21,505	22,210	23,781	25,609
VHMSK 2 025 064 06 03 L250	2,5	1,25	6	64	3,00	25,00	0,050	2	15	26,673	27,559	29,531	31,825
VHMSK 2 025 064 06 03 L300	2,5	1,25	6	64	3,00	30,00	0,050	2	15	31,841	32,907	35,280	∞
VHMSK 2 030 064 06 03 L030	3,0	1,50	6	64	3,00	-	-	2	6	5,057	5,412	6,385	8,006
VHMSK 2 030 064 06 03 L060	3,0	1,50	6	64	3,00	6,00	0,050	2	8	7,050	7,444	8,426	9,801
VHMSK 2 030 064 06 03 L080	3,0	1,50	6	64	3,00	8,00	0,050	2	10	9,097	9,514	10,504	11,775
VHMSK 2 030 064 06 03 L100	3,0	1,50	6	64	3,00	10,00	0,050	2	13	11,151	11,546	12,441	13,513
VHMSK 2 030 064 06 03 L120	3,0	1,50	6	64	3,00	12,00	0,050	2	15	13,227	13,635	14,545	15,603
VHMSK 2 030 064 06 03 L160	3,0	1,50	6	64	3,00	16,00	0,050	2	15	17,361	17,914	19,144	20,576
VHMSK 2 030 064 06 03 L200	3,0	1,50	6	64	3,00	20,00	0,050	2	15	21,496	22,193	23,744	25,548
VHMSK 2 030 064 06 03 L250	3,0	1,50	6	64	3,00	25,00	0,050	2	15	26,664	27,541	29,493	∞
VHMSK 2 030 064 06 03 L300	3,0	1,50	6	64	3,00	30,00	0,050	2	15	31,833	32,890	35,242	∞

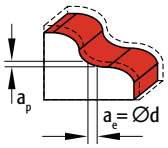
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**150 - 220**	emulsion
P1.2	< 1000	< 300	**120 - 180**	emulsion
P1.3	< 1400	< 400	**100 - 150**	emulsion
H2.1		42-50 HRc	**150 - 190**	min.lub.
H2.2		50-55 HRc	**100 - 140**	min.lub.
H2.3		55-70 HRc	**70 - 90**	min.lub.
M3.1	< 950		**80 - 130**	emulsion
M3.2	< 1250		**60 - 100**	emulsion
K4.1	< 800		**100 - 160**	emulsion
S6.1	< 1500		**40 - 60**	emulsion
S6.2	< 1600		**45 - 70**	emulsion
S6.3	< 1600		**30 - 50**	emulsion
S6.4	< 1250		**60 - 90**	emulsion

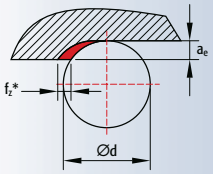
VHMSK20500640603L030
Material 1.2343 (52 HRc)

V_c	56 m/min
n	36000 rpm
F_z	0,006 mm/t
Vf	432 mm/min
a_p	0,01 mm
a_e	0,01 mm
Coolant	min. lubrication

- Finishing application.
  Schlichtbearbeitung.
- Excellent surface finish.
  Ausgezeichnete Oberflächenqualität.
- Save a polishing operation.
  Erspart Nachpolieren.







$$f_z^* = f_z \sqrt{\frac{d}{a_e}}$$

Shoulder milling / Eckfräsen

	P			M			S			H2.1 / H2.2 / H2.3			
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
0,1	<0,06	<0,004	0,001 - 0,003	<0,06	<0,004	0,001 - 0,003	<0,06	<0,004	0,001 - 0,003	< 0,05	< 0,004	0,001 - 0,003
0,2	<0,12	<0,008	0,002 - 0,004	<0,12	<0,008	0,002 - 0,004	<0,12	<0,008	0,002 - 0,004	< 0,09	< 0,008	0,002 - 0,004
0,3	<0,18	<0,012	0,003 - 0,006	<0,18	<0,012	0,003 - 0,006	<0,18	<0,012	0,003 - 0,006	< 0,14	< 0,012	0,003 - 0,006
0,4	<0,24	<0,016	0,004 - 0,008	<0,24	<0,016	0,004 - 0,008	<0,24	<0,016	0,004 - 0,008	< 0,18	< 0,016	0,004 - 0,008
0,5	<0,30	<0,020	0,005 - 0,009	<0,30	<0,020	0,005 - 0,009	<0,30	<0,020	0,005 - 0,009	< 0,23	< 0,020	0,005 - 0,009
0,6	<0,36	<0,024	0,006 - 0,010	<0,36	<0,024	0,006 - 0,010	<0,36	<0,024	0,006 - 0,010	< 0,27	< 0,024	0,006 - 0,010
0,8	<0,48	<0,032	0,007 - 0,012	<0,48	<0,032	0,007 - 0,012	<0,48	<0,032	0,007 - 0,012	< 0,36	< 0,032	0,007 - 0,012
1,0	<0,60	<0,040	0,008 - 0,015	<0,60	<0,040	0,008 - 0,015	<0,60	<0,040	0,008 - 0,015	< 0,45	< 0,040	0,008 - 0,015
1,2	<0,72	<0,048	0,010 - 0,016	<0,72	<0,048	0,010 - 0,016	<0,72	<0,048	0,010 - 0,016	< 0,54	< 0,048	0,010 - 0,016
1,5	<0,90	<0,060	0,012 - 0,018	<0,90	<0,060	0,012 - 0,018	<0,90	<0,060	0,012 - 0,018	< 0,68	< 0,060	0,012 - 0,018
2,0	<1,20	<0,080	0,016 - 0,022	<1,20	<0,080	0,016 - 0,022	<1,20	<0,080	0,016 - 0,022	< 0,90	< 0,080	0,016 - 0,022
2,5	<1,50	<0,100	0,018 - 0,025	<1,50	<0,100	0,018 - 0,025	<1,50	<0,100	0,018 - 0,025	< 1,13	< 0,100	0,018 - 0,025
3,0	<1,80	<0,120	0,020 - 0,028	<1,80	<0,120	0,020 - 0,028	<1,80	<0,120	0,020 - 0,028	< 1,35	< 0,120	0,020 - 0,028

Slot milling / Nutfräsen

	P			M			S			H2.1 / H2.2 / H2.3			
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
0,1	<0,03	0,100	0,001 - 0,002	<0,03	0,100	0,001 - 0,002	<0,03	0,100	0,001 - 0,002	<0,02	0,100	0,001 - 0,002
0,2	<0,06	0,200	0,002 - 0,003	<0,06	0,200	0,002 - 0,003	<0,06	0,200	0,002 - 0,003	<0,04	0,200	0,002 - 0,003
0,3	<0,09	0,300	0,003 - 0,005	<0,09	0,300	0,003 - 0,005	<0,09	0,300	0,003 - 0,005	<0,06	0,300	0,003 - 0,005
0,4	<0,12	0,400	0,004 - 0,006	<0,12	0,400	0,004 - 0,006	<0,12	0,400	0,004 - 0,006	<0,08	0,400	0,004 - 0,006
0,5	<0,15	0,500	0,005 - 0,008	<0,15	0,500	0,005 - 0,008	<0,15	0,500	0,005 - 0,008	<0,10	0,500	0,005 - 0,008
0,6	<0,18	0,600	0,006 - 0,010	<0,18	0,600	0,006 - 0,010	<0,18	0,600	0,006 - 0,010	<0,12	0,600	0,006 - 0,010
0,8	<0,24	0,800	0,008 - 0,012	<0,24	0,800	0,008 - 0,012	<0,24	0,800	0,008 - 0,012	<0,16	0,800	0,008 - 0,012
1,0	<0,30	1,000	0,009 - 0,014	<0,30	1,000	0,009 - 0,014	<0,30	1,000	0,009 - 0,014	<0,20	1,000	0,009 - 0,014
1,2	<0,36	1,200	0,010 - 0,016	<0,36	1,200	0,010 - 0,016	<0,36	1,200	0,010 - 0,016	<0,24	1,200	0,010 - 0,016
1,5	<0,45	1,500	0,012 - 0,018	<0,45	1,500	0,012 - 0,018	<0,45	1,500	0,012 - 0,018	<0,30	1,500	0,012 - 0,018
2,0	<0,60	2,000	0,016 - 0,022	<0,60	2,000	0,016 - 0,022	<0,60	2,000	0,016 - 0,022	<0,40	2,000	0,016 - 0,022
2,5	<0,75	2,500	0,018 - 0,025	<0,75	2,500	0,018 - 0,025	<0,75	2,500	0,018 - 0,025	<0,50	2,500	0,018 - 0,025
3,0	<0,90	3,000	0,020 - 0,028	<0,90	3,000	0,020 - 0,028	<0,90	3,000	0,020 - 0,028	<0,60	3,000	0,020 - 0,028

- At shoulder milling, feed per tooth F_z* for lower a_e values should be converted according formula.
  Beim Eckfräsen ist der Vorschub F_z* von der Schnittbreite a_e abhängig.
- Given conditions are based on VHMS, VHMSR and VHMSK end mills.
  Angegebene Schnittwerte sind bezogen auf Schaftfräser VHMS, VHMSR und VHMSK.
- Without corner radius.
  Ohne Eckenradius.
- For shoulder milling cutting speed V_c may be increased up to 30%.
  Beim Eckfräsen kann die Schnittgeschwindigkeit V_c um 30% erhöht werden.

a_e	F_z*=
0,10 x d	F_z x 3
0,25 x d	F_z x 2
0,50 x d	F_z x 1

Keep the tool cool!

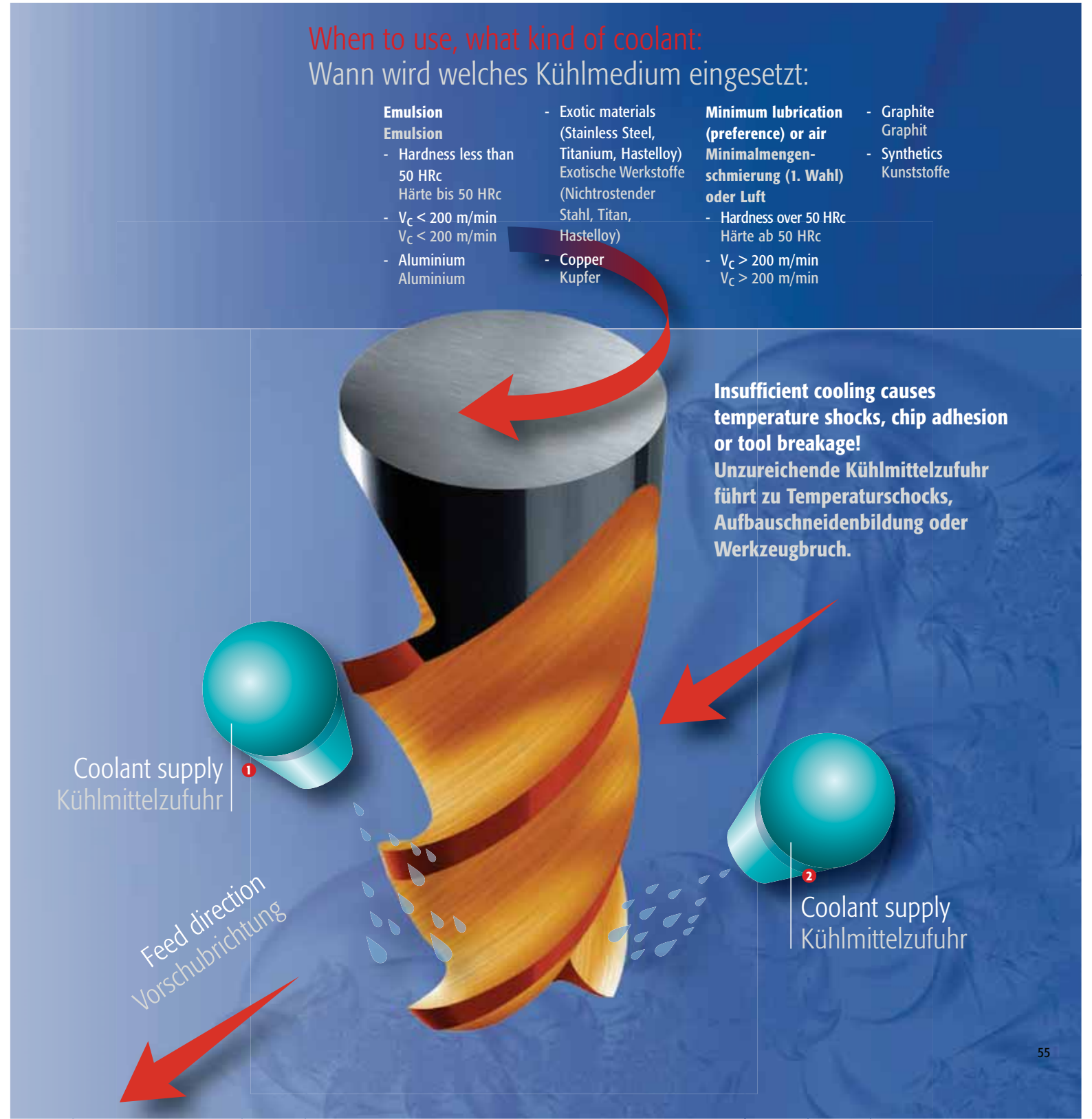
It's recommended to use coolant (emulsion, minimum lubrication, or air) if possible. Coolant contributes to improve tool life, surface finish and chip evacuation.
Wenn möglich, empfehlen wir grundsätzlich mit Kühlung zu arbeiten (Emulsion, Minimalmengenschmierung oder Luft). Eine entsprechende Kühlung fördert die Späneabfuhr, verlängert die Werkzeugstandzeit und ermöglicht bessere Oberflächenqualitäten.

1. From the front into the flutes for direct cooling.
   Direkte Kühlmittelzufuhr an die Schneiden für den Kühlungseffekt.
2. Pointed from the right hand side in the flutes to evacuate the chips.
   Kühlmittelzufuhr von rechts in den Spankammern für die Spanabfuhr.

When to use, what kind of coolant:
Wann wird welches Kühlmedium eingesetzt:

Emulsion
Emulsion
- Hardness less than 50 HRc
  Härte bis 50 HRc
- V_c < 200 m/min
  V_c < 200 m/min
- Aluminium
  Aluminium
- Exotic materials (Stainless Steel, Titanium, Hastelloy)
  Exotische Werkstoffe (Nichtrostender Stahl, Titan, Hastelloy)
- Copper
  Kupfer

Minimum lubrication (preference) or air
Minimalmengen-schmierung (1. Wahl) oder Luft
- Hardness over 50 HRc
  Härte ab 50 HRc
- V_c > 200 m/min
  V_c > 200 m/min
- Graphite
  Graphit
- Synthetics
  Kunststoffe

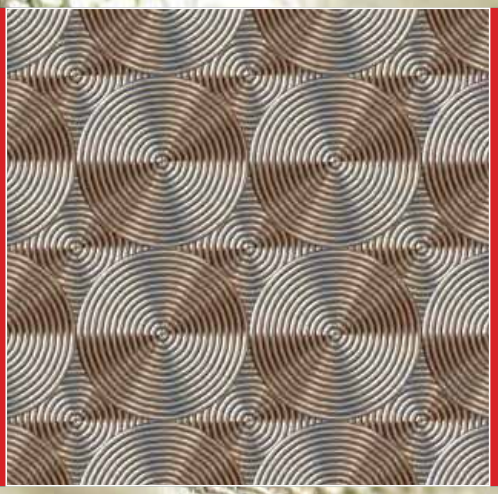


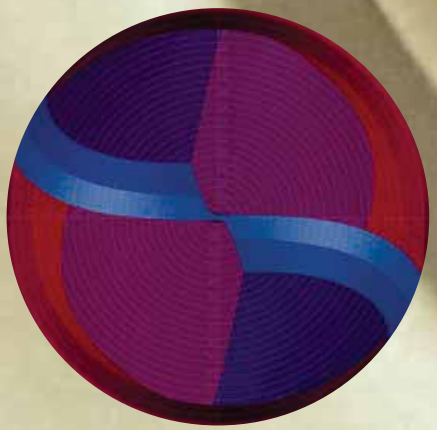
Milling exotic materials

Fräsen exotische Werkstoffe

Most common problems to face / Häufig auftretende Probleme:

- Abrasiveness of the material.
  Abrasivität des Materials.
- Resonance of the machine and/or workpiece.
  Maschinen- und/oder Werkstückschwingungen.
- Vibrations of the workpiece and/or tool.
  Werkstück- und/oder Werkzeugvibrationen.
- Burrs.
  Grat Bildung.





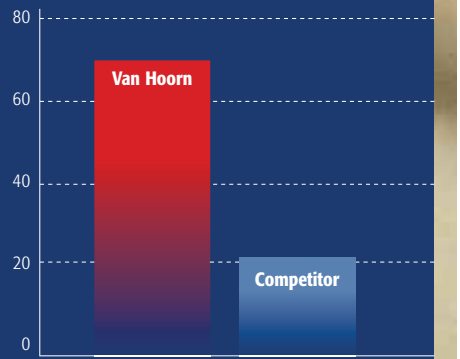
New centre

- **Higher productivity with smooth edges**
  Höhere Produktivität durch glatte Schneiden
- **Optimized center**
  Optimiertes Zentrum
- **New generation coating**
  Neue Generation Beschichtung

Workpiece Material: 3.7165

	Van Hoorn	Competitor
V_c	85 m/min	30 m/min
n	1691 rpm	600 rpm
F_z	0,080 mm/t	0,033 mm/t
Z	4	4
V_f	540 mm/min	80 mm/min
a_p	8 mm	16 mm
a_e	16 mm	16 mm
Coolant	emulsion	emulsion
Q	**69,12 cm³/min**	**20,48 cm³/min**

VHVTR Material removal rate



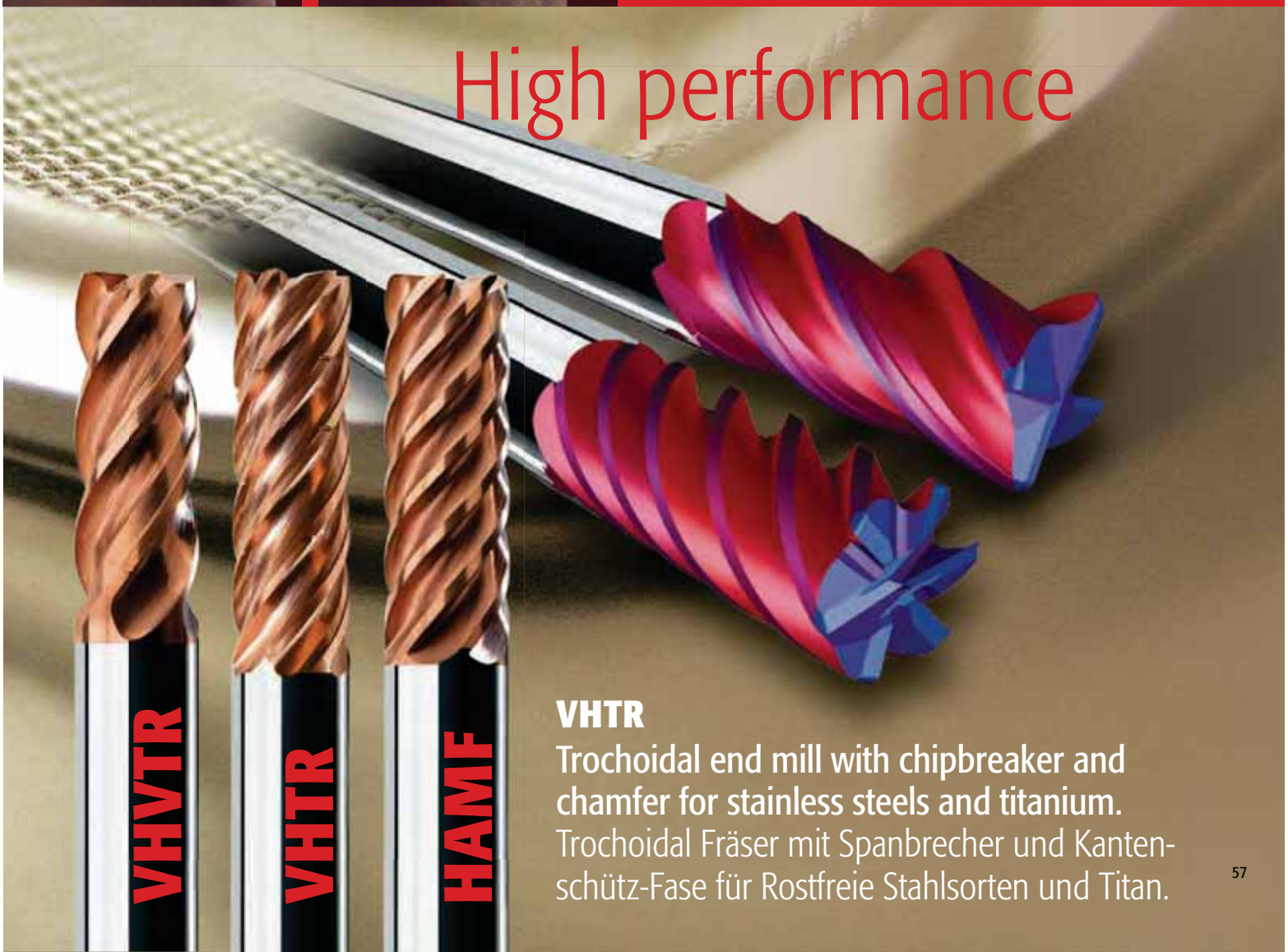
VHC new generation end mills for machining exotic materials:

VHC neue Schaftfräser-Generation für die Bearbeitung exotischer Werkstoffe:

- VHVTR: 4 and 5 flute for roughing / semi finishing.
  VHVTR: 4 und 5 Schneiden für Schrupp- / mittlere Bearbeitung.
- HAMF (L-XL): Multiple flute finishing.
  HAMF (L-XL): Mehrschneidenfräser.
- HABM: Ball nose for finishing / semi finishing.
  HABM: Vollradius für Schlicht- / mittlere Bearbeitung.

HAMF updated

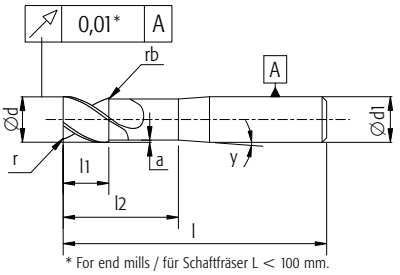
- **Specialized center for chip evacuation!**
  Spezieller Zentrum für Spänefluss!
- **Extreme tool life improvement**
  Sehr hohe Standzeit Verbesserung



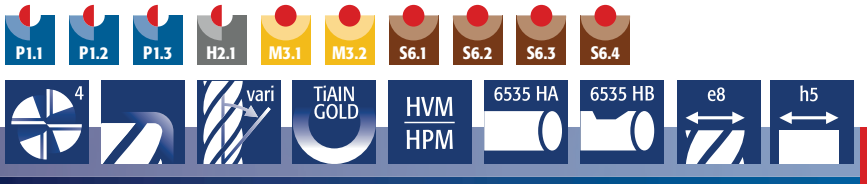
VHTR

Trochoidal end mill with chipbreaker and chamfer for stainless steels and titanium.
Trochoidal Fräser mit Spanbrecher und Kanten-schütz-Fase für Rostfreie Stahlsorten und Titan.

Short



* For end mills / für Schaftfräser L < 100 mm.



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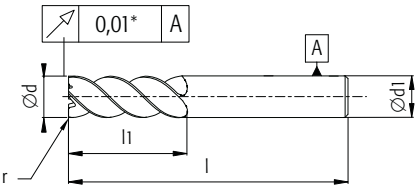
The new standard in milling super alloys!
Der neue Standard in Fräsen von Sonderlegierungen!

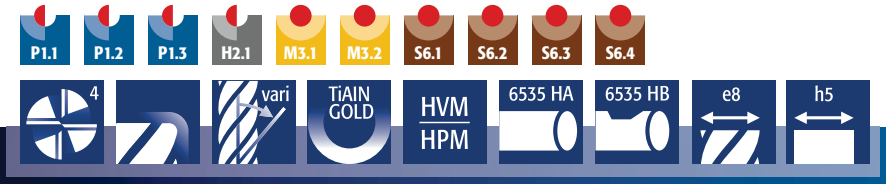
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
Short										
VHVTR 4 030 051 06 03 S	3,0	0,20	6	51	5,0	7,0	0,100	4	15	
VHVTR 4 040 051 06 03 S	4,0	0,20	6	51	6,0	9,0	0,100	4	15	
VHVTR 4 050 051 06 03 S	5,0	0,20	6	51	7,0	11,0	0,200	4	15	
VHVTR 4 060 064 06 03 010 S	6,0	0,10	6	64	8,0	13,0	0,200	4	-	new/neu
VHVTR 4 060 064 06 03 030 S	6,0	0,30	6	64	8,0	13,0	0,200	4	-	
VHVTR 4 060 064 06 03 050 S	6,0	0,50	6	64	8,0	13,0	0,200	4	-	
VHVTR 4 060 064 06 03 100 S	6,0	1,00	6	64	8,0	13,0	0,200	4	-	
VHVTR 4 080 064 08 03 010 S	8,0	0,10	8	64	11,0	18,0	0,300	4	-	new/neu
VHVTR 4 080 064 08 03 030 S	8,0	0,30	8	64	11,0	18,0	0,300	4	-	
VHVTR 4 080 064 08 03 050 S	8,0	0,50	8	64	11,0	18,0	0,300	4	-	
VHVTR 4 080 064 08 03 100 S	8,0	1,00	8	64	11,0	18,0	0,300	4	-	
VHVTR 4 100 070 10 03 010 S	10,0	0,10	10	70	13,0	22,0	0,300	4	-	new/neu
VHVTR 4 100 070 10 03 030 S	10,0	0,30	10	70	13,0	22,0	0,300	4	-	
VHVTR 4 100 070 10 03 050 S	10,0	0,50	10	70	13,0	22,0	0,300	4	-	
VHVTR 4 100 070 10 03 100 S	10,0	1,00	10	70	13,0	22,0	0,300	4	-	
VHVTR 4 120 078 12 03 010 S	12,0	0,10	12	78	15,0	25,0	0,300	4	-	new/neu
VHVTR 4 120 078 12 03 030 S	12,0	0,30	12	78	15,0	25,0	0,300	4	-	
VHVTR 4 120 078 12 03 050 S	12,0	0,50	12	78	15,0	25,0	0,300	4	-	
VHVTR 4 120 078 12 03 100 S	12,0	1,00	12	78	15,0	25,0	0,300	4	-	
VHVTR 4 140 089 14 03 050 S	14,0	0,50	14	89	17,0	30,0	0,300	4	-	new/neu
VHVTR 4 140 089 14 03 100 S	14,0	1,00	14	89	17,0	30,0	0,300	4	-	
VHVTR 4 160 089 16 03 010 S	16,0	0,10	16	89	19,0	35,0	0,300	4	-	new/neu
VHVTR 4 160 089 16 03 050 S	16,0	0,50	16	89	19,0	35,0	0,300	4	-	
VHVTR 4 160 089 16 03 100 S	16,0	1,00	16	89	19,0	35,0	0,300	4	-	
VHVTR 4 200 102 20 03 050 S	20,0	0,50	20	102	23,0	42,0	0,400	4	-	
VHVTR 4 200 102 20 03 100 S	20,0	1,00	20	102	23,0	42,0	0,400	4	-	
VHVTR 4 250 120 25 03 050 S	25,0	0,50	25	120	28,0	45,0	0,400	4	-	
VHVTR 4 250 120 25 03 100 S	25,0	1,00	25	120	28,0	45,0	0,400	4	-	

EVEN SHANK DIAMETERS STARTING FROM Ø6 MM ARE AVAILABLE WITH WELDON, ADD "W" TO THE ARTICLE CODE. E.G. VHVTR**W** 4 060…

Standard



* For end mills / für Schaftfräser L < 100 mm.



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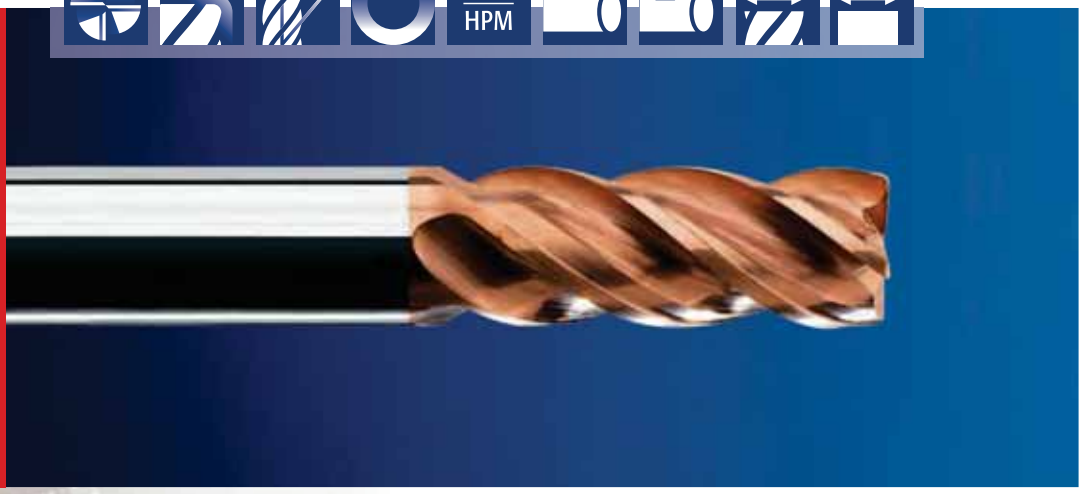
One tool for roughing and finishing!

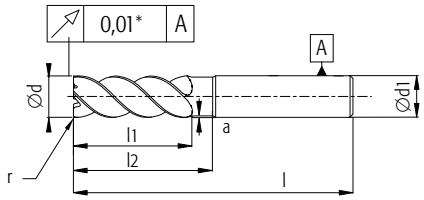
Ein Fräser für Schruppen und Schlichten!



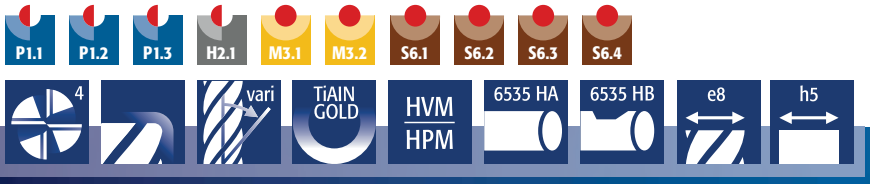
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
Standard										
VHVTR 4 030 051 06 03	3,0	0,20	6	51	7,0	-	-	4	15	
VHVTR 4 040 051 06 03	4,0	0,20	6	51	9,0	-	-	4	15	
VHVTR 4 050 051 06 03	5,0	0,20	6	51	11,0	-	-	4	15	
VHVTR 4 060 064 06 03 010	6,0	0,10	6	64	13,0			4	-	new/neu
VHVTR 4 060 064 06 03 030	6,0	0,30	6	64	13,0	-	-	4	-	
VHVTR 4 060 064 06 03 050	6,0	0,50	6	64	13,0	-	-	4	-	
VHVTR 4 060 064 06 03 100	6,0	1,00	6	64	13,0	-	-	4	-	
VHVTR 4 080 064 08 03 010	8,0	0,10	8	64	18,0			4	-	new/neu
VHVTR 4 080 064 08 03 030	8,0	0,30	8	64	18,0	-	-	4	-	
VHVTR 4 080 064 08 03 050	8,0	0,50	8	64	18,0	-	-	4	-	
VHVTR 4 080 064 08 03 100	8,0	1,00	8	64	18,0	-	-	4	-	
VHVTR 4 100 070 10 03 010	10,0	0,10	10	70	22,0			4	-	new/neu
VHVTR 4 100 070 10 03 030	10,0	0,30	10	70	22,0	-	-	4	-	
VHVTR 4 100 070 10 03 050	10,0	0,50	10	70	22,0	-	-	4	-	
VHVTR 4 100 070 10 03 100	10,0	1,00	10	70	22,0	-	-	4	-	
VHVTR 4 120 078 12 03 010	12,0	0,10	12	78	25,0			4	-	new/neu
VHVTR 4 120 078 12 03 030	12,0	0,30	12	78	25,0	-	-	4	-	
VHVTR 4 120 078 12 03 050	12,0	0,50	12	78	25,0	-	-	4	-	
VHVTR 4 120 078 12 03 100	12,0	1,00	12	78	25,0	-	-	4	-	
VHVTR 4 140 089 14 03 050	14,0	0,50	14	89	30,0	-	-	4	-	new/neu
VHVTR 4 140 089 14 03 100	14,0	1,00	14	89	30,0	-	-	4	-	
VHVTR 4 160 089 16 03 010	16,0	0,10	16	89	35,0			4	-	new/neu
VHVTR 4 160 089 16 03 050	16,0	0,50	16	89	35,0	-	-	4	-	
VHVTR 4 160 089 16 03 100	16,0	1,00	16	89	35,0	-	-	4	-	
VHVTR 4 200 102 20 03 050	20,0	0,50	20	102	42,0	-	-	4	-	
VHVTR 4 200 102 20 03 100	20,0	1,00	20	102	42,0	-	-	4	-	
VHVTR 4 250 120 25 03 050	25,0	0,50	25	120	45,0	-	-	4	-	
VHVTR 4 250 120 25 03 100	25,0	1,00	25	120	45,0	-	-	4	-	

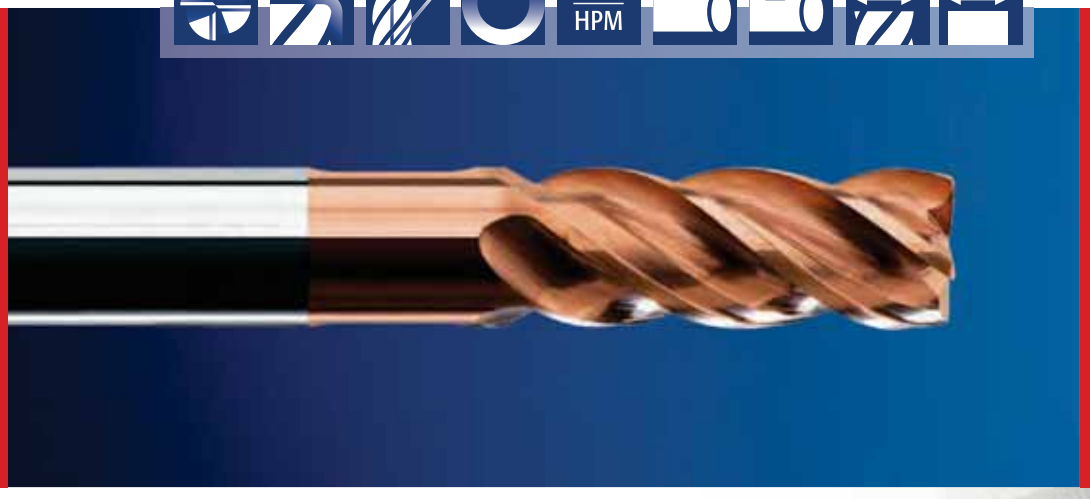
EVEN SHANK DIAMETERS STARTING FROM Ø6 MM ARE AVAILABLE WITH WELDON, ADD "W" TO THE ARTICLE CODE. E.G. VHVTR**W** 4 060…

Neck relief



* For end mills / für Schaftfräser L < 100 mm.





Wide range of standard lengths!
Großes Programm mit Standardmaße!

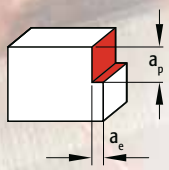
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
With neck relief										
VHVTR 4 030 051 06 03 020 L	3,0	0,20	6	51	7,0	9,0	0,100	4	15	
VHVTR 4 040 051 06 03 020 L	4,0	0,20	6	51	9,0	12,0	0,100	4	15	
VHVTR 4 050 051 06 03 020 L	5,0	0,20	6	51	11,0	15,0	0,200	4	15	
VHVTR 4 060 064 06 03 010 L	6,0	0,10	6	64	13,0	18,0	0,200	4	-	new/neu
VHVTR 4 060 064 06 03 030 L	6,0	0,30	6	64	13,0	18,0	0,200	4	-	
VHVTR 4 060 064 06 03 050 L	6,0	0,50	6	64	13,0	18,0	0,200	4	-	
VHVTR 4 060 064 06 03 100 L	6,0	1,00	6	64	13,0	18,0	0,200	4	-	
VHVTR 4 080 064 08 03 010 L	8,0	0,10	8	64	18,0	24,0	0,300	4	-	new/neu
VHVTR 4 080 064 08 03 030 L	8,0	0,30	8	64	18,0	24,0	0,300	4	-	
VHVTR 4 080 064 08 03 050 L	8,0	0,50	8	64	18,0	24,0	0,300	4	-	
VHVTR 4 080 064 08 03 100 L	8,0	1,00	8	64	18,0	24,0	0,300	4	-	
VHVTR 4 100 070 10 03 010 L	10,0	0,10	10	70	22,0	30,0	0,300	4	-	new/neu
VHVTR 4 100 070 10 03 030 L	10,0	0,30	10	70	22,0	30,0	0,300	4	-	
VHVTR 4 100 070 10 03 050 L	10,0	0,50	10	70	22,0	30,0	0,300	4	-	
VHVTR 4 100 070 10 03 100 L	10,0	1,00	10	70	22,0	30,0	0,300	4	-	
VHVTR 4 120 083 12 03 010 L	12,0	0,10	12	83	25,0	36,0	0,300	4	-	new/neu
VHVTR 4 120 083 12 03 030 L	12,0	0,30	12	83	25,0	36,0	0,300	4	-	
VHVTR 4 120 083 12 03 050 L	12,0	0,50	12	83	25,0	36,0	0,300	4	-	
VHVTR 4 120 083 12 03 100 L	12,0	1,00	12	83	25,0	36,0	0,300	4	-	
VHVTR 4 120 102 12 03 010 L	12,0	0,10	12	102	25,0	36,0	0,300	4	-	new/neu
VHVTR 4 120 102 12 03 030 L	12,0	0,30	12	102	25,0	36,0	0,300	4	-	
VHVTR 4 120 102 12 03 050 L	12,0	0,50	12	102	25,0	36,0	0,300	4	-	
VHVTR 4 120 102 12 03 100 L	12,0	1,00	12	102	25,0	36,0	0,300	4	-	
VHVTR 4 140 102 14 03 050 L	14,0	0,50	14	102	30,0	42,0	0,300	4	-	new/neu
VHVTR 4 140 102 14 03 100 L	14,0	1,00	14	102	30,0	42,0	0,300	4	-	
VHVTR 4 160 102 16 03 010 L	16,0	0,10	16	102	35,0	48,0	0,300	4	-	new/neu
VHVTR 4 160 102 16 03 050 L	16,0	0,50	16	102	35,0	48,0	0,300	4	-	
VHVTR 4 160 102 16 03 100 L	16,0	1,00	16	102	35,0	48,0	0,300	4	-	
VHVTR 4 200 125 20 03 050 L	20,0	0,50	20	125	42,0	60,0	0,400	4	-	
VHVTR 4 200 125 20 03 100 L	20,0	1,00	20	125	42,0	60,0	0,400	4	-	
VHVTR 4 250 131 25 03 050 L	25,0	0,50	25	131	45,0	75,0	0,400	4	-	
VHVTR 4 250 131 25 03 100 L	25,0	1,00	25	131	45,0	75,0	0,400	4	-	

EVEN SHANK DIAMETERS STARTING FROM Ø6 MM ARE AVAILABLE WITH WELDON, ADD "W" TO THE ARTICLE CODE. E.G. VHVTR**W** 4 060…

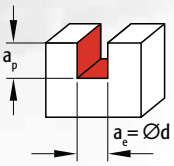
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**140 - 220**	emulsion
P1.2	< 1000	< 300	**100 - 180**	emulsion
P1.3	< 1400	< 400	**70 - 160**	emulsion
H2.1		42-50 HRc	**80 - 140**	emulsion
M3.1	< 950		**80 - 130**	emulsion
M3.2	< 1250		**60 - 100**	emulsion
S6.1	< 1500		**40 - 60**	emulsion
S6.2	< 1600		**45 - 70**	emulsion
S6.3	< 1600		**30 - 50**	emulsion
S6.4	< 1250		**60 -90**	emulsion

High performance!

- Productivity
  Produktivität
- Tool life
  Standzeit
- Surface finish
- Oberfläche Qualität



a_p up to 2,00 x d
a_e up to 0,45 x d



a_p up to 1,00 x d

Shoulder milling / Eckfräsen (1xD depth of cut)

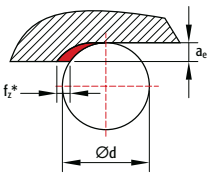
a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 3,0	< 1,4	0,010 - 0,020
< 4,0	< 1,8	0,015 - 0,030
< 5,0	< 2,3	0,020 -0,040
< 6,0	< 2,7	0,025 - 0,050
< 8,0	< 3,6	0,030 - 0,060
< 10,0	< 4,5	0,040 - 0,070
< 12,0	< 5,4	0,050 - 0,080
< 14,0	< 6,3	0,055 - 0,090
< 16,0	< 7,2	0,060 - 0,100
< 20,0	< 9,0	0,080 - 0,120
< 25,0	< 11,3	0,100 - 0,150

Shoulder milling / Eckfräsen (2xD depth of cut)

a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 6,0	< 0,75	0,010 - 0,030
< 8,0	< 1,00	0,020 - 0,040
< 10,0	< 1,25	0,025 - 0,055
< 12,0	< 1,50	0,035 - 0,065
< 16,0	< 2,00	0,045 - 0,075
< 20,0	< 2,50	0,055 - 0,085
< 24,0	< 3,00	0,070 - 0,100
< 28,0	< 3,50	0,080 - 0,120
< 32,0	< 4,00	0,090 - 0,130
< 40,0	< 5,00	0,110 - 0,150
< 50,0	< 6,25	0,135 - 0,185

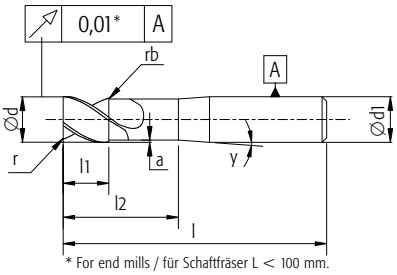
Slot milling / Nutfräsen

a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 3,0	3,0	0,005 - 0,015
< 4,0	4,0	0,008 - 0,025
< 5,0	5,0	0,010 -0,030
< 6,0	6,0	0,015 - 0,035
< 8,0	8,0	0,025 - 0,045
< 10,0	10,0	0,030 - 0,050
< 12,0	12,0	0,035 - 0,060
< 14,0	14,0	0,040 - 0,070
< 16,0	16,0	0,050 - 0,080
< 20,0	20,0	0,060 - 0,100
< 25,0	25,0	0,080 - 0,130

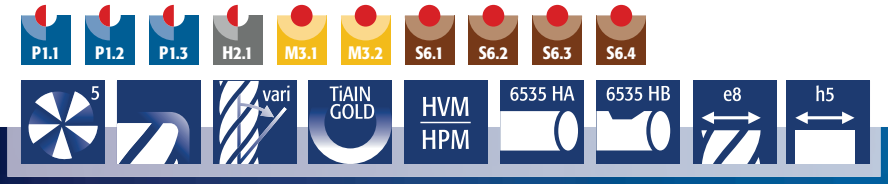


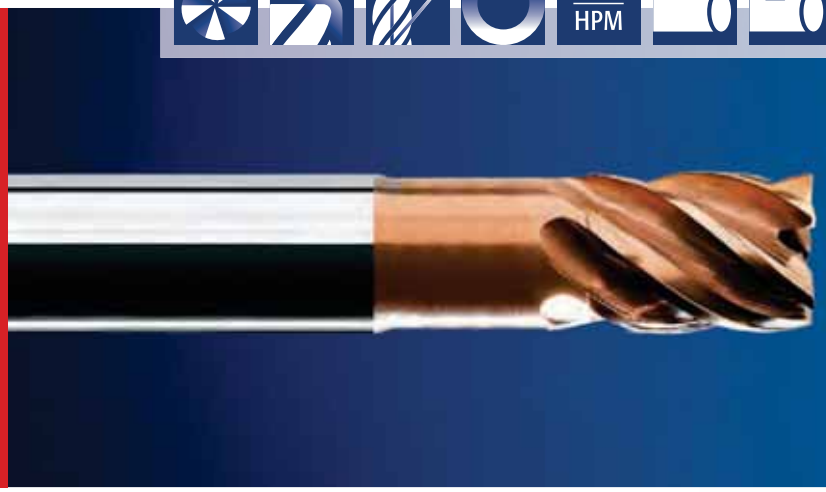
$$f_z^* = f_z \sqrt{\frac{d}{a_e}}$$

Short



* For end mills / für Schaftfräser L < 100 mm.





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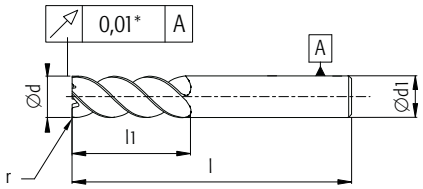
Ideal tool for trochoidal milling super alloys!
Idealer Fräser für trochoidales Fräsen von Sonderlegierungen!

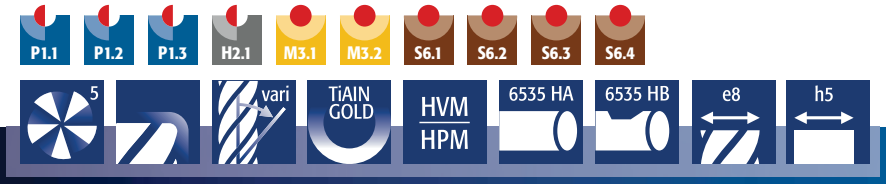
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
Short										
VHVTR 5 030 051 06 03 S	3,0	0,20	6	51	5,0	7,0	0,100	5	15	
VHVTR 5 040 051 06 03 S	4,0	0,20	6	51	6,0	9,0	0,100	5	15	
VHVTR 5 050 051 06 03 S	5,0	0,20	6	51	7,0	11,0	0,200	5	15	
VHVTR 5 060 064 06 03 010 S	6,0	0,10	6	64	8,0	13,0	0,200	5	-	new/neu
VHVTR 5 060 064 06 03 030 S	6,0	0,30	6	64	8,0	13,0	0,200	5	-	
VHVTR 5 060 064 06 03 050 S	6,0	0,50	6	64	8,0	13,0	0,200	5	-	
VHVTR 5 060 064 06 03 100 S	6,0	1,00	6	64	8,0	13,0	0,200	5	-	
VHVTR 5 080 064 08 03 010 S	8,0	0,10	8	64	11,0	18,0	0,300	5	-	new/neu
VHVTR 5 080 064 08 03 030 S	8,0	0,30	8	64	11,0	18,0	0,300	5	-	
VHVTR 5 080 064 08 03 050 S	8,0	0,50	8	64	11,0	18,0	0,300	5	-	
VHVTR 5 080 064 08 03 100 S	8,0	1,00	8	64	11,0	18,0	0,300	5	-	
VHVTR 5 100 070 10 03 010 S	10,0	0,10	10	70	13,0	22,0	0,300	5	-	new/neu
VHVTR 5 100 070 10 03 030 S	10,0	0,30	10	70	13,0	22,0	0,300	5	-	
VHVTR 5 100 070 10 03 050 S	10,0	0,50	10	70	13,0	22,0	0,300	5	-	
VHVTR 5 100 070 10 03 100 S	10,0	1,00	10	70	13,0	22,0	0,300	5	-	
VHVTR 5 120 078 12 03 010 S	12,0	0,10	12	78	15,0	25,0	0,300	5	-	new/neu
VHVTR 5 120 078 12 03 030 S	12,0	0,30	12	78	15,0	25,0	0,300	5	-	
VHVTR 5 120 078 12 03 050 S	12,0	0,50	12	78	15,0	25,0	0,300	5	-	
VHVTR 5 120 078 12 03 100 S	12,0	1,00	12	78	15,0	25,0	0,300	5	-	
VHVTR 5 140 089 14 03 050 S	14,0	0,50	14	89	17,0	30,0	0,300	5	-	new/neu
VHVTR 5 140 089 14 03 100 S	14,0	1,00	14	89	17,0	30,0	0,300	5	-	
VHVTR 5 160 089 16 03 010 S	16,0	0,10	16	89	19,0	35,0	0,300	5	-	new/neu
VHVTR 5 160 089 16 03 050 S	16,0	0,50	16	89	19,0	35,0	0,300	5	-	
VHVTR 5 160 089 16 03 100 S	16,0	1,00	16	89	19,0	35,0	0,300	5	-	
VHVTR 5 200 102 20 03 050 S	20,0	0,50	20	102	23,0	42,0	0,400	5	-	
VHVTR 5 200 102 20 03 100 S	20,0	1,00	20	102	23,0	42,0	0,400	5	-	
VHVTR 5 250 120 25 03 050 S	25,0	0,50	25	120	28,0	45,0	0,400	5	-	
VHVTR 5 250 120 25 03 100 S	25,0	1,00	25	120	28,0	45,0	0,400	5	-	

EVEN SHANK DIAMETERS STARTING FROM Ø6 MM ARE AVAILABLE WITH WELDON, ADD "W" TO THE ARTICLE CODE. E.G. VHVTR**W** 5 060…

Standard



* For end mills / für Schaftfräser L < 100 mm.



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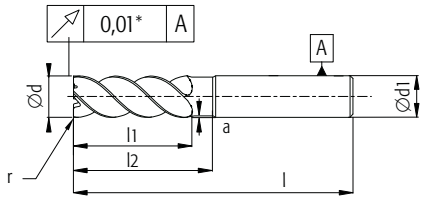
Earn money by improving your production!
Geld sparen durch Produktionsverbesserung!

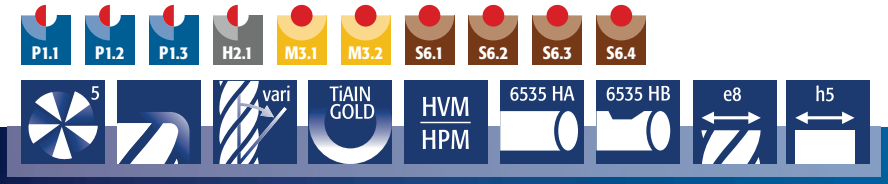
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
Standard										
VHVTR 5 030 051 06 03	3,0	0,20	6	51	7,0	-	-	5	15	
VHVTR 5 040 051 06 03	4,0	0,20	6	51	9,0	-	-	5	15	
VHVTR 5 050 051 06 03	5,0	0,20	6	51	11,0	-	-	5	15	
VHVTR 5 060 064 06 03 010	6,0	0,10	6	64	13,0	-	-	5	-	new/neu
VHVTR 5 060 064 06 03 030	6,0	0,30	6	64	13,0	-	-	5	-	
VHVTR 5 060 064 06 03 050	6,0	0,50	6	64	13,0	-	-	5	-	
VHVTR 5 060 064 06 03 100	6,0	1,00	6	64	13,0	-	-	5	-	
VHVTR 5 080 064 08 03 010	8,0	0,10	8	64	18,0	-	-	5	-	new/neu
VHVTR 5 080 064 08 03 030	8,0	0,30	8	64	18,0	-	-	5	-	
VHVTR 5 080 064 08 03 050	8,0	0,50	8	64	18,0	-	-	5	-	
VHVTR 5 080 064 08 03 100	8,0	1,00	8	64	18,0	-	-	5	-	
VHVTR 5 100 070 10 03 010	10,0	0,10	10	70	22,0	-	-	5	-	new/neu
VHVTR 5 100 070 10 03 030	10,0	0,30	10	70	22,0	-	-	5	-	
VHVTR 5 100 070 10 03 050	10,0	0,50	10	70	22,0	-	-	5	-	
VHVTR 5 100 070 10 03 100	10,0	1,00	10	70	22,0	-	-	5	-	
VHVTR 5 120 078 12 03 010	12,0	0,10	12	78	25,0	-	-	5	-	new/neu
VHVTR 5 120 078 12 03 030	12,0	0,30	12	78	25,0	-	-	5	-	
VHVTR 5 120 078 12 03 050	12,0	0,50	12	78	25,0	-	-	5	-	
VHVTR 5 120 078 12 03 100	12,0	1,00	12	78	25,0	-	-	5	-	
VHVTR 5 140 089 14 03 050	14,0	0,50	14	89	30,0	-	-	5	-	new/neu
VHVTR 5 140 089 14 03 100	14,0	1,00	14	89	30,0	-	-	5	-	
VHVTR 5 160 089 16 03 010	16,0	0,10	16	89	35,0	-	-	5	-	new/neu
VHVTR 5 160 089 16 03 050	16,0	0,50	16	89	35,0	-	-	5	-	
VHVTR 5 160 089 16 03 100	16,0	1,00	16	89	35,0	-	-	5	-	
VHVTR 5 200 102 20 03 050	20,0	0,50	20	102	42,0	-	-	5	-	
VHVTR 5 200 102 20 03 100	20,0	1,00	20	102	42,0	-	-	5	-	
VHVTR 5 250 120 25 03 050	25,0	0,50	25	120	45,0	-	-	5	-	
VHVTR 5 250 120 25 03 100	25,0	1,00	25	120	45,0	-	-	5	-	

EVEN SHANK DIAMETERS STARTING FROM Ø6 MM ARE AVAILABLE WITH WELDON, ADD "W" TO THE ARTICLE CODE. E.G. VHVTR**W** 5 060…

Neck relief



* For end mills / für Schaftfräser L < 100 mm.



VHVTR the best you can get!
VHVTR das Beste im Markt!

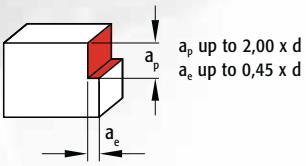
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
With neck relief										
VHVTR 5 030 051 06 03 020 L	3,0	0,20	6	51	8,0	9,0	0,100	5	15	
VHVTR 5 040 051 06 03 020 L	4,0	0,20	6	51	10,0	12,0	0,100	5	15	
VHVTR 5 050 051 06 03 020 L	5,0	0,20	6	51	12,0	15,0	0,200	5	15	
VHVTR 5 060 064 06 03 010 L	6,0	0,10	6	64	14,0	18,0	0,200	5	-	new/neu
VHVTR 5 060 064 06 03 030 L	6,0	0,30	6	64	14,0	18,0	0,200	5	-	
VHVTR 5 060 064 06 03 050 L	6,0	0,50	6	64	14,0	18,0	0,200	5	-	
VHVTR 5 060 064 06 03 100 L	6,0	1,00	6	64	14,0	18,0	0,200	5	-	
VHVTR 5 080 064 08 03 010 L	8,0	0,10	8	64	18,0	24,0	0,300	5	-	new/neu
VHVTR 5 080 064 08 03 030 L	8,0	0,30	8	64	18,0	24,0	0,300	5	-	
VHVTR 5 080 064 08 03 050 L	8,0	0,50	8	64	18,0	24,0	0,300	5	-	
VHVTR 5 080 064 08 03 100 L	8,0	1,00	8	64	18,0	24,0	0,300	5	-	
VHVTR 5 100 070 10 03 010 L	10,0	0,10	10	70	22,0	30,0	0,300	5	-	new/neu
VHVTR 5 100 070 10 03 030 L	10,0	0,30	10	70	22,0	30,0	0,300	5	-	
VHVTR 5 100 070 10 03 050 L	10,0	0,50	10	70	22,0	30,0	0,300	5	-	
VHVTR 5 100 070 10 03 100 L	10,0	1,00	10	70	22,0	30,0	0,300	5	-	
VHVTR 5 120 083 12 03 010 L	12,0	0,10	12	83	25,0	36,0	0,300	5	-	new/neu
VHVTR 5 120 083 12 03 030 L	12,0	0,30	12	83	25,0	36,0	0,300	5	-	new/neu
VHVTR 5 120 083 12 03 050 L	12,0	0,50	12	83	25,0	36,0	0,300	5	-	new/neu
VHVTR 5 120 083 12 03 100 L	12,0	1,00	12	83	25,0	36,0	0,300	5	-	new/neu
VHVTR 5 120 102 12 03 010 L	12,0	0,10	12	102	25,0	36,0	0,300	5	-	new/neu
VHVTR 5 120 102 12 03 030 L	12,0	0,30	12	102	25,0	36,0	0,300	5	-	
VHVTR 5 120 102 12 03 050 L	12,0	0,50	12	102	25,0	36,0	0,300	5	-	
VHVTR 5 120 102 12 03 100 L	12,0	1,00	12	102	25,0	36,0	0,300	5	-	
VHVTR 5 140 102 14 03 050 L	14,0	0,50	14	102	30,0	42,0	0,300	5	-	new/neu
VHVTR 5 140 102 14 03 100 L	14,0	1,00	14	102	30,0	42,0	0,300	5	-	
VHVTR 5 160 102 16 03 010 L	16,0	0,10	16	102	35,0	48,0	0,300	5	-	new/neu
VHVTR 5 160 102 16 03 050 L	16,0	0,50	16	102	35,0	48,0	0,300	5	-	
VHVTR 5 160 102 16 03 100 L	16,0	1,00	16	102	35,0	48,0	0,300	5	-	
VHVTR 5 200 125 20 03 050 L	20,0	0,50	20	125	42,0	60,0	0,400	5	-	
VHVTR 5 200 125 20 03 100 L	20,0	1,00	20	125	42,0	60,0	0,400	5	-	
VHVTR 5 250 131 25 03 050 L	25,0	0,50	25	131	45,0	75,0	0,400	5	-	
VHVTR 5 250 131 25 03 100 L	25,0	1,00	25	131	45,0	75,0	0,400	5	-	

EVEN SHANK DIAMETERS STARTING FROM Ø6 MM ARE AVAILABLE WITH WELDON, ADD "W" TO THE ARTICLE CODE. E.G. VHVTR**W** 5 060…

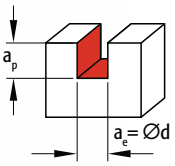
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**140 - 220**	emulsion
P1.2	< 1000	< 300	**100 - 180**	emulsion
P1.3	< 1400	< 400	**70 - 160**	emulsion
H2.1		42-50 HRc	**80 - 140**	emulsion
M3.1	< 950		**80 - 130**	emulsion
M3.2	< 1250		**60 - 100**	emulsion
S6.1	< 1500		**40 - 60**	emulsion
S6.2	< 1600		**45 - 70**	emulsion
S6.3	< 1600		**30 - 50**	emulsion
S6.4	< 1250		**60 -90**	emulsion

High performance!

- **Productivity**
  Produktivität
- **Tool life**
  Standzeit
- **Surface finish**
- Oberfläche Qualität

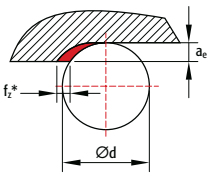


a_p up to 2,00 x d
a_e up to 0,45 x d



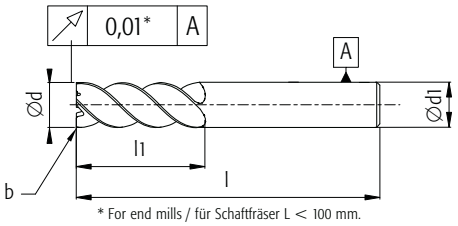
a_p up to 1,00 x d

Ød (mm)	Shoulder milling / Eckfräsen (1xD depth of cut) a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	Shoulder milling / Eckfräsen (2xD depth of cut) a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
3,0	< 3,0	< 1,4	0,010 - 0,020	< 6,0	< 0,75	0,010 - 0,030
4,0	< 4,0	< 1,8	0,015 - 0,030	< 8,0	< 1,00	0,020 - 0,040
5,0	< 5,0	< 2,3	0,020 -0,040	< 10,0	< 1,25	0,025 - 0,055
6,0	< 6,0	< 2,7	0,025 - 0,050	< 12,0	< 1,50	0,035 - 0,065
8,0	< 8,0	< 3,6	0,030 - 0,060	< 16,0	< 2,00	0,045 - 0,075
10,0	< 10,0	< 4,5	0,040 - 0,070	< 20,0	< 2,50	0,055 - 0,085
12,0	< 12,0	< 5,4	0,050 - 0,080	< 24,0	< 3,00	0,070 - 0,100
14,0	< 14,0	< 6,3	0,055 - 0,090	< 28,0	< 3,50	0,080 - 0,120
16,0	< 16,0	< 7,2	0,060 - 0,100	< 32,0	< 4,00	0,090 - 0,130
20,0	< 20,0	< 9,0	0,080 - 0,120	< 40,0	< 5,00	0,110 - 0,150
25,0	< 25,0	< 11,3	0,100 - 0,150	< 50,0	< 6,25	0,135 - 0,185



$$f_z^* = f_z \sqrt{\frac{d}{a_e}}$$

Standard

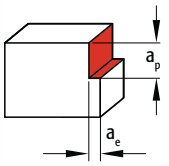


* For end mills / für Schaftfräser L < 100 mm.

Article Number *Artikelnummer*	Ød (mm)	b (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
VHTR 4 030 060 06 03	3,0	0,10	6	60	10,0	-	-	4	15	new/neu
VHTR 4 040 060 06 03	4,0	0,10	6	60	13,0	-	-	4	15	new/neu
VHTR 4 050 060 06 03	5,0	0,10	6	60	16,0	-	-	4	15	new/neu
VHTR 5 060 060 06 03	6,0	0,10	6	60	19,0	-	-	5	-	new/neu
VHTR 5 080 065 08 03	8,0	0,15	8	65	25,0	-	-	5	-	new/neu
VHTR 5 100 078 10 03	10,0	0,20	10	78	32,0	-	-	5	-	new/neu
VHTR 6 120 090 12 03	12,0	0,20	12	90	38,0	-	-	6	-	new/neu
VHTR 6 160 100 16 03	16,0	0,30	16	100	42,0	-	-	6	-	new/neu
VHTR 7 200 105 20 03	20,0	0,40	20	105	50,0	-	-	7	-	new/neu
4xD										
VHTR 4 030 064 06 03 L	3,0	0,10	6	64	13,0	-	-	4	15	new/neu
VHTR 4 040 064 06 03 L	4,0	0,10	6	64	17,0	-	-	4	15	new/neu
VHTR 4 050 064 06 03 L	5,0	0,10	6	64	21,0	-	-	4	15	new/neu
VHTR 5 060 064 06 03 L	6,0	0,10	6	64	25,0	-	-	5	-	new/neu
VHTR 5 080 078 08 03 L	8,0	0,15	6	78	33,0	-	-	5	-	new/neu
VHTR 5 100 089 10 03 L	10,0	0,15	10	89	42,0	-	-	5	-	new/neu
VHTR 5 120 102 12 03 L	12,0	0,15	12	102	50,0	-	-	5	-	new/neu
VHTR 5 160 125 16 03 L	16,0	0,20	16	125	66,0	-	-	5	-	new/neu

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**220 - 280**	emulsion
P1.2	< 1000	< 300	**145 - 225**	emulsion
P1.3	< 1400	< 400	**100 - 180**	emulsion
H2.1		< 50 HRc	**100 - 150**	emulsion
M3.1	< 950		**115 - 165**	emulsion
M3.2	< 1250		**85 - 125**	emulsion
S6.1	< 1500		**55 - 75**	emulsion
S6.2	< 1600		**60 - 90**	emulsion
S6.3	< 1600		**45 - 65**	emulsion
S6.4	< 1250		**80 - 120**	emulsion

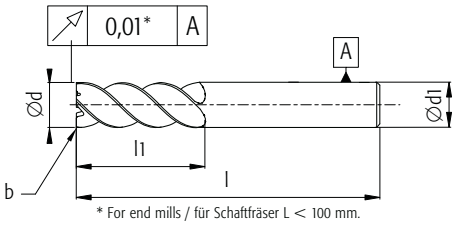
- High MRR (Material Removal Rate)
  Großes Spanvolumen erreichen
- Constant cutting force
  Konstante Schnittkraft
  - Better for machine
    Besser für die Maschine
  - Better for end mill
    Besser für Schaftfräser
  - Increased lifetime
    Erhöhte Lebensdauer
- Optimized cutting conditions to application area
  Optimierte Schnittwertebedingungen auf Anwendungsgebiet



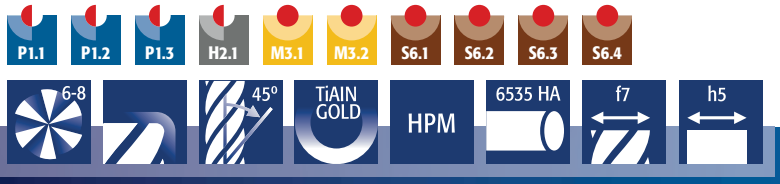
Shoulder milling / Eckfräsen

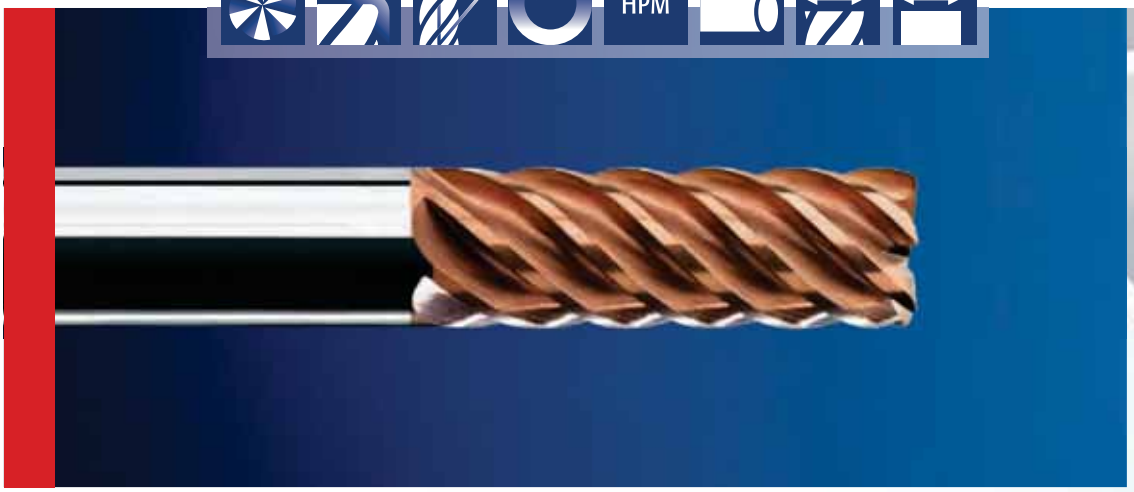
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
3,0	< 9,00	< 0,450	0,015 - 0,035
4,0	< 12,00	< 0,600	0,025 - 0,050
5,0	< 15,00	< 0,750	0,030 - 0,060
6,0	< 18,00	< 0,900	0,040 - 0,070
8,0	< 24,00	< 1,200	0,050 - 0,085
10,0	< 30,00	< 1,500	0,060 - 0,100
12,0	< 36,00	< 1,800	0,085 - 0,120
16,0	< 40,00	< 2,400	0,100 - 0,145
20,0	< 50,00	< 3,000	0,125 - 0,175

Standard



* For end mills / für Schaftfräser L < 100 mm.





Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
Standard / Long / Extra long										
HAMF 6 030 057 06 03 010	3,0	0,10	6	57	7,00	-	-	6	15	new/neu
HAMF 6 040 057 06 03 010	4,0	0,10	6	57	9,00	-	-	6	15	new/neu
HAMF 6 050 057 06 03 010	5,0	0,10	6	57	11,00	-	-	6	15	new/neu
HAMF 6 060 057 06 03 010	6,0	0,10	6	57	15,00	-	-	6	-	new/neu
HAMF 6 060 057 06 03 030	6,0	0,30	6	57	15,00	-	-	6	-	
HAMF 6 080 064 08 03 010	8,0	0,10	8	64	20,00	-	-	6	-	new/neu
HAMF 6 080 064 08 03 050	8,0	0,50	8	64	20,00	-	-	6	-	
HAMF 6 100 078 10 03 010	10,0	0,10	10	78	22,00	-	-	6	-	new/neu
HAMF 6 100 078 10 03 050	10,0	0,50	10	78	22,00	-	-	6	-	
HAMF 6 120 078 12 03 010	12,0	0,10	12	78	28,00	-	-	6	-	new/neu
HAMF 6 120 078 12 03 050	12,0	0,50	12	78	28,00	-	-	6	-	
HAMF 6 160 089 16 03 015	16,0	0,15	16	89	34,00	-	-	6	-	new/neu
HAMF 6 160 089 16 03 050	16,0	0,50	16	89	34,00	-	-	6	-	
HAMF 8 200 102 20 03 015	20,0	0,15	20	102	42,00	-	-	8	-	new/neu
HAMF 8 200 102 20 03 050	20,0	0,50	20	102	42,00	-	-	8	-	
HAMFL 6 030 064 06 03 010	3,0	0,10	6	65	10,00	-	-	6	15	new/neu
HAMFL 6 040 064 06 03 010	4,0	0,10	6	65	13,00	-	-	6	15	new/neu
HAMFL 6 050 064 06 03 010	5,0	0,10	6	65	16,00	-	-	6	15	new/neu
HAMFL 6 060 064 06 03 010	6,0	0,10	6	65	20,00	-	-	6	-	new/neu
HAMFL 6 060 064 06 03 030	6,0	0,30	6	64	20,00	-	-	6	-	
HAMFL 6 080 078 08 03 010	8,0	0,10	8	78	30,00	-	-	6	-	new/neu
HAMFL 6 080 078 08 03 050	8,0	0,50	8	78	30,00	-	-	6	-	
HAMFL 6 100 089 10 03 010	10,0	0,10	10	89	35,00	-	-	6	-	new/neu
HAMFL 6 100 089 10 03 050	10,0	0,50	10	89	35,00	-	-	6	-	
HAMFL 6 120 102 12 03 010	12,0	0,10	12	102	40,00	-	-	6	-	new/neu
HAMFL 6 120 102 12 03 050	12,0	0,50	12	102	40,00	-	-	6	-	
HAMFL 6 160 102 16 03 015	16,0	0,15	16	102	50,00	-	-	6	-	new/neu
HAMFL 6 160 102 16 03 050	16,0	0,50	16	102	50,00	-	-	6	-	
HAMFL 8 200 125 20 03 015	20,0	0,15	20	125	60,00	-	-	8	-	new/neu
HAMFL 8 200 125 20 03 050	20,0	0,50	20	125	60,00	-	-	8	-	
HAMFXL 6 060 070 06 03 010	6,0	0,10	6	70	30,00	-	-	6	-	new/neu
HAMFXL 6 080 102 08 03 010	8,0	0,10	8	102	40,00	-	-	6	-	new/neu
HAMFXL 6 080 102 08 03 050	8,0	0,50	8	102	40,00	-	-	6	-	
HAMFXL 6 100 125 10 03 010	10,0	0,10	10	125	60,00	-	-	6	-	new/neu
HAMFXL 6 100 125 10 03 050	10,0	0,50	10	125	60,00	-	-	6	-	
HAMFXL 6 120 150 12 03 010	12,0	0,10	12	150	65,00	-	-	6	-	new/neu
HAMFXL 6 120 150 12 03 050	12,0	0,50	12	150	65,00	-	-	6	-	
HAMFXL 6 160 150 16 03 015	16,0	0,15	16	150	75,00	-	-	6	-	new/neu
HAMFXL 6 160 150 16 03 050	16,0	0,50	16	150	75,00	-	-	6	-	
HAMFXL 8 200 150 20 03 015	20,0	0,15	20	150	80,00	-	-	8	-	new/neu
HAMFXL 8 200 150 20 03 050	20,0	0,50	20	150	80,00	-	-	8	-	

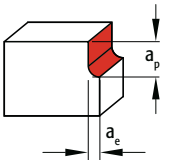
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**140 - 220**	emulsion
P1.2	< 1000	< 300	**100 - 180**	emulsion
P1.3	< 1400	< 400	**70 - 160**	emulsion
H2.1		42-50 HRc	**80 - 140**	emulsion
M3.1	< 950		**80 - 130**	emulsion
M3.2	< 1250		**60 - 100**	emulsion
S6.1	< 1500		**40 - 60**	emulsion
S6.2	< 1600		**45 - 70**	emulsion
S6.3	< 1600		**30 - 50**	emulsion
S6.4	< 1250		**60 -90**	emulsion

Super smooth surface finish
Super glatte Oberflächenqualität

HAMFL82001252003050
Material 1.4401 stainless 316

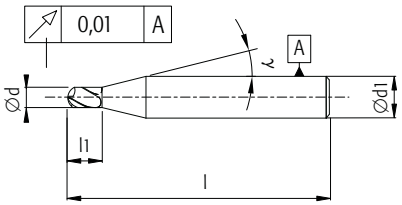
V_c	100 m/min
n	3979 rpm
F_z	0,03 mm/t
V_f	950 mm/min
a_p	40 mm
a_e	0,2 mm
Coolant	emulsion
Q	**7,6 cm³/min**

- Superior surface finish!
  Hervorragende Oberflächenqualität!
- Excellent straightness tolerances.
  Ausgezeichnete Plantoleranzen.
- Cutting length up to 6 x D.
  Schnitttiefen bis 6 x D.

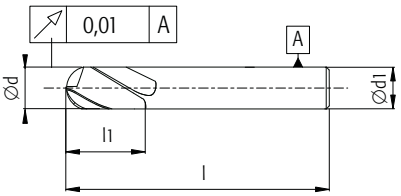


	Roughing / Schruppfräsen			Finishing / Schlichtfräsen		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
6,0	< 20,0	< 0,48	0,035 - 0,055	< 20,0	< 0,12	0,020 - 0,040
8,0	< 40,0	< 0,64	0,045 - 0,075	< 40,0	< 0,16	0,030 - 0,050
10,0	< 60,0	< 0,80	0,070 - 0,090	< 60,0	< 0,20	0,040 - 0,060
12,0	< 65,0	< 0,96	0,080 - 0,110	< 65,0	< 0,24	0,050 - 0,080
16,0	< 75,0	< 1,28	0,100 - 0,140	< 75,0	< 0,32	0,070 - 0,100
20,0	< 80,0	< 1,60	0,120 - 0,180	< 80,0	< 0,40	0,085 - 0,120

Micro



Standard



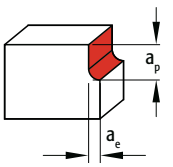
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
HABM 2 004 051 04 03	0,4	0,20	4	51	0,60	-	-	2	10
HABM 2 005 051 04 03	0,5	0,25	4	51	0,90	-	-	2	10
HABM 2 006 051 04 03	0,6	0,30	4	51	1,20	-	-	2	10
HABM 2 008 051 04 03	0,8	0,40	4	51	1,50	-	-	2	10
HABM 2 010 051 04 03	1,0	0,50	4	51	2,00	-	-	2	15
HABM 2 015 051 04 03	1,5	0,75	4	51	3,00	-	-	2	15
HABM 2 020 051 04 03	2,0	1,00	4	51	4,00	-	-	2	15
HABM 2 030 051 04 03	3,0	1,50	4	51	6,00	-	-	2	15
HABM 2 040 057 06 03	4,0	2,00	6	57	8,00	-	-	2	15
HABM 2 050 057 06 03	5,0	2,50	6	57	10,00	-	-	2	15
HABM 2 060 057 06 03	6,0	3,00	6	57	12,00	-	-	2	-
HABM 2 080 063 08 03	8,0	4,00	8	63	16,00	-	-	2	-
HABM 2 100 072 10 03	10,0	5,00	10	72	20,00	-	-	2	-
HABM 2 120 083 12 03	12,0	6,00	12	83	24,00	-	-	2	-

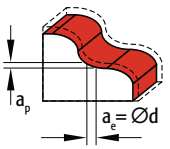
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**140 - 220**	emulsion
P1.2	< 1000	< 300	**100 - 180**	emulsion
P1.3	< 1400	< 400	**70 - 160**	emulsion
H2.1		42-50 HRc	**80 - 140**	emulsion
M3.1	< 950		**80 - 130**	emulsion
M3.2	< 1250		**60 - 100**	emulsion
S6.1	< 1500		**40 - 60**	emulsion
S6.2	< 1600		**45 - 70**	emulsion
S6.3	< 1600		**30 - 50**	emulsion
S6.4	< 1250		**60 -90**	emulsion

HABM20801000803
Material 1.4462 Duplex

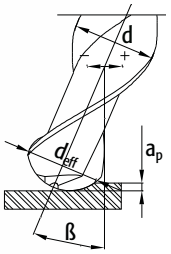
V_c	120 m/min
n	4775 rpm
F_z	0,04 mm/t
V_f	385 mm/min
a_p	0,1 mm
a_e	0,1 mm
Coolant	emulsion
Tool life	**2,5 Hours**

- Improved tool life.
  Erhöhte Standzeit.
- Better surface finish.
  Bessere Oberflächenqualität.





Ød (mm)	Roughing / Schruppfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	Finishing / Schlichtfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
0,4	< 0,60	< 0,12	0,004 - 0,008	< 0,60	< 0,04	0,007 - 0,015
0,5	<0,75	< 0,15	0,005 - 0,009	< 0,75	< 0,05	0,010 - 0,020
0,6	<0,90	< 0,18	0,006 - 0,010	< 0,90	< 0,06	0,012 - 0,021
0,8	<1,20	< 0,24	0,007 - 0,012	< 1,20	< 0,08	0,014 - 0,023
1,0	< 1,50	< 0,30	0,008 - 0,015	< 1,50	< 0,10	0,015 - 0,025
1,5	< 2,25	< 0,45	0,012 - 0,018	< 2,25	< 0,15	0,020 - 0,030
2,0	< 3,00	< 0,60	0,016 - 0,022	< 3,00	< 0,20	0,025 - 0,035
3,0	< 4,50	< 0,90	0,018 - 0,025	< 4,50	< 0,30	0,028 - 0,040
4,0	< 6,00	< 1,20	0,020 - 0,028	< 6,00	< 0,40	0,030 - 0,045
5,0	< 7,50	< 1,50	0,025 - 0,035	< 7,50	< 0,50	0,035 - 0,050
6,0	< 9,00	< 1,80	0,028 - 0,042	< 9,00	< 0,60	0,040 - 0,055
8,0	< 12,00	< 2,40	0,030 - 0,050	< 12,00	< 0,80	0,050 - 0,065
10,0	< 15,00	< 3,00	0,040 - 0,070	< 15,00	<1,00	0,055 - 0,080
12,0	< 18,00	< 3,60	0,050 - 0,080	< 18,00	< 1,20	0,065 - 0,090



- For the cutting speed V_c calculation the effective cutting diameter d_{eff} has to be taken into account. See formula.
- Für die Berechnung der Schnittgeschwindigkeit muss der effektive Durchmesser d_{eff} berücksichtigt werden (siehe Formel).

$$ß \neq 0: \quad d_{eff} = d \bullet \sin\left[ß \pm \arccos\left(\frac{d - 2a_p}{d}\right)\right]$$

High volume milling or roughing?

HVM oder Schruppen?

Van Hoorn Carbide designed a program of HVM or roughing end mills on a wide spectrum of applications and materials: Steels up to 50 HRc, alloy steels, tool steels, stainless steels, carbon steel, cast iron as well as materials that contain Chrome (Cr) or Nickel (Ni).

Van Hoorn Carbide deckt mit seinem Produktprogramm ein weites Anwendungsspektrum in der HVM- und Schruppbearbeitung ab: Stähle bis 50 HRc, legierte Stähle, Werkzeugstähle, nichtrostende Stähle, Kohlenstoffstahl, Guss sowie Werkstoffe mit Chrom (Cr) oder Nickel (Ni) Anteilen.

VHTS

Trochoidal end mill with chipbreaker and chamfer for steel.
Trochoidal Fräser mit Spanbrecher und Kantenschütz-Fase für Stahlsorten.

VHRS

Slotting and HVM side milling for steel.
Nutfräsen und HVM eckfräsen für Stahl.

VHVFF
Advantages / Vorteile:

- **Smooth cutting**
  Reibungsloses Schneiden
- **Optimized surface finish**
  Optimale Oberflächenqualität
- **High feed rate capabilities**
  Hohe Vorschubgeschwindigkeiten
- **Reduction of operation times and tooling costs**
  Reduzierung der Prozess- und Werkzeugkosten
- **Slot milling up to 1,5xD**
  Nutfräsen bis 1,5xD
- **Side milling: a_e = 0,45xD with a_p = 2xD**
  Eckfräsen: a_e = 0,45xD mit a_p = 2xD

Ideal geometry to optimize chip flow and reduce cutting forces

Ideale Schneiden-geometrie für Spanabfuhr und Reduzierung der Schnittkräfte

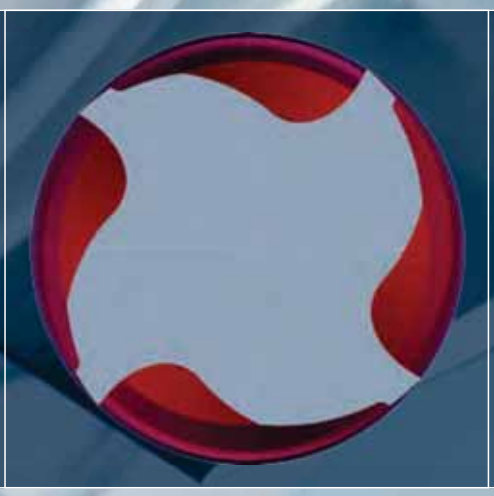
VHC High volume milling and roughing:

VHC HVM und Schruppbearbeitung:

- **VHVF: Sharp corner geometry.**
  VHVF: Scharfe Schneidkantengeometrie.
- **VHVFR: Corner radius.**
  VHVFR: Eckenradius.
- **VHVFF: 3 and 4 flute, with chamfer.**
  VHVFF: 3 und 4 Schneiden, mit Kantenfase.
- **VHRFF: Chamfer and with ripper profile.**
  VHRFF: Kantenfase und Kordelprofil.
- **VHRS: 4 and 5 flute with corner radius.**
  VHRS: 4 und 5 Schneiden, mit Eckenradius.
- **VHTS: Trochoidal end mill with chipbreaker.**
  VHTS: Trochoidal Fräser für Stähle.

VHRS

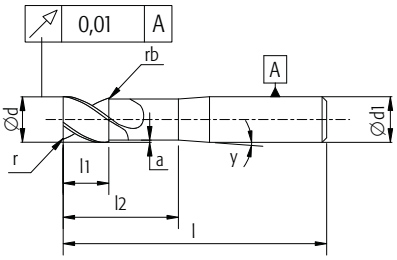
- Suitable for material groups M and P
  Verwendbar für Materialgruppe M und P
- Unequal tooth spacing
  Ungleiche Zahnteilung
- Variable helix
  Ungleicher Spiralwinkel
- Wide range of program
  Sehr großes Programm
  - Short / Kurz
  - Standard / Standard
  - Long / Lang
  - 5 flute / 5 Schneiden

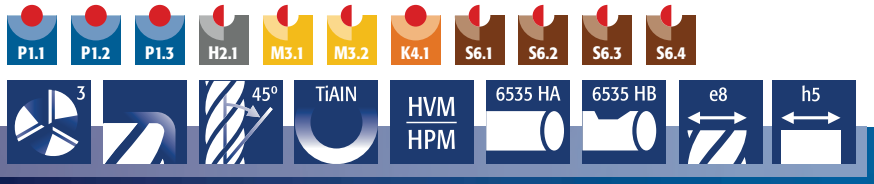


VHRS4

VHRS5

Standard





Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
Standard									
VHVFR 3 020 039 03 03	2,0	0,20	3	39	3,00	10,00	0,050	3	15
VHVFR 3 030 039 03 03	3,0	0,20	3	39	4,00	10,00	0,050	3	-
VHVFR 3 040 051 06 03	4,0	0,20	6	51	5,00	12,00	0,100	3	15
VHVFR 3 040 064 06 03	4,0	0,20	6	64	5,00	12,00	0,100	3	15
VHVFR 3 050 051 06 03	5,0	0,20	6	51	6,00	14,00	0,150	3	15
VHVFR 3 050 064 06 03	5,0	0,20	6	64	6,00	14,00	0,150	3	15
VHVFR 3 060 064 06 03	6,0	0,30	6	64	7,00	16,00	0,200	3	-
VHVFR 3 080 064 08 03	8,0	0,50	8	64	9,00	20,00	0,300	3	-
VHVFR 3 100 070 10 03	10,0	0,50	10	70	12,00	25,00	0,300	3	-
VHVFR 3 120 078 12 03	12,0	0,50	12	78	15,00	30,00	0,300	3	-
VHVFR 3 160 089 16 03	16,0	0,50	16	89	18,00	38,00	0,300	3	-
with Weldon / mit Weldon									
VHVFRW 3 060 064 06 03	6,0	0,30	6	64	7,00	16,00	0,200	3	-
VHVFRW 3 080 064 08 03	8,0	0,50	8	64	9,00	20,00	0,300	3	-
VHVFRW 3 100 070 10 03	10,0	0,50	10	70	12,00	25,00	0,300	3	-
VHVFRW 3 120 078 12 03	12,0	0,50	12	78	15,00	30,00	0,300	3	-
VHVFRW 3 160 089 16 03	16,0	0,50	16	89	18,00	38,00	0,300	3	-

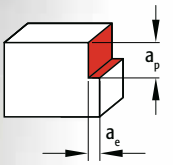
EVEN SHANK DIAMETERS STARTING FROM Ø6 MM ARE AVAILABLE WITH WELDON, ADD "W" TO THE ARTICLE CODE. E.G. VHVFR**W** 3 060…

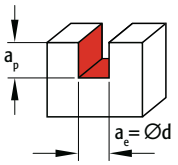
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**140 - 220**	emulsion
P1.2	< 1000	< 300	**100 - 180**	emulsion
P1.3	< 1400	< 400	**70 - 160**	emulsion
H2.1		42-50 HRc	**80 - 140**	emulsion
M3.1	< 950		**80 - 130**	emulsion
M3.2	< 1250		**60 - 100**	emulsion
K4.1	< 800		**100 - 160**	emulsion
S6.1	< 1500		**40 - 60**	emulsion
S6.2	< 1600		**45 - 70**	emulsion
S6.3	< 1600		**30 - 50**	emulsion
S6.4	< 1250		**60 -90**	emulsion

VHVFR30400510603
Workpiece Material: 1.4104
Hardness: 430F

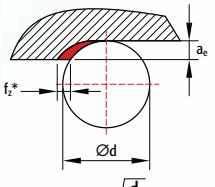
	Van Hoorn	Competitor
V_c	130 m/min	120 m/min
n	10350 rpm	4774 rpm
F_z	0,05 mm/t	0,035 mm/t
V_f	1552 mm/min	500 mm/min
a_p	1,0 mm	8,0 mm
a_e	4,0 mm	1,0 mm
Coolant	emulsion	emulsion
Q	**6,2 mm³/min**	**4,0 mm³/min**

- Optimized chip removal.
  Optimierte Spanabfuhr!
- Excellent tool life!
  Hervorragende Standzeit!
- Geometry for roughing - semi finishing.
  Schneidengeometrien für Schrupp- und mittlere Bearbeitung.





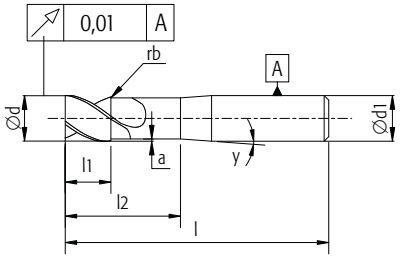
Ød (mm)	Shoulder milling / Eckfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	Slot milling / Nutfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
2,0	< 2,0	< 0,9	0,008 - 0,015	< 2,0	2,0	0,003 - 0,010
3,0	< 3,0	< 1,4	0,010 - 0,020	< 3,0	3,0	0,005 - 0,015
4,0	< 4,0	< 1,8	0,015 - 0,030	< 4,0	4,0	0,008 - 0,025
5,0	< 5,0	< 2,3	0,020 -0,040	< 5,0	5,0	0,010 - 0,030
6,0	< 6,0	< 2,7	0,025 - 0,050	< 6,0	6,0	0,015 - 0,035
8,0	< 8,0	< 3,6	0,030 - 0,060	< 8,0	8,0	0,025 - 0,045
10,0	< 10,0	< 4,5	0,040 - 0,070	< 10,0	10,0	0,030 - 0,050
12,0	< 12,0	< 5,4	0,050 - 0,080	< 12,0	12,0	0,035 - 0,060
14,0	< 14,0	< 6,3	0,055 - 0,090	< 14,0	14,0	0,040 - 0,070
16,0	< 16,0	< 7,2	0,060 - 0,100	< 16,0	16,0	0,050 - 0,080



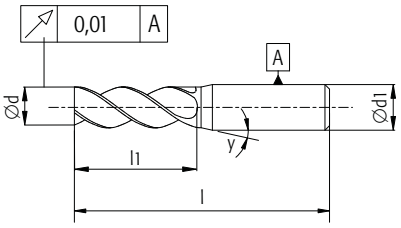
$$f_z^* = f_z \sqrt{\frac{d}{a_e}}$$

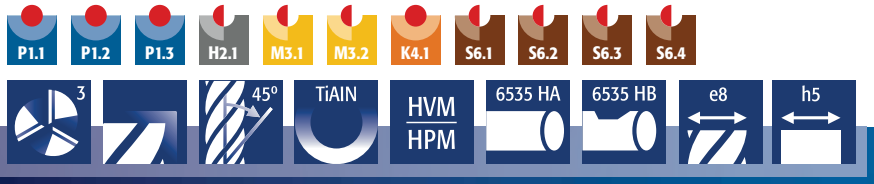
- At shoulder milling, feed per tooth Fz* for lower a_e values should be converted according table.
  Beim Eckfräsen ist der Vorschub Fz* von der Schnittbreite a_e abhängig.
- For finishing application V_c may be increased up to 20%.
  Bei Schlichtoperationen sollte die Schnittgeschwindigkeit V_c um 20% erhöht werden.

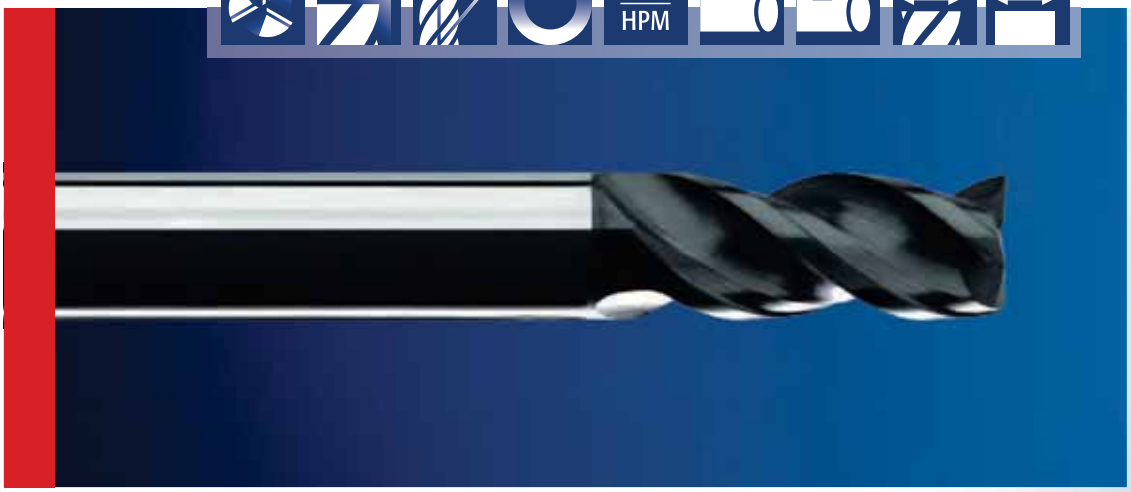
Short



Standard







Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
Short / Kurze Ausführung									
VHVF 3 020 039 03 03 S	2,0	-	3	39	4,00	8,00	0,050	3	15
VHVF 3 030 039 03 03 S	3,0	-	3	39	5,00	10,00	0,050	3	-
VHVF 3 040 051 04 03 S	4,0	-	4	51	6,00	12,00	0,100	3	-
VHVF 3 050 051 05 03 S	5,0	-	5	51	7,00	14,00	0,150	3	-
VHVF 3 060 064 06 03 S	6,0	-	6	64	8,00	16,00	0,200	3	-
VHVF 3 080 064 08 03 S	8,0	-	8	64	11,00	20,00	0,300	3	-
VHVF 3 100 070 10 03 S	10,0	-	10	70	13,00	22,00	0,300	3	-
VHVF 3 120 078 12 03 S	12,0	-	12	78	15,00	25,00	0,300	3	-
VHVF 3 160 089 16 03 S	16,0	-	16	89	19,00	35,00	0,300	3	-
with Weldon / mit Weldon									
VHVFW 3 060 064 06 03 S	6,0	-	6	64	8,00	16,00	0,200	3	-
VHVFW 3 080 064 08 03 S	8,0	-	8	64	11,00	20,00	0,300	3	-
VHVFW 3 100 070 10 03 S	10,0	-	10	70	13,00	22,00	0,300	3	-
VHVFW 3 120 078 12 03 S	12,0	-	12	78	15,00	25,00	0,300	3	-
VHVFW 3 160 089 16 03 S	16,0	-	16	89	19,00	35,00	0,300	3	-

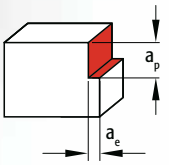
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
Standard									
VHVF 3 020 039 03 03	2,0	-	3	39	8,00	-	-	3	15
VHVF 3 030 039 03 03	3,0	-	3	39	10,00	-	-	3	-
VHVF 3 040 051 04 03	4,0	-	4	51	12,00	-	-	3	-
VHVF 3 050 051 05 03	5,0	-	5	51	14,00	-	-	3	-
VHVF 3 060 064 06 03	6,0	-	6	64	16,00	-	-	3	-
VHVF 3 080 064 08 03	8,0	-	8	64	20,00	-	-	3	-
VHVF 3 100 070 10 03	10,0	-	10	70	22,00	-	-	3	-
VHVF 3 120 078 12 03	12,0	-	12	78	25,00	-	-	3	-
VHVF 3 160 089 16 03	16,0	-	16	89	35,00	-	-	3	-
with Weldon / mit Weldon									
VHVFW 3 060 064 06 03	6,0	-	6	64	16,00	-	-	3	-
VHVFW 3 080 064 08 03	8,0	-	8	64	20,00	-	-	3	-
VHVFW 3 100 070 10 03	10,0	-	10	70	22,00	-	-	3	-
VHVFW 3 120 078 12 03	12,0	-	12	78	25,00	-	-	3	-
VHVFW 3 160 089 16 03	16,0	-	16	89	35,00	-	-	3	-

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**140 - 220**	emulsion
P1.2	< 1000	< 300	**100 - 180**	emulsion
P1.3	< 1400	< 400	**70 - 160**	emulsion
H2.1		42-50 HRc	**80 - 140**	emulsion
M3.1	< 950		**80 - 130**	emulsion
M3.2	< 1250		**60 - 100**	emulsion
K4.1	< 800		**100 - 160**	emulsion
S6.1	< 1500		**40 - 60**	emulsion
S6.2	< 1600		**45 - 70**	emulsion
S6.3	< 1600		**30 - 50**	emulsion
S6.4	< 1250		**60 -90**	emulsion

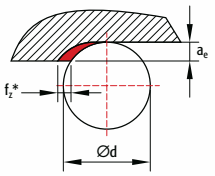
VHVF30300390303
Material 1.2311 not hardened

V_c	90 m/min
n	9550 rpm
F_z	0,008 mm/t
V_f	230 mm/min
a_p	2,5 mm
a_e	3 mm
Coolant	emulsion
Q	**1,73 cm³/min**

- Improved tool life.
  Erhöhte Standzeit.
- No burrs.
  Gratfrei.
- Optimized surface finish.
  Optimierte Oberflächenqualität.



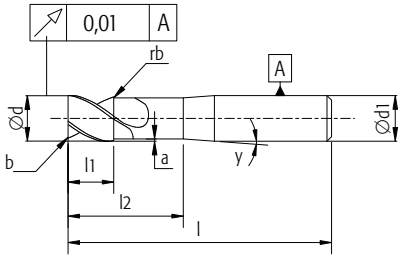
Ød (mm)	Shoulder milling / Eckfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	Slot milling / Nutfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
2,0	< 4,0	< 0,6	0,008 - 0,015	< 2,0	2,0	0,003 - 0,010
3,0	< 6,0	< 0,9	0,010 - 0,020	< 3,0	3,0	0,005 - 0,015
4,0	< 8,0	< 1,2	0,015 - 0,030	< 4,0	4,0	0,008 - 0,025
5,0	< 10,0	< 1,5	0,020 - 0,040	< 5,0	5,0	0,010 - 0,030
6,0	< 12,0	< 1,8	0,025 - 0,050	< 6,0	6,0	0,015 - 0,035
8,0	< 16,0	< 2,4	0,030 - 0,060	< 8,0	8,0	0,025 - 0,045
10,0	< 20,0	< 3,0	0,040 - 0,070	< 10,0	10,0	0,030 - 0,050
12,0	< 24,0	< 3,6	0,050 - 0,080	< 12,0	12,0	0,035 - 0,060
14,0	< 28,0	< 4,2	0,055 - 0,090	< 14,0	14,0	0,040 - 0,070
16,0	< 32,0	< 4,8	0,060 - 0,100	< 16,0	16,0	0,050 - 0,080



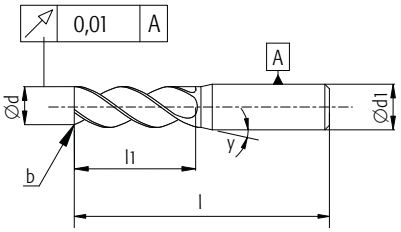
$$f_z^* = f_z \sqrt{\frac{d}{a_e}}$$

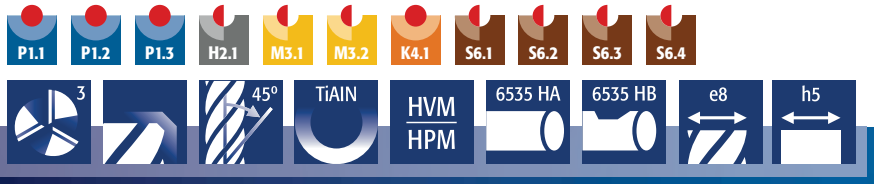
- Given conditions are based on VHVFF end mills with chamfer. VHVF is with sharp corner.
  Angegebene Schnittdaten beziehen sich auf VHFF Schaftfräser mit Kantenfase. VHVF Ausführung hat scharfe Schneidkanten.
- For finishing application V_c may be increased up to 20%.
  Bei Schlichtoperationen sollte die Schnittgeschwindigkeit V_c um 20% erhöht werden.

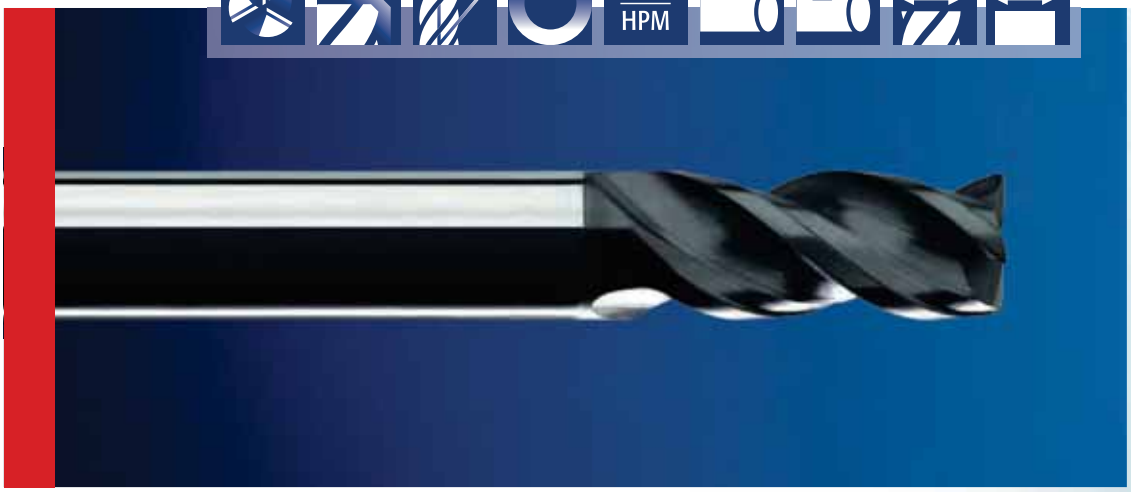
Short



Standard







Article Number *Artikelnummer*	Ød (mm)	b (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
Short / Kurze Ausführung									
VHVFF 3 020 039 03 03 S	2,0	0,10	3	39	4,00	8,00	0,050	3	15
VHVFF 3 030 039 03 03 S	3,0	0,10	3	39	5,00	10,00	0,050	3	-
VHVFF 3 040 051 04 03 S	4,0	0,10	4	51	6,00	12,00	0,100	3	-
VHVFF 3 050 051 05 03 S	5,0	0,15	5	51	7,00	14,00	0,150	3	-
VHVFF 3 060 064 06 03 S	6,0	0,15	6	64	8,00	16,00	0,200	3	-
VHVFF 3 080 064 08 03 S	8,0	0,20	8	64	11,00	20,00	0,300	3	-
VHVFF 3 100 070 10 03 S	10,0	0,20	10	70	13,00	22,00	0,300	3	-
VHVFF 3 120 078 12 03 S	12,0	0,25	12	78	15,00	25,00	0,300	3	-
VHVFF 3 160 089 16 03 S	16,0	0,25	16	89	19,00	35,00	0,300	3	-
Weldon / mit Weldon									
VHVFFW 3 060 064 06 03 S	6,0	0,15	6	64	8,00	16,00	0,200	3	-
VHVFFW 3 080 064 08 03 S	8,0	0,20	8	64	11,00	20,00	0,300	3	-
VHVFFW 3 100 070 10 03 S	10,0	0,20	10	70	13,00	22,00	0,300	3	-
VHVFFW 3 120 078 12 03 S	12,0	0,25	12	78	15,00	25,00	0,300	3	-
VHVFFW 3 160 089 16 03 S	16,0	0,25	16	89	19,00	35,00	0,300	3	-

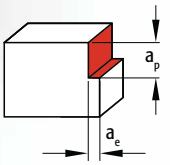
Article Number *Artikelnummer*	Ød (mm)	b (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
Standard									
VHVFF 3 020 039 03 03	2,0	0,10	3	39	8,00	-	-	3	15
VHVFF 3 030 039 03 03	3,0	0,10	3	39	10,00	-	-	3	-
VHVFF 3 040 051 04 03	4,0	0,10	4	51	12,00	-	-	3	-
VHVFF 3 050 051 05 03	5,0	0,15	5	51	14,00	-	-	3	-
VHVFF 3 060 064 06 03	6,0	0,15	6	64	16,00	-	-	3	-
VHVFF 3 080 064 08 03	8,0	0,20	8	64	20,00	-	-	3	-
VHVFF 3 100 070 10 03	10,0	0,20	10	70	22,00	-	-	3	-
VHVFF 3 120 078 12 03	12,0	0,25	12	78	25,00	-	-	3	-
VHVFF 3 160 089 16 03	16,0	0,25	16	89	35,00	-	-	3	-
with Weldon / mit Weldon									
VHVFFW 3 060 064 06 03	6,0	0,15	6	64	16,00	-	-	3	-
VHVFFW 3 080 064 08 03	8,0	0,20	8	64	20,00	-	-	3	-
VHVFFW 3 100 070 10 03	10,0	0,20	10	70	22,00	-	-	3	-
VHVFFW 3 120 078 12 03	12,0	0,25	12	78	25,00	-	-	3	-
VHVFFW 3 160 089 16 03	16,0	0,25	16	89	35,00	-	-	3	-

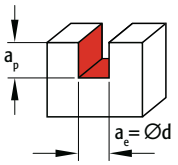
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**140 - 220**	emulsion
P1.2	< 1000	< 300	**100 - 180**	emulsion
P1.3	< 1400	< 400	**70 - 160**	emulsion
H2.1		42-50 HRc	**80 - 140**	emulsion
M3.1	< 950		**80 - 130**	emulsion
M3.2	< 1250		**60 - 100**	emulsion
K4.1	< 800		**100 - 160**	emulsion
S6.1	< 1500		**40 - 60**	emulsion
S6.2	< 1600		**45 - 70**	emulsion
S6.3	< 1600		**30 - 50**	emulsion
S6.4	< 1250		**60 -90**	emulsion

VHVFFW30800640803
Hardness: Stainless 304

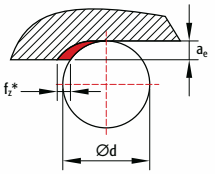
V_c	90 m/min
n	3580 rpm
F_z	0,038 mm/t
V_f	408 mm/min
a_p	10,0 mm
a_e	8,0 mm
Coolant	emulsion
Q	**32,6 cm³/min**

- Slotting application.
  Nutfräsen.
- No burrs.
  Gratfrei.
- Excellent surface finish!
  Ausgezeichnete Oberflächenqualität.





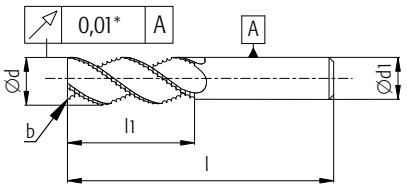
Ød (mm)	Shoulder milling / Eckfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	Slot milling / Nutfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
2,0	< 4,0	< 0,6	0,008 - 0,015	< 2,0	2,0	0,003 - 0,010
3,0	< 6,0	< 0,9	0,010 - 0,020	< 3,0	3,0	0,005 - 0,015
4,0	< 8,0	< 1,2	0,015 - 0,030	< 4,0	4,0	0,008 - 0,025
5,0	< 10,0	< 1,5	0,020 - 0,040	< 5,0	5,0	0,010 - 0,030
6,0	< 12,0	< 1,8	0,025 - 0,050	< 6,0	6,0	0,015 - 0,035
8,0	< 16,0	< 2,4	0,030 - 0,060	< 8,0	8,0	0,025 - 0,045
10,0	< 20,0	< 3,0	0,040 - 0,070	< 10,0	10,0	0,030 - 0,050
12,0	< 24,0	< 3,6	0,050 - 0,080	< 12,0	12,0	0,035 - 0,060
14,0	< 28,0	< 4,2	0,055 - 0,090	< 14,0	14,0	0,040 - 0,070
16,0	< 32,0	< 4,8	0,060 - 0,100	< 16,0	16,0	0,050 - 0,080



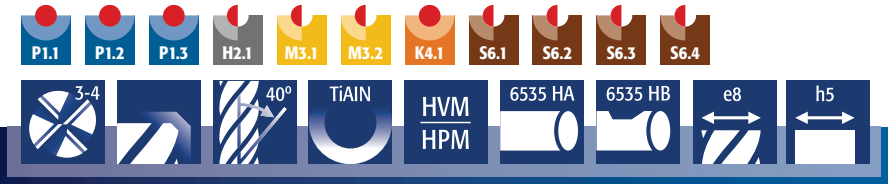
$$f_z^* = f_z \sqrt{\frac{d}{a_e}}$$

- Given conditions are based on VHVFF end mills with chamfer. VHVF is with sharp corner.
  Angegebene Schnittdaten beziehen sich auf VHFF Schaftfräser mit Kantenfase. VHVF Ausführung hat scharfe Schneidkanten.
- For finishing application V_c may be increased up to 20%.
  Bei Schlichtoperationen sollte die Schnittgeschwindigkeit V_c um 20% erhöht werden.

Standard



* For end mills / für Schaftfräser L < 100 mm.



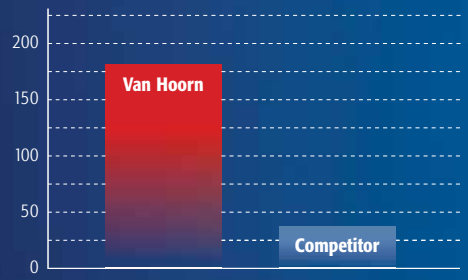
Article Number *Artikelnummer*	Ød (mm)	b (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
Standard									
VHRFF 3 060 064 06 03 025	6,0	0,25	6	64	16,00	-	-	3	-
VHRFF 3 080 064 08 03 050	8,0	0,50	8	64	20,00	-	-	3	-
VHRFF 3 100 070 10 03 050	10,0	0,50	10	70	22,00	-	-	3	-
VHRFF 3 120 078 12 03 050	12,0	0,50	12	78	25,00	-	-	3	-
VHRFF 3 140 089 14 03 100	14,0	1,00	14	89	25,00	-	-	3	-
VHRFF 3 160 089 16 03 100	16,0	1,00	16	89	35,00	-	-	3	-
VHRFF 4 200 102 20 03 100	20,0	1,00	20	102	40,00	-	-	4	-
with Weldon / mit Weldon									
VHRFFW 3 060 064 06 03 025	6,0	0,25	6	64	16,00	-	-	3	-
VHRFFW 3 080 064 08 03 050	8,0	0,50	8	64	20,00	-	-	3	-
VHRFFW 3 100 070 10 03 050	10,0	0,50	10	70	22,00	-	-	3	-
VHRFFW 3 120 078 12 03 050	12,0	0,50	12	78	25,00	-	-	3	-
VHRFFW 3 140 089 14 03 100	14,0	1,00	14	89	25,00	-	-	3	-
VHRFFW 3 160 089 16 03 100	16,0	1,00	16	89	35,00	-	-	3	-
VHRFFW 4 200 102 20 03 100	20,0	1,00	20	102	40,00	-	-	4	-

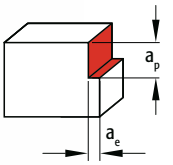
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**140 - 220**	emulsion
P1.2	< 1000	< 300	**100 - 180**	emulsion
P1.3	< 1400	< 400	**70 - 160**	emulsion
H2.1		42-50 HRc	**80 - 140**	emulsion
M3.1	< 950		**80 - 130**	emulsion
M3.2	< 1250		**60 - 100**	emulsion
K4.1	< 800		**100 - 160**	emulsion
S6.1	< 1500		**40 - 60**	emulsion
S6.2	< 1600		**45 - 70**	emulsion
S6.3	< 1600		**30 - 50**	emulsion
S6.4	< 1250		**60 -90**	emulsion

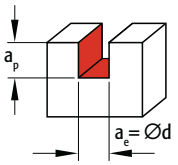
VHRFFW31600891603100
Workpiece Material: 1.0718
Hardness: 170 HB

	Van Hoorn	Competitor
V_c	250 m/min	250 m/min
n	4975 rpm	4975 rpm
F_z	0,20 mm/t	0,08 mm/t
V_f	3000 mm/min	1200 mm/min
a_p	20,0 mm	20,0 mm
a_e	3,0 mm	1,5 mm
Coolant	emulsion	emulsion
Q	**180,0 mm³/min**	**36,0 mm³/min**

Material removal rate
Zerspanungsleistung





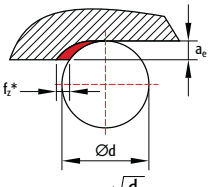


Shoulder milling / Eckfräsen

Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
6,0	< 12,0	< 2,7	0,025 - 0,050
8,0	< 16,0	< 3,6	0,030 - 0,060
10,0	< 20,0	< 4,5	0,040 - 0,070
12,0	< 24,0	< 5,4	0,050 - 0,080
14,0	< 28,0	< 6,3	0,055 - 0,090
16,0	< 32,0	< 7,2	0,060 - 0,100
20,0	< 40,0	< 9,0	0,080 - 0,120

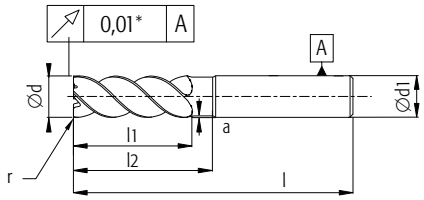
Slot milling / Nutfräsen

a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 6,0	6,0	0,015 - 0,035
< 8,0	8,0	0,025 - 0,045
< 10,0	10,0	0,030 - 0,050
< 12,0	12,0	0,035 - 0,060
< 14,0	14,0	0,040 - 0,070
< 16,0	16,0	0,050 - 0,080
< 20,0	20,0	0,060 - 0,100

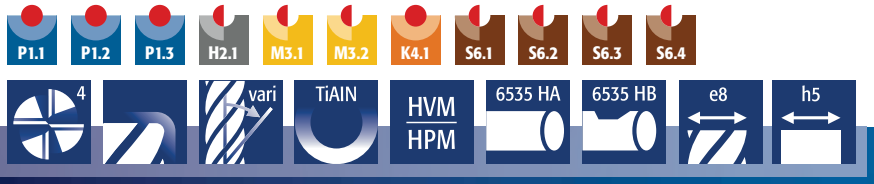


$$f_z^* = f_z \sqrt{\frac{d}{a_e}}$$

Short



* For end mills / für Schaftfräser L < 100 mm.



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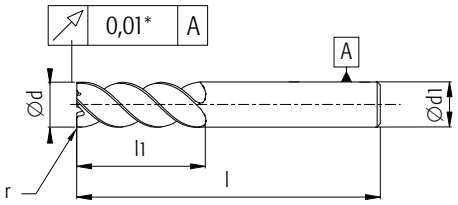
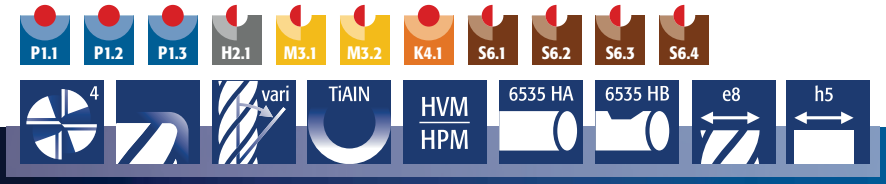
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
Short / Kurze Ausführung										
VHRS 4 030 051 06 03 S	3,0	0,20	6	51	5,0	7,0	0,100	4	15	
VHRS 4 040 051 06 03 S	4,0	0,20	6	51	6,0	9,0	0,100	4	15	
VHRS 4 050 051 06 03 S	5,0	0,20	6	51	7,0	11,0	0,200	4	15	
VHRS 4 060 064 06 03 010 S	6,0	0,10	6	64	8,0	13,0	0,200	4	-	new/neu
VHRS 4 060 064 06 03 030 S	6,0	0,30	6	64	8,0	13,0	0,200	4	-	
VHRS 4 060 064 06 03 050 S	6,0	0,50	6	64	8,0	13,0	0,200	4	-	
VHRS 4 060 064 06 03 100 S	6,0	1,00	6	64	8,0	13,0	0,200	4	-	
VHRS 4 080 064 08 03 010 S	8,0	0,10	8	64	11,0	18,0	0,300	4	-	new/neu
VHRS 4 080 064 08 03 030 S	8,0	0,30	8	64	11,0	18,0	0,300	4	-	
VHRS 4 080 064 08 03 050 S	8,0	0,50	8	64	11,0	18,0	0,300	4	-	
VHRS 4 080 064 08 03 100 S	8,0	1,00	8	64	11,0	18,0	0,300	4	-	
VHRS 4 100 070 10 03 010 S	10,0	0,10	10	70	13,0	22,0	0,300	4	-	new/neu
VHRS 4 100 070 10 03 030 S	10,0	0,30	10	70	13,0	22,0	0,300	4	-	
VHRS 4 100 070 10 03 050 S	10,0	0,50	10	70	13,0	22,0	0,300	4	-	
VHRS 4 100 070 10 03 100 S	10,0	1,00	10	70	13,0	22,0	0,300	4	-	
VHRS 4 120 078 12 03 010 S	12,0	0,10	12	78	15,0	25,0	0,300	4	-	new/neu
VHRS 4 120 078 12 03 030 S	12,0	0,30	12	78	15,0	25,0	0,300	4	-	
VHRS 4 120 078 12 03 050 S	12,0	0,50	12	78	15,0	25,0	0,300	4	-	
VHRS 4 120 078 12 03 100 S	12,0	1,00	12	78	15,0	25,0	0,300	4	-	
VHRS 4 140 089 14 03 050 S	14,0	0,50	14	89	17,0	30,0	0,300	4	-	new/neu
VHRS 4 140 089 14 03 100 S	14,0	1,00	14	89	17,0	30,0	0,300	4	-	
VHRS 4 160 089 16 03 010 S	16,0	0,10	16	89	19,0	35,0	0,300	4	-	new/neu
VHRS 4 160 089 16 03 050 S	16,0	0,50	16	89	19,0	35,0	0,300	4	-	
VHRS 4 160 089 16 03 100 S	16,0	1,00	16	89	19,0	35,0	0,300	4	-	
VHRS 4 200 102 20 03 050 S	20,0	0,50	20	102	23,0	42,0	0,400	4	-	
VHRS 4 200 102 20 03 100 S	20,0	1,00	20	102	23,0	42,0	0,400	4	-	
VHRS 4 250 120 25 03 050 S	25,0	0,50	25	120	28,0	45,0	0,400	4	-	
VHRS 4 250 120 25 03 100 S	25,0	1,00	25	120	28,0	45,0	0,400	4	-	

EVEN SHANK DIAMETERS STARTING FROM Ø6 MM ARE AVAILABLE WITH WELDON, ADD "W" TO THE ARTICLE CODE. E.G. VHRS**W** 4 060…

Standard



* For end mills / für Schaftfräser L < 100 mm.



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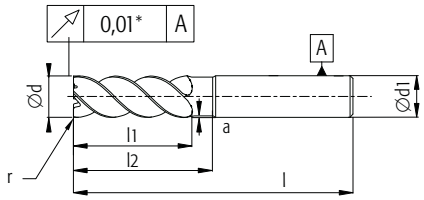
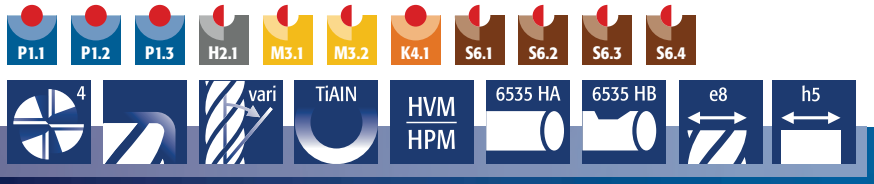
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
Standard										
VHRS 4 030 051 06 03	3,0	0,20	6	51	7,0	-	-	4	15	
VHRS 4 040 051 06 03	4,0	0,20	6	51	9,0	-	-	4	15	
VHRS 4 050 051 06 03	5,0	0,20	6	51	11,0	-	-	4	15	
VHRS 4 060 064 06 03 010	5,0	0,10	6	64	13,0	-	-	4	-	new/neu
VHRS 4 060 064 06 03 030	6,0	0,30	6	64	13,0	-	-	4	-	
VHRS 4 060 064 06 03 050	6,0	0,50	6	64	13,0	-	-	4	-	
VHRS 4 060 064 06 03 100	6,0	1,00	6	64	13,0	-	-	4	-	
VHRS 4 080 064 08 03 010	8,0	0,10	8	64	18,0	-	-	4	-	new/neu
VHRS 4 080 064 08 03 030	8,0	0,30	8	64	18,0	-	-	4	-	
VHRS 4 080 064 08 03 050	8,0	0,50	8	64	18,0	-	-	4	-	
VHRS 4 080 064 08 03 100	8,0	1,00	8	64	18,0	-	-	4	-	
VHRS 4 100 070 10 03 010	10,0	0,10	10	70	22,0	-	-	4	-	new/neu
VHRS 4 100 070 10 03 030	10,0	0,30	10	70	22,0	-	-	4	-	
VHRS 4 100 070 10 03 050	10,0	0,50	10	70	22,0	-	-	4	-	
VHRS 4 100 070 10 03 100	10,0	1,00	10	70	22,0	-	-	4	-	
VHRS 4 120 078 12 03 010	12,0	0,10	12	78	25,0	-	-	4	-	new/neu
VHRS 4 120 078 12 03 030	12,0	0,30	12	78	25,0	-	-	4	-	
VHRS 4 120 078 12 03 050	12,0	0,50	12	78	25,0	-	-	4	-	
VHRS 4 120 078 12 03 100	12,0	1,00	12	78	25,0	-	-	4	-	
VHRS 4 140 089 14 03 050	14,0	0,50	14	89	30,0	-	-	4	-	
VHRS 4 140 089 14 03 100	14,0	1,00	14	89	30,0	-	-	4	-	new/neu
VHRS 4 160 089 16 03 010	16,0	0,10	16	89	35,0	-	-	4	-	new/neu
VHRS 4 160 089 16 03 050	16,0	0,50	16	89	35,0	-	-	4	-	
VHRS 4 160 089 16 03 100	16,0	1,00	16	89	35,0	-	-	4	-	
VHRS 4 200 102 20 03 050	20,0	0,50	20	102	42,0	-	-	4	-	
VHRS 4 200 102 20 03 100	20,0	1,00	20	102	42,0	-	-	4	-	
VHRS 4 250 120 25 03 050	25,0	0,50	25	120	45,0	-	-	4	-	
VHRS 4 250 120 25 03 100	25,0	1,00	25	120	45,0	-	-	4	-	

EVEN SHANK DIAMETERS STARTING FROM Ø6 MM
ARE AVAILABLE WITH WELDON, ADD "W" TO
THE ARTICLE CODE. E.G. VHRS**W** 4 060…

Neck relief



* For end mills / für Schaftfräser L < 100 mm.



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Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
With neck relief										
VHRS 4 030 051 06 03 L	3,0	0,20	6	51	7,0	9,0	0,100	4	15	
VHRS 4 040 051 06 03 L	4,0	0,30	6	51	9,0	12,0	0,100	4	15	
VHRS 4 050 051 06 03 L	5,0	0,30	6	51	11,0	15,0	0,200	4	15	
VHRS 4 060 064 06 03 010 L	6,0	0,10	6	64	13,0	18,0	0,200	4	-	new/neu
VHRS 4 060 064 06 03 030 L	6,0	0,30	6	64	13,0	18,0	0,200	4	-	
VHRS 4 060 064 06 03 050 L	6,0	0,50	6	64	13,0	18,0	0,200	4	-	
VHRS 4 060 064 06 03 100 L	6,0	1,00	6	64	13,0	18,0	0,200	4	-	
VHRS 4 080 064 08 03 010 L	8,0	0,10	8	64	18,0	24,0	0,300	4	-	new/neu
VHRS 4 080 064 08 03 030 L	8,0	0,30	8	64	18,0	24,0	0,300	4	-	
VHRS 4 080 064 08 03 050 L	8,0	0,50	8	64	18,0	24,0	0,300	4	-	
VHRS 4 080 064 08 03 100 L	8,0	1,00	8	64	18,0	24,0	0,300	4	-	
VHRS 4 100 070 10 03 010 L	10,0	0,10	10	70	22,0	30,0	0,300	4	-	new/neu
VHRS 4 100 070 10 03 030 L	10,0	0,30	10	70	22,0	30,0	0,300	4	-	
VHRS 4 100 070 10 03 050 L	10,0	0,50	10	70	22,0	30,0	0,300	4	-	
VHRS 4 100 070 10 03 100 L	10,0	1,00	10	70	22,0	30,0	0,300	4	-	
VHRS 4 120 083 12 03 010 L	12,0	0,10	12	83	25,0	36,0	0,300	4	-	new/neu
VHRS 4 120 083 12 03 030 L	12,0	0,30	12	83	25,0	36,0	0,300	4	-	new/neu
VHRS 4 120 083 12 03 050 L	12,0	0,50	12	83	25,0	36,0	0,300	4	-	new/neu
VHRS 4 120 083 12 03 100 L	12,0	1,00	12	83	25,0	36,0	0,300	4	-	new/neu
VHRS 4 120 102 12 03 010 L	12,0	0,10	12	102	25,0	36,0	0,300	4	-	new/neu
VHRS 4 120 102 12 03 030 L	12,0	0,30	12	102	25,0	36,0	0,300	4	-	new/neu
VHRS 4 120 102 12 03 050 L	12,0	0,50	12	102	25,0	36,0	0,300	4	-	new/neu
VHRS 4 120 102 12 03 100 L	12,0	1,00	12	102	25,0	36,0	0,300	4	-	new/neu
VHRS 4 140 102 14 03 050 L	14,0	0,50	14	102	30,0	42,0	0,300	4	-	new/neu
VHRS 4 140 102 14 03 100 L	14,0	1,00	14	102	30,0	42,0	0,300	4	-	new/neu
VHRS 4 160 102 16 03 010 L	16,0	0,10	16	102	35,0	48,0	0,300	4	-	new/neu
VHRS 4 160 102 16 03 050 L	16,0	0,50	16	102	35,0	48,0	0,300	4	-	new/neu
VHRS 4 160 102 16 03 100 L	16,0	1,00	16	102	35,0	48,0	0,300	4	-	new/neu
VHRS 4 200 125 20 03 050 L	20,0	0,50	20	125	42,0	60,0	0,300	4	-	new/neu
VHRS 4 200 125 20 03 100 L	20,0	1,00	20	125	42,0	60,0	0,300	4	-	new/neu
VHRS 4 250 131 25 03 050 L	25,0	0,50	25	131	45,0	75,0	0,400	4	-	new/neu
VHRS 4 250 131 25 03 100 L	25,0	1,00	25	131	45,0	75,0	0,400	4	-	

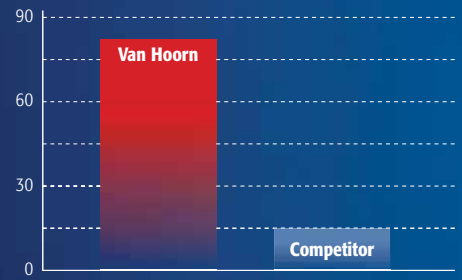
EVEN SHANK DIAMETERS STARTING FROM Ø6 MM ARE AVAILABLE WITH WELDON, ADD "W" TO THE ARTICLE CODE. E.G. VHRS**W** 4 060…

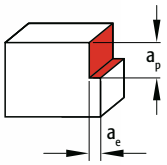
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**140 - 220**	emulsion
P1.2	< 1000	< 300	**100 - 180**	emulsion
P1.3	< 1400	< 400	**70 - 160**	emulsion
H2.1		42-50 HRc	**80 - 140**	emulsion
M3.1	< 950		**80 - 130**	emulsion
M3.2	< 1250		**60 - 100**	emulsion
K4.1	< 800		**100 - 160**	emulsion
S6.1	< 1500		**40 - 60**	emulsion
S6.2	< 1600		**45 - 70**	emulsion
S6.3	< 1600		**30 - 50**	emulsion
S6.4	< 1250		**60 -90**	emulsion

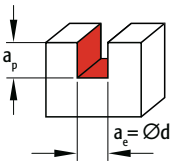
VHRS 41200781203
Workpiece Material: 1.0503
Hardness: - HB

	Van Hoorn	Competitor
V_c	180 m/min	130 m/min
n	4775 rpm	2586 rpm
F_z	0,08 mm/t	0,06 mm/t
a_p	18 mm	12 mm
a_e	3 mm	2 mm
Coolant	emulsion	emulsion
Q	**82 mm³/min**	**15 mm³/min**

Material removal rate
Zerspanungsleistung







Shoulder milling / Eckfräsen (1xD depth of cut)

a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 3,0	< 1,4	0,010 - 0,020
< 4,0	< 1,8	0,015 - 0,030
< 5,0	< 2,3	0,020 - 0,040
< 6,0	< 2,7	0,025 - 0,050
< 8,0	< 3,6	0,030 - 0,060
< 10,0	< 4,5	0,040 - 0,070
< 12,0	< 5,4	0,050 - 0,080
< 14,0	< 6,3	0,055 - 0,090
< 16,0	< 7,2	0,060 - 0,100
< 20,0	< 9,0	0,080 - 0,120
< 25,0	< 11,3	0,100 - 0,150

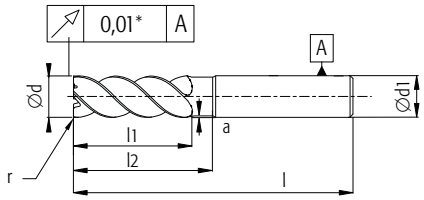
Shoulder milling / Eckfräsen (2xD depth of cut)

a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 6,0	< 0,75	0,010 - 0,030
< 8,0	< 1,00	0,020 - 0,040
< 10,0	< 1,25	0,025 - 0,055
< 12,0	< 1,50	0,035 - 0,065
< 16,0	< 2,00	0,045 - 0,075
< 20,0	< 2,50	0,055 - 0,085
< 24,0	< 3,00	0,070 - 0,100
< 28,0	< 3,50	0,080 - 0,120
< 32,0	< 4,00	0,090 - 0,130
< 40,0	< 5,00	0,110 - 0,150
< 50,0	< 6,25	0,135 - 0,185

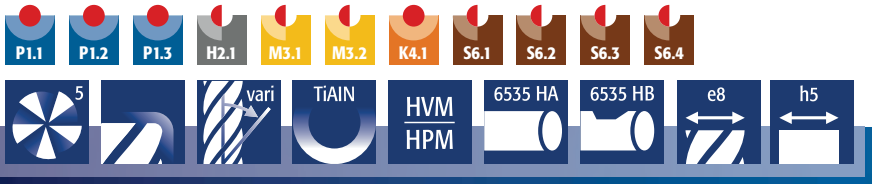
Slot milling / Nutfräsen

a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 3,0	3,0	0,005 - 0,015
< 4,0	4,0	0,008 - 0,025
< 5,0	5,0	0,010 - 0,030
< 6,0	6,0	0,015 - 0,035
< 8,0	8,0	0,025 - 0,045
< 10,0	10,0	0,030 - 0,050
< 12,0	12,0	0,035 - 0,060
< 14,0	14,0	0,040 - 0,070
< 16,0	16,0	0,050 - 0,080
< 20,0	20,0	0,060 - 0,100
< 25,0	25,0	0,080 - 0,130

Short



* For end mills / für Schaftfräser L < 100 mm.



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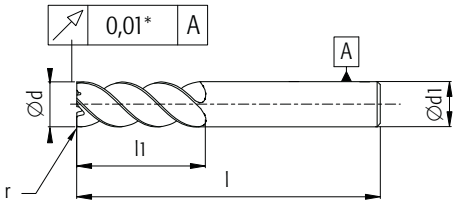
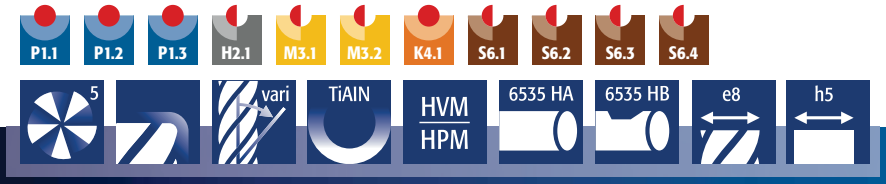
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
Short / Kurze Ausführung										
VHRS 5 030 051 06 03 S	3,0	0,20	6	51	5,0	7,0	0,100	5	15	
VHRS 5 040 051 06 03 S	4,0	0,20	6	51	6,0	9,0	0,100	5	15	
VHRS 5 050 051 06 03 S	5,0	0,20	6	51	7,0	11,0	0,200	5	15	
VHRS 5 060 064 06 03 010 S	6,0	0,10	6	64	8,0	13,0	0,200	5	-	new/neu
VHRS 5 060 064 06 03 030 S	6,0	0,30	6	64	8,0	13,0	0,200	5	-	
VHRS 5 060 064 06 03 050 S	6,0	0,50	6	64	8,0	13,0	0,200	5	-	
VHRS 5 060 064 06 03 100 S	6,0	1,00	6	64	8,0	13,0	0,200	5	-	
VHRS 5 080 064 08 03 010 S	8,0	0,10	8	64	11,0	18,0	0,300	5	-	new/neu
VHRS 5 080 064 08 03 030 S	8,0	0,30	8	64	11,0	18,0	0,300	5	-	
VHRS 5 080 064 08 03 050 S	8,0	0,50	8	64	11,0	18,0	0,300	5	-	
VHRS 5 080 064 08 03 100 S	8,0	1,00	8	64	11,0	18,0	0,300	5	-	
VHRS 5 100 070 10 03 010 S	10,0	0,10	10	70	13,0	22,0	0,300	5	-	new/neu
VHRS 5 100 070 10 03 030 S	10,0	0,30	10	70	13,0	22,0	0,300	5	-	
VHRS 5 100 070 10 03 050 S	10,0	0,50	10	70	13,0	22,0	0,300	5	-	
VHRS 5 100 070 10 03 100 S	10,0	1,00	10	70	13,0	22,0	0,300	5	-	
VHRS 5 120 078 12 03 010 S	12,0	0,10	12	78	15,0	25,0	0,300	5	-	new/neu
VHRS 5 120 078 12 03 030 S	12,0	0,30	12	78	15,0	25,0	0,300	5	-	
VHRS 5 120 078 12 03 050 S	12,0	0,50	12	78	15,0	25,0	0,300	5	-	
VHRS 5 120 078 12 03 100 S	12,0	1,00	12	78	15,0	25,0	0,300	5	-	
VHRS 5 140 089 14 03 050 S	14,0	0,50	14	89	17,0	30,0	0,300	5	-	new/neu
VHRS 5 140 089 14 03 100 S	14,0	1,00	14	89	17,0	30,0	0,300	5	-	
VHRS 5 160 089 16 03 010 S	16,0	0,10	16	89	19,0	35,0	0,300	5	-	new/neu
VHRS 5 160 089 16 03 050 S	16,0	0,50	16	89	19,0	35,0	0,300	5	-	
VHRS 5 160 089 16 03 100 S	16,0	1,00	16	89	19,0	35,0	0,300	5	-	
VHRS 5 200 102 20 03 050 S	20,0	0,50	20	102	23,0	42,0	0,400	5	-	
VHRS 5 200 102 20 03 100 S	20,0	1,00	20	102	23,0	42,0	0,400	5	-	
VHRS 5 250 120 25 03 050 S	25,0	0,50	25	120	28,0	45,0	0,400	5	-	
VHRS 5 250 120 25 03 100 S	25,0	1,00	25	120	28,0	45,0	0,400	5	-	

EVEN SHANK DIAMETERS STARTING FROM Ø6 MM ARE AVAILABLE WITH WELDON, ADD "W" TO THE ARTICLE CODE. E.G. VHRS**W** 5 060…

Standard



* For end mills / für Schaftfräser L < 100 mm.



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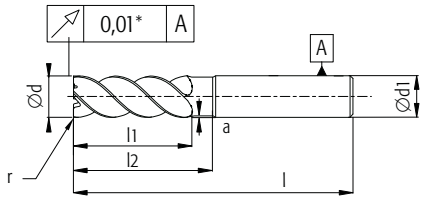
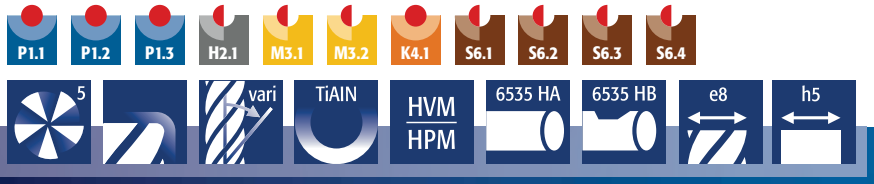
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
Standard										
VHRS 5 030 051 06 03	3,0	0,20	6	51	7,0	-	-	5	15	
VHRS 5 040 051 06 03	4,0	0,20	6	51	9,0	-	-	5	15	
VHRS 5 050 051 06 03	5,0	0,20	6	51	11,0	-	-	5	15	
VHRS 5 060 064 06 03 010	6,0	0,10	6	64	13,0	-	-	5	-	new/neu
VHRS 5 060 064 06 03 030	6,0	0,30	6	64	13,0	-	-	5	-	
VHRS 5 060 064 06 03 050	6,0	0,50	6	64	13,0	-	-	5	-	
VHRS 5 060 064 06 03 100	6,0	1,00	6	64	13,0	-	-	5	-	
VHRS 5 080 064 08 03 010	8,0	0,10	8	64	18,0	-	-	5	-	new/neu
VHRS 5 080 064 08 03 030	8,0	0,30	8	64	18,0	-	-	5	-	
VHRS 5 080 064 08 03 050	8,0	0,50	8	64	18,0	-	-	5	-	
VHRS 5 080 064 08 03 100	8,0	1,00	8	64	18,0	-	-	5	-	
VHRS 5 100 070 10 03 010	10,0	0,10	10	70	22,0	-	-	5	-	new/neu
VHRS 5 100 070 10 03 030	10,0	0,30	10	70	22,0	-	-	5	-	
VHRS 5 100 070 10 03 050	10,0	0,50	10	70	22,0	-	-	5	-	
VHRS 5 100 070 10 03 100	10,0	1,00	10	70	22,0	-	-	5	-	
VHRS 5 120 078 12 03 010	12,0	0,10	12	78	25,0	-	-	5	-	new/neu
VHRS 5 120 078 12 03 030	12,0	0,30	12	78	25,0	-	-	5	-	
VHRS 5 120 078 12 03 050	12,0	0,50	12	78	25,0	-	-	5	-	
VHRS 5 120 078 12 03 100	12,0	1,00	12	78	25,0	-	-	5	-	
VHRS 5 140 089 14 03 050	14,0	0,50	14	89	30,0	-	-	5	-	new/neu
VHRS 5 140 089 14 03 100	14,0	1,00	14	89	30,0	-	-	5	-	
VHRS 5 160 089 16 03 010	16,0	0,10	16	89	35,0	-	-	5	-	new/neu
VHRS 5 160 089 16 03 050	16,0	0,50	16	89	35,0	-	-	5	-	
VHRS 5 160 089 16 03 100	16,0	1,00	16	89	35,0	-	-	5	-	
VHRS 5 200 102 20 03 050	20,0	0,50	20	102	42,0	-	-	5	-	
VHRS 5 200 102 20 03 100	20,0	1,00	20	102	42,0	-	-	5	-	
VHRS 5 250 120 25 03 050	25,0	0,50	25	120	45,0	-	-	5	-	
VHRS 5 250 120 25 03 100	25,0	1,00	25	120	45,0	-	-	5	-	

EVEN SHANK DIAMETERS STARTING FROM Ø6 MM
ARE AVAILABLE WITH WELDON, ADD "W" TO
THE ARTICLE CODE. E.G. VHRS**W** 5 060…

Neck relief



* For end mills / für Schaftfräser L < 100 mm.



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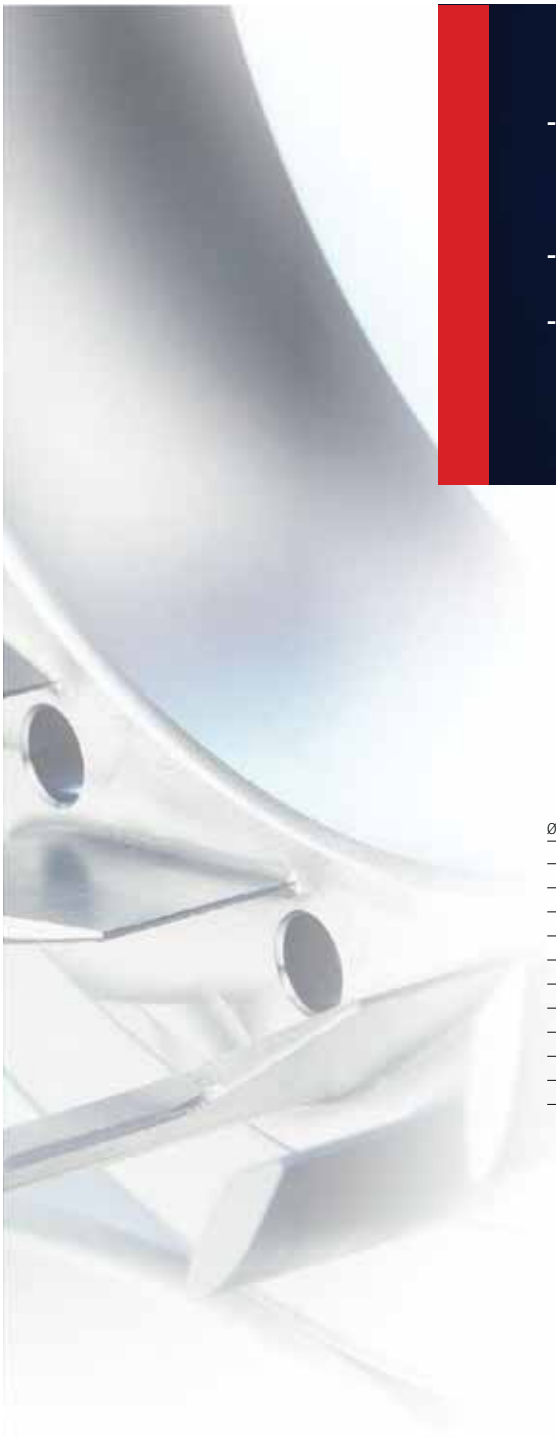
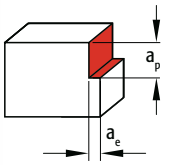
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
With neck relief										
VHRS 5 030 051 06 03 020 L	3,0	0,20	6	51	8,0	9,0	0,100	5	15	
VHRS 5 040 051 06 03 020 L	4,0	0,20	6	51	10,0	12,0	0,100	5	15	
VHRS 5 050 051 06 03 020 L	5,0	0,20	6	51	12,0	15,0	0,200	5	15	
VHRS 5 060 064 06 03 010 L	6,0	0,10	6	64	13,0	18,0	0,200	5	-	new/neu
VHRS 5 060 064 06 03 030 L	6,0	0,30	6	64	14,0	18,0	0,200	5	-	
VHRS 5 060 064 06 03 050 L	6,0	0,50	6	64	14,0	18,0	0,200	5	-	
VHRS 5 060 064 06 03 100 L	6,0	1,00	6	64	14,0	18,0	0,200	5	-	
VHRS 5 080 064 08 03 010 L	8,0	0,10	8	64	18,0	24,0	0,300	5	-	new/neu
VHRS 5 080 064 08 03 030 L	8,0	0,30	8	64	18,0	24,0	0,300	5	-	
VHRS 5 080 064 08 03 050 L	8,0	0,50	8	64	18,0	24,0	0,300	5	-	
VHRS 5 080 064 08 03 100 L	8,0	1,00	8	64	18,0	24,0	0,300	5	-	
VHRS 5 100 070 10 03 010 L	10,0	0,10	10	70	22,0	30,0	0,300	5	-	new/neu
VHRS 5 100 070 10 03 030 L	10,0	0,30	10	70	22,0	30,0	0,300	5	-	
VHRS 5 100 070 10 03 050 L	10,0	0,50	10	70	22,0	30,0	0,300	5	-	
VHRS 5 100 070 10 03 100 L	10,0	1,00	10	70	22,0	30,0	0,300	5	-	
VHRS 5 120 083 12 03 010 L	12,0	0,10	12	83	25,0	36,0	0,300	5	-	new/neu
VHRS 5 120 083 12 03 030 L	12,0	0,30	12	83	25,0	36,0	0,300	5	-	new/neu
VHRS 5 120 083 12 03 050 L	12,0	0,50	12	83	25,0	36,0	0,300	5	-	new/neu
VHRS 5 120 083 12 03 100 L	12,0	1,00	12	83	25,0	36,0	0,300	5	-	new/neu
VHRS 5 120 102 12 03 010 L	12,0	0,10	12	102	25,0	36,0	0,300	5	-	new/neu
VHRS 5 120 102 12 03 030 L	12,0	0,30	12	102	25,0	36,0	0,300	5	-	
VHRS 5 120 102 12 03 050 L	12,0	0,50	12	102	25,0	36,0	0,300	5	-	
VHRS 5 120 102 12 03 100 L	12,0	1,00	12	102	25,0	36,0	0,300	5	-	
VHRS 5 140 102 14 03 050 L	14,0	0,50	14	102	30,0	42,0	0,300	5	-	new/neu
VHRS 5 140 102 14 03 100 L	14,0	1,00	14	102	30,0	42,0	0,300	5	-	
VHRS 5 160 102 16 03 010 L	16,0	0,10	16	102	35,0	48,0	0,300	5	-	new/neu
VHRS 5 160 102 16 03 050 L	16,0	0,50	16	102	35,0	48,0	0,300	5	-	
VHRS 5 160 102 16 03 100 L	16,0	1,00	16	102	35,0	48,0	0,300	5	-	
VHRS 5 200 125 20 03 050 L	20,0	0,50	20	125	42,0	60,0	0,400	5	-	
VHRS 5 200 125 20 03 100 L	20,0	1,00	20	125	42,0	60,0	0,400	5	-	
VHRS 5 250 131 25 03 050 L	25,0	0,50	25	131	45,0	75,0	0,400	5	-	
VHRS 5 250 131 25 03 100 L	25,0	1,00	25	131	45,0	75,0	0,400	5	-	

EVEN SHANK DIAMETERS STARTING FROM Ø6 MM ARE AVAILABLE WITH WELDON, ADD "W" TO THE ARTICLE CODE. E.G. VHRS**W** 5 060…

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**140 - 220**	emulsion
P1.2	< 1000	< 300	**100 - 180**	emulsion
P1.3	< 1400	< 400	**70 - 160**	emulsion
H2.1		42-50 HRc	**80 - 140**	emulsion
M3.1	< 950		**80 - 130**	emulsion
M3.2	< 1250		**60 - 100**	emulsion
K4.1	< 800		**100 - 160**	emulsion
S6.1	< 1500		**40 - 60**	emulsion
S6.2	< 1600		**45 - 70**	emulsion
S6.3	< 1600		**30 - 50**	emulsion
S6.4	< 1250		**60 -90**	emulsion

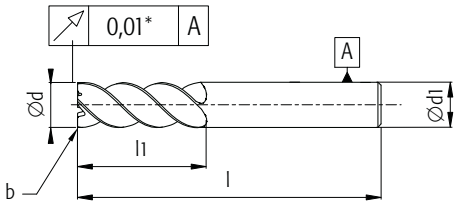


- **Special designed geometry for machining materials P1.1, 1.2, 1.3, K4.1**
  Spezieller Geometrie zur Zerspanung materialen P1.1, 1.2, 1.3, K4.1
- **5 Flute for new machining strategies**
  5 Schneiden zur Zerspanung mit neuen Strategien
- **High metal removal rate!**
  Maximales Zerspanungsvolumen!

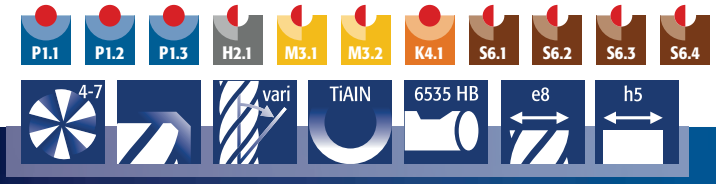


Ød (mm)	Shoulder milling / Stirnfräsen (1xD depth of cut) a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	Shoulder milling / Stirnfräsen (2xD depth of cut) a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
3,0	< 3,00	< 1,4	0,010 - 0,020	< 6,00	< 0,750	0,010 - 0,030
4,0	< 4,00	< 1,8	0,015 - 0,030	< 8,00	< 1,000	0,020 - 0,040
5,0	< 5,00	< 2,3	0,020 -0,040	< 10,00	< 1,250	0,025 - 0,055
6,0	< 6,00	< 2,7	0,025 - 0,050	< 12,00	< 1,500	0,035 - 0,065
8,0	< 8,00	< 3,6	0,030 - 0,060	< 16,00	< 2,000	0,045 - 0,075
10,0	< 10,00	< 4,5	0,040 - 0,070	< 20,00	< 2,500	0,055 - 0,085
12,0	< 12,00	< 5,4	0,050 - 0,080	< 24,00	< 3,000	0,070 - 0,100
14,0	< 14,00	< 6,3	0,055 - 0,090	< 28,00	< 3,500	0,080 - 0,120
16,0	< 16,00	< 7,2	0,060 - 0,100	< 32,00	< 4,000	0,090 - 0,130
20,0	< 20,00	< 9,0	0,080 - 0,120	< 40,00	< 5,000	0,110 - 0,150
25,0	< 25,00	< 11,3	0,100 - 0,150	< 50,00	< 6,250	0,135 - 0,185

Standard



* For end mills / für Schaftfräser L < 100 mm.

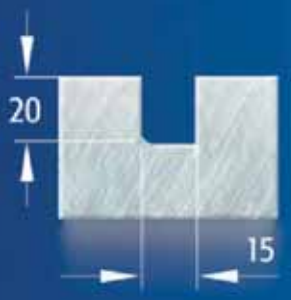


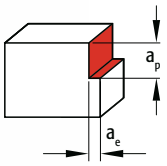
Article Number *Artikelnummer*	Ød (mm)	b (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
VHTS 4 030 060 06 03	3,0	0,10	6	60	10,0	-	-	4	15	new/neu
VHTS 4 040 060 06 03	4,0	0,10	6	60	13,0	-	-	4	15	new/neu
VHTS 4 050 060 06 03	5,0	0,10	6	60	16,0	-	-	4	15	new/neu
VHTS 5 060 060 06 03	6,0	0,10	6	60	19,0	-	-	5	-	new/neu
VHTS 5 080 065 08 03	8,0	0,15	8	65	25,0	-	-	5	-	new/neu
VHTS 5 100 078 10 03	10,0	0,20	10	78	32,0	-	-	5	-	new/neu
VHTS 6 120 090 12 03	12,0	0,20	12	90	38,0	-	-	6	-	new/neu
VHTS 6 160 100 16 03	16,0	0,30	16	100	42,0	-	-	6	-	new/neu
VHTS 7 200 105 20 03	20,0	0,40	20	105	50,0	-	-	7	-	new/neu
4xD										
VHTS 4 030 064 06 03 L	3,0	0,10	6	64	13,0	-	-	4	15	new/neu
VHTS 4 040 064 06 03 L	4,0	0,10	6	64	17,0	-	-	4	15	new/neu
VHTS 4 050 064 06 03 L	5,0	0,10	6	64	21,0	-	-	4	15	new/neu
VHTS 5 060 064 06 03 L	6,0	0,10	6	64	25,0	-	-	5	-	new/neu
VHTS 5 080 078 08 03 L	8,0	0,15	8	78	33,0	-	-	5	-	new/neu
VHTS 5 100 089 10 03 L	10,0	0,15	10	89	42,0	-	-	5	-	new/neu
VHTS 5 120 102 12 03 L	12,0	0,15	12	102	50,0	-	-	5	-	new/neu
VHTS 5 160 125 16 03 L	16,0	0,20	16	125	66,0	-	-	5	-	new/neu

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**240 - 300**	emulsion
P1.2	< 1000	< 300	**160 - 240**	emulsion
P1.3	< 1400	< 400	**130 - 200**	emulsion
H2.1		< 50 HRc	**100 - 150**	emulsion
M3.1	< 950		**100 - 150**	emulsion
M3.2	< 1250		**90 - 120**	emulsion
K4.1	< 800		**125 - 225**	emulsion
S6.1	< 1500		**45 - 65**	emulsion
S6.2	< 1600		**50 - 80**	emulsion
S6.3	< 1600		**35 - 55**	emulsion
S6.4	< 1250		**70 - 105**	emulsion

Workpiece Material: St.37

	VHTS 5 100 072 06 03	Competitor
a_p max	20 mm	10 mm
a_e	1 mm (programmed)	10 mm / 5 mm
V_c	250 mtr/min	180 mtr/min
n	7957 rpm	5730 rpm
F_z	0,12 mm/t	0,04 mm/t
V_f	4774 mm/min	912 mm/min
Productiontime	24 s	37 s





Shoulder milling / Eckfräsen

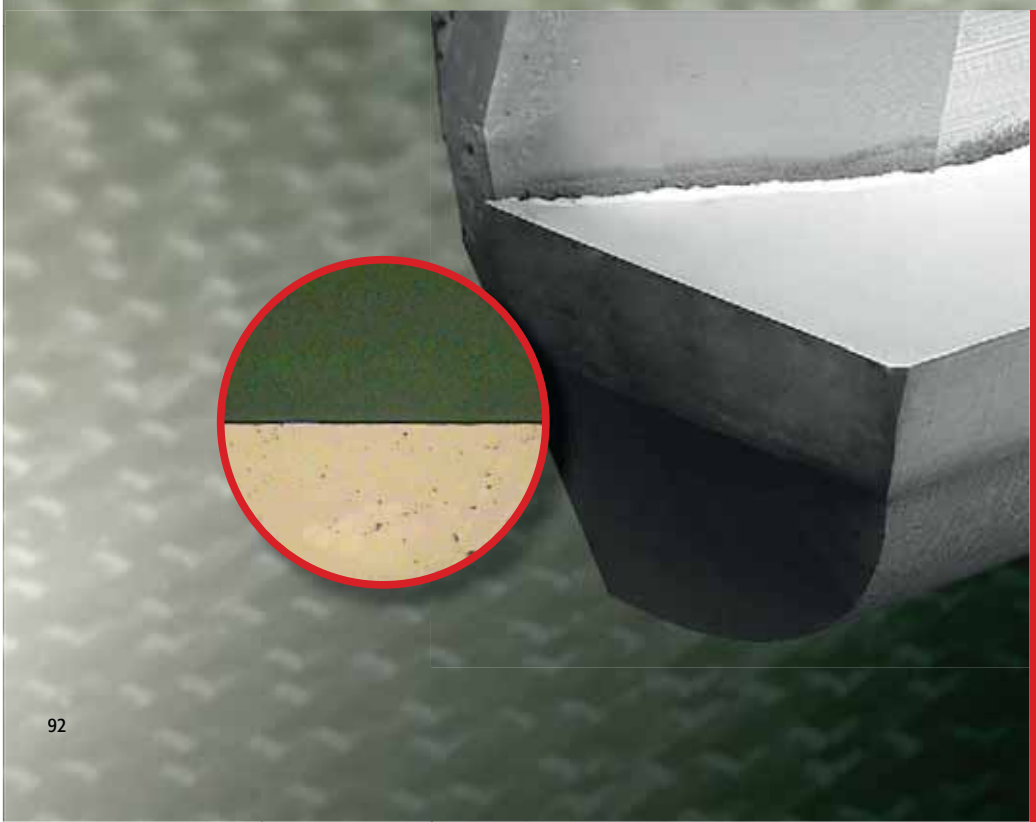
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
3,0	< 9,00	< 0,600	0,015 - 0,035
4,0	< 12,00	< 0,800	0,025 - 0,050
5,0	< 15,00	< 1,000	0,030 - 0,060
6,0	< 18,00	< 1,200	0,040 - 0,070
8,0	< 24,00	< 1,600	0,050 - 0,085
10,0	< 30,00	< 2,000	0,060 - 0,100
12,0	< 36,00	< 2,400	0,085 - 0,120
16,0	< 40,00	<3 ,200	0,100 - 0,145
20,0	< 50,00	< 4,000	0,125 - 0,175

Solutions for synthetics and composite materials

Lösungen für die Bearbeitung von Kunst- und Verbundwerkstoffen

Years of experience and numerous tests in aerospace applications, provided the details required to develop an integral end mill high-end program for glass- and carbon fibre reinforced materials.

Jahrelange Erfahrung und zahlreiche Teste in der Luft- und Raumfahrtindustrie ermöglichten die Entwicklung eines umfassenden High-End-Fräserprogramms für Glas- und Kohlefaserverstärkte Werkstoffe.



Van Hoorn vs competitor

Workpiece Material: Nylon
End mill: VHDT 2 100 078 R010
Hardness: with Glass Fibre

	Van Hoorn	Competitor
V_c	251 m/min	402 m/min
n	8.000 -/min	8.000 -/min
F_z	0,188 mm/t	0,025 mm/t
V_f	3.000 mm/min	400 mm/min
a_p	1,2 mm	4,5 mm
a_e	10 mm	16 mm
Coolant	air / external	air / external
Q	36,0 cm^3/min	28,8 cm^3/min
Tool life	25 pockets	13 pockets

Diamond tipped vs PCD

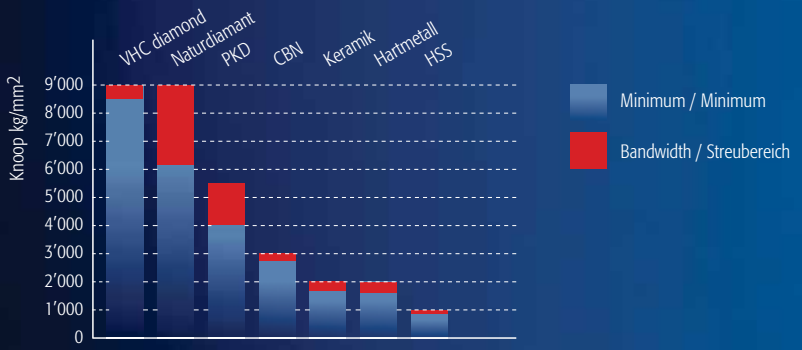
Diamantbestückung vs PCD

2 To 5 times more tool life
2 Bis 5-fache Standzeit

More accuracy & a better surface finish
Höhere Genauigkeit und bessere Oberflächenqualität

Higher machine efficiency
Höhere Maschineneffizienz

Hardness Comparison (Knoop kg/mm²)
Härtevergleich (Knoop kg/mm²)

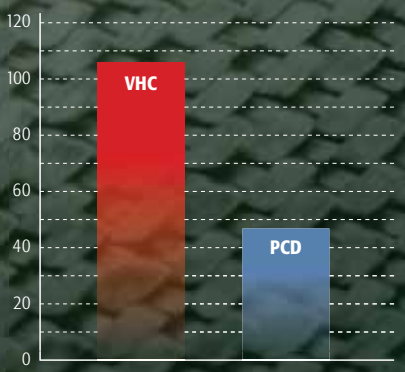


High accurate manufacturing by laser

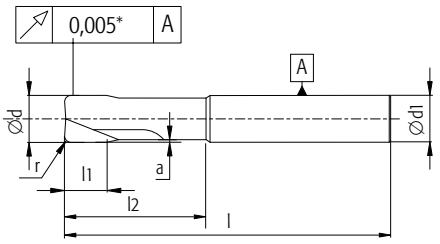
Hohe Genauigkeit Produktion mit laser

Workpiece Material:	Aerospace Composite T800/M21
End mill:	VHDT 2 060 078 R05
Operation / Bearbeitung:	Schoulder Milling / Eckfräsen
V_c	285 m/min
D_c	6,0 mm
F_z	0,12 mm/t
V_f	3.000 mm/min
a_p	4,0 mm
a_e	2,5 mm
Coolant	air / external
Result / Ergebnis **PCD**	47,0 cm³/min
Result / Ergebnis **VHC**	107,0 cm³/min
Improvement Verbesserung	**2,3 time higher tool life** 2,3 fache Standzeit

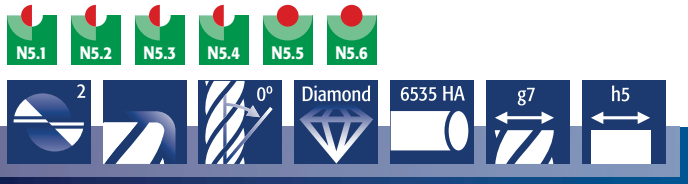
Praxis examples
Bearbeitungsbeispiele



Standard



* For end mills / für Schaftfräser L < 100 mm.



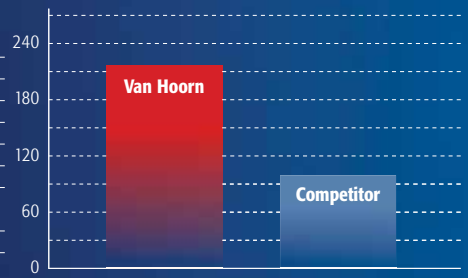
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHDT 2 030 078 030 L09	3,0	0,30	6	78	2,50	9,00	0,250	2	25
VHDT 2 030 078 030 L15	3,0	0,30	6	78	2,50	15,00	0,250	2	25
VHDT 2 030 078 R03	3,0	0,30	6	78	3,00	9,00	0,100	2	15
VHDT 2 030 078 050 L09	3,0	0,50	6	78	2,50	9,00	0,250	2	25
VHDT 2 030 078 050 L15	3,0	0,50	6	78	2,50	15,00	0,250	2	25
VHDT 2 030 078 R05	3,0	0,50	6	78	3,00	9,00	0,100	2	15
VHDT 2 040 078 030 L12	4,0	0,30	6	78	2,50	12,00	0,250	2	25
VHDT 2 040 078 030 L20	4,0	0,30	6	78	2,50	20,00	0,250	2	25
VHDT 2 040 078 R03	4,0	0,30	6	78	4,00	12,00	0,100	2	15
VHDT 2 040 078 050 L12	4,0	0,50	6	78	2,50	12,00	0,250	2	25
VHDT 2 040 078 050 L20	4,0	0,50	6	78	2,50	20,00	0,250	2	25
VHDT 2 040 078 R05	4,0	0,50	6	78	4,00	12,00	0,100	2	15
VHDT 2 050 078 030 L15	5,0	0,30	6	78	3,00	15,00	0,300	2	25
VHDT 2 050 078 030 L25	5,0	0,30	6	78	3,00	25,00	0,300	2	25
VHDT 2 050 078 050 L15	5,0	0,50	6	78	3,00	15,00	0,300	2	25
VHDT 2 050 078 050 L25	5,0	0,50	6	78	3,00	25,00	0,300	2	25
VHDT 2 050 078 R05	5,0	0,50	6	78	5,00	15,00	0,100	2	15
VHDT 2 050 078 R10	5,0	1,00	6	78	5,00	15,00	0,100	2	15
VHDT 2 060 078 R05	6,0	0,50	6	78	6,00	18,00	0,100	2	-
VHDT 2 060 078 R10	6,0	1,00	6	78	6,00	18,00	0,100	2	-
VHDT 2 060 102 030 L18	6,0	0,30	6	102	6,00	18,00	0,300	2	-
VHDT 2 060 102 030 L30	6,0	0,30	6	102	6,00	30,00	0,300	2	-
VHDT 2 060 102 050 L18	6,0	0,50	6	102	6,00	18,00	0,300	2	-
VHDT 2 060 102 050 L30	6,0	0,50	6	102	6,00	30,00	0,300	2	-
VHDT 2 060 102 100 L18	6,0	1,00	6	102	6,00	18,00	0,300	2	-
VHDT 2 060 102 100 L30	6,0	1,00	6	102	6,00	30,00	0,300	2	-
VHDT 2 080 078 R05	8,0	0,50	8	78	8,00	24,00	0,100	2	-
VHDT 2 080 078 R10	8,0	1,00	8	78	8,00	24,00	0,100	2	-
VHDT 2 080 102 030 L24	8,0	0,30	8	102	7,00	24,00	0,400	2	-
VHDT 2 080 102 050 L24	8,0	0,50	8	102	7,00	24,00	0,400	2	-
VHDT 2 080 102 100 L24	8,0	1,00	8	102	7,00	24,00	0,400	2	-
VHDT 2 100 078 R10	10,0	1,00	10	78	10,00	30,00	0,100	2	-
VHDT 2 100 102 050 L30	10,0	0,50	10	102	8,00	30,00	0,500	2	-
VHDT 2 100 102 100 L30	10,0	1,00	10	102	8,00	30,00	0,500	2	-
VHDT 2 120 078 R10	12,0	1,00	12	78	12,00	30,00	0,100	2	-
VHDT 2 120 107 050 L36	12,0	0,50	12	107	9,00	36,00	0,500	2	-
VHDT 2 120 107 100 L36	12,0	1,00	12	107	9,00	36,00	0,500	2	-

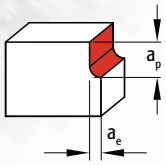
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.1	< 500	< 150	**350 - 650**	emulsion / air
N5.2	< 400	< 120	**200 - 500**	emulsion / air
N5.3	< 350	< 100	**350 - 500**	emulsion / air
N5.4			**400 - 1000**	emulsion / air
N5.5			**400 - 1000**	emulsion / air
N5.6			**< 700**	emulsion / air

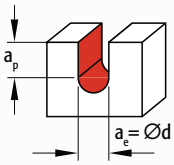
VHDT2060078R05
Workpiece Material: T800 M21
Hardness: Aerospace Material

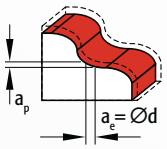
	Van Hoorn	Competitor
V_c	283 m/min	283 m/min
n	15000 rpm	15000 rpm
F_z	0,10 mm/t	0,10 mm/t
V_f	3000 mm/min	3000 mm/min
a_p	4,0 mm	4,0 mm
a_e	6,0 mm	6,0 mm
Coolant	emulsion	emulsion
Q	**72,0 mm³/min**	**72,0 mm³/min**
Tool life	**214 min**	**94 min**

Tool life
Lebensdauer









Shoulder milling / Eckfräsen

Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
3,0	< 1,95	< 1,20	0,020 - 0,030
4,0	< 2,60	< 1,60	0,030 - 0,045
5,0	< 3,25	< 2,00	0,040 - 0,060
6,0	< 3,90	< 2,40	0,050 - 0,070
8,0	< 5,20	< 3,20	0,060 - 0,080
10,0	< 6,50	< 4,00	0,070 - 0,100
12,0	< 7,80	< 4,80	0,090 - 0,120

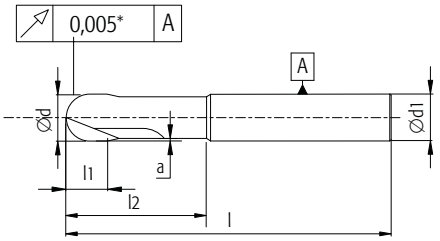
Slot milling / Nutfräsen

a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 0,60	< 3,0	0,010 - 0,020
< 0,80	< 4,0	0,020 - 0,040
< 1,00	< 5,0	0,030 - 0,045
< 1,20	< 6,0	0,040 - 0,060
< 1,60	< 8,0	0,050 - 0,070
< 2,00	< 10,0	0,060 - 0,080
< 2,40	< 12,0	0,080 - 0,100

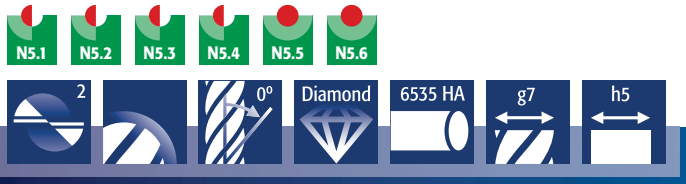
Profile milling / Profilfräsen

a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 0,60	< 0,30	0,020 - 0,030
< 0,80	< 0,40	0,030 - 0,045
< 1,00	< 0,50	0,040 - 0,060
< 1,20	< 0,60	0,050 - 0,070
< 1,60	< 0,80	0,060 - 0,080
< 2,00	< 1,00	0,070 - 0,100
< 2,40	< 12,0	0,080 - 0,120

Standard



* For end mills / für Schaftfräser L < 100 mm.



Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHDB 2 030 078 L09	3,0	1,50	6	78	2,50	9,00	0,250	2	25
VHDB 2 030 078 L15	3,0	1,50	6	78	2,50	15,00	0,250	2	25
VHDB 2 030 078	3,0	1,50	6	78	3,00	9,00	0,100	2	15
VHDB 2 040 078 L12	4,0	2,00	6	78	2,50	12,00	0,250	2	25
VHDB 2 040 078 L20	4,0	2,00	6	78	2,50	20,00	0,250	2	25
VHDB 2 040 078	4,0	2,00	6	78	4,00	12,00	0,100	2	15
VHDB 2 050 078 L15	5,0	2,50	6	78	3,00	15,00	0,300	2	25
VHDB 2 050 078 L25	5,0	2,50	6	78	3,00	25,00	0,300	2	25
VHDB 2 050 078	5,0	2,50	6	78	5,00	15,00	0,100	2	15
VHDB 2 060 078	6,0	3,00	6	78	6,00	18,00	0,100	2	-
VHDB 2 060 102 L18	6,0	3,00	6	102	6,00	18,00	0,300	2	-
VHDB 2 060 102 L30	6,0	3,00	6	102	6,00	30,00	0,300	2	-
VHDB 2 080 078	8,0	4,00	8	78	8,00	24,00	0,100	2	-
VHDB 2 080 102 L24	8,0	4,00	8	102	7,00	24,00	0,400	2	-
VHDB 2 080 102 L40	8,0	4,00	8	102	7,00	40,00	0,400	2	-
VHDB 2 100 078	10,0	5,00	10	78	10,00	30,00	0,100	2	-
VHDB 2 100 102 L30	10,0	5,00	10	102	8,00	30,00	0,500	2	-
VHDB 2 100 102 L50	10,0	5,00	10	102	8,00	50,00	0,500	2	-
VHDB 2 120 078	12,0	6,00	12	78	12,00	30,00	0,100	2	-
VHDB 2 120 107 L36	12,0	6,00	12	107	9,00	36,00	0,500	2	-
VHDB 2 120 107 L60	12,0	6,00	12	107	9,00	60,00	0,500	2	-

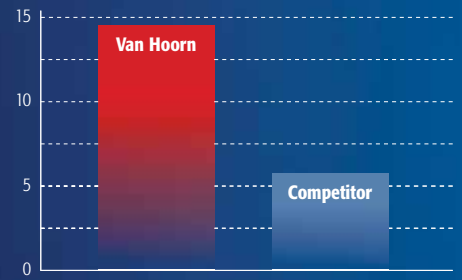
Available in special dimensions on request.
Sondermaße auf Anfrage lieferbar.

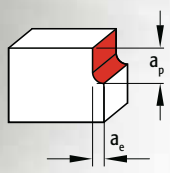
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.1	< 500	< 150	**350 - 650**	emulsion / air
N5.2	< 400	< 120	**200 - 500**	emulsion / air
N5.3	< 350	< 100	**350 - 500**	emulsion / air
N5.4			**400 - 1000**	emulsion / air
N5.5			**400 - 1000**	emulsion / air
N5.6			**< 700**	emulsion / air

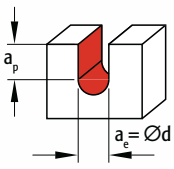
VHDB2100078
Workpiece Material: Hextool
Hardness: Aerospace Material

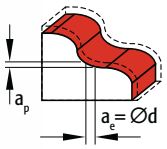
	Van Hoorn	Competitor
V_c	314 m/min	377 m/min
n	10000 rpm	10000 rpm
F_z	0,15 mm/t	0,10 mm/t
V_f	3000 mm/min	2600 mm/min
a_p	0,35 mm	0,35 mm
a_e	0,35 mm	0,35 mm
Coolant	dry	dry
Q	**0,37 mm³/min**	**0,32 mm³/min**
Tool life	**14 h 10 min**	**5 h 33 min**

Tool life
Lebensdauer









Shoulder milling / Stirnfräsen

Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
3,0	< 1,95	< 1,2	0,020 - 0,030
4,0	< 2,60	< 1,6	0,030 - 0,045
5,0	< 3,25	< 2,0	0,040 - 0,060
6,0	< 3,90	< 2,4	0,050 - 0,070
8,0	< 5,20	< 3,2	0,060 - 0,080
10,0	< 6,50	< 4,0	0,070 - 0,100
12,0	< 7,80	< 4,8	0,090 - 0,120

Slot milling / Nutfräsen

a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 0,6	3,0	0,010 - 0,020
< 0,8	4,0	0,020 - 0,040
< 1,0	5,0	0,030 - 0,045
< 1,2	6,0	0,040 - 0,060
< 1,6	8,0	0,050 - 0,070
< 2,0	10,0	0,060 - 0,080
< 2,4	12,0	0,080 - 0,100

Profile milling / Profilfräsen

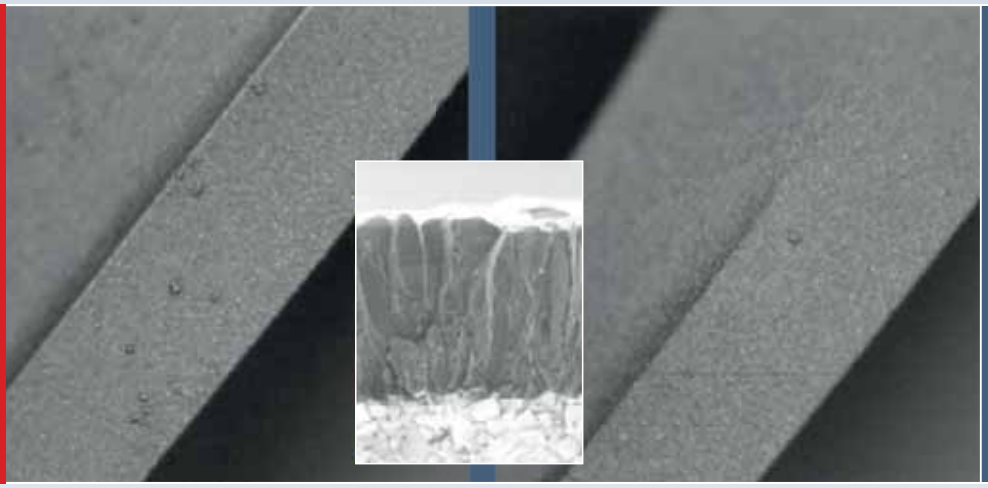
a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
< 0,6	< 0,3	0,020 - 0,030
< 0,8	< 0,4	0,030 - 0,045
< 1,0	< 0,5	0,040 - 0,060
< 1,2	< 0,6	0,050 - 0,070
< 1,6	< 0,8	0,060 - 0,080
< 2,0	< 1,0	0,070 - 0,100
< 2,4	< 1,2	0,080 - 0,120

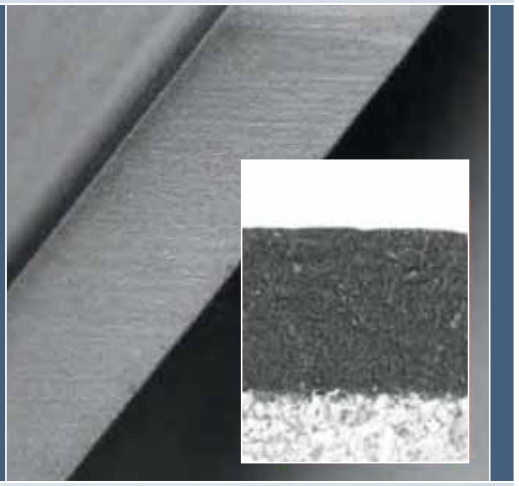
End mills for graphite EDM technology

Schaftfräser für die Graphit-Bearbeitung in der Erodiertechnik (EDM)

The leading technology of Van Hoorn Carbide diamond coated end mills:
Van Hoorn Carbide's Technologieführung durch Diamantbeschichtete Schaftfräser:

- **Accuracy**
  Genauigkeit
- **Smooth surface finish**
  Glatte Oberflächen
- **Process times**
  Bearbeitungszeiten
- **Tool life**
  Standzeit





VHC technology / VHC Technologie:

- **Technology to minimize droplets**
  Verfahren zur Minimierung von Tröpfchenbildung
- **Superior accuracy and tolerances**
  Überragende Genauigkeiten und Toleranzen
- **Improved performance and tool life**
  Leistungssteigerungen und Standzeitverlängerung

Productivity test
Produktivitäts-Test

Workpiece Material: SGL Graphite
End mill: VHGR 2 080 078 08 02
Hardness: R8500

	Van Hoorn	Competitor
V_c	503 m/min	302 m/min
n	20.000 -/min	8.000 -/min
F_z	0,113 mm/t	0,167 mm/t
V_f	4.500 mm/min	4.00 mm/min
a_p	8,0 mm	1,5 mm
a_e	8 mm	12 mm
Coolant	air	air
Q	288 cm^3/min	72 cm^3/min

VHC diamond coated end mills for applications on graphite:

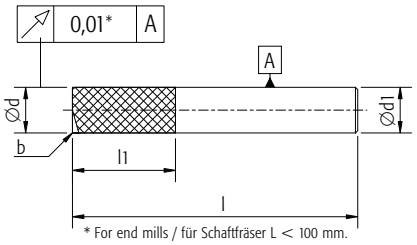
VHC Diamant beschichtete Schaftfräser für die Graphit-Bearbeitung:

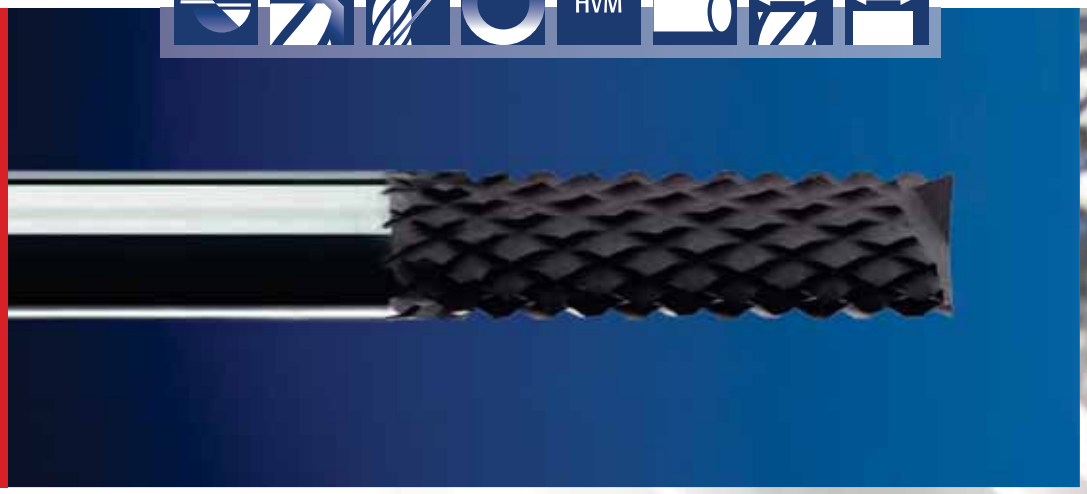
- **VHGR: Roughing geometry.**
  VHGR: Schrupp-Geometrie.
- **VHGT: 40° helix sharp geometry.**
  VHGT: 40° Spiralwinkel scharfer Schneidengeometrie.
- **VHGTF: 40° helix geometry with corner radius.**
  VHGTF: 40° Spiralwinkel mit Eckenradius.
- **VHGKF: 40° helix ball nose geometry.**
  VHGKF: 40° Spiralwinkel Radiusfräser.
- **VHMG: Micro end mill with corner radius.**
  VHMG: Mikro-Schaftfräser scharfer Schneidengeometrie.
- **VHMGK: Micro ball nose geometry.**
  VHMGK: Mikro-Radiusfräser.

Advantages / Vorteile:

- **Better tool life**
  Längere Standzeiten
- **Excellent accuracy**
  Ausgezeichnete Genauigkeiten
- **High production efficiency**
  Hohe Produktivität
- **Excellent surface finish**
  Hervorragende Oberflächenqualität

Standard





Article Number *Artikelnummer*	Ød (mm)	b (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z
VHGR 2 040 060 04 02	4,0	0,25	4	60	12,00	-	-	2
VHGR 2 060 078 06 02	6,0	0,30	6	78	18,00	-	-	2
VHGR 2 080 078 08 02	8,0	0,35	8	78	24,00	-	-	2
VHGR 2 100 078 10 02	10,0	0,40	10	78	30,00	-	-	2
VHGR 2 120 089 12 02	12,0	0,50	12	89	36,00	-	-	2
VHGR 2 120 150 12 02	12,0	0,50	12	150	36,00	50,00	0,300	2
VHGR 2 160 150 16 02	16,0	0,50	16	150	36,00	70,00	0,400	2

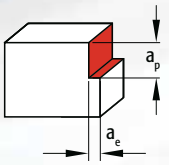
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.4			< 600	air
N5.5			< 600	air
N5.6			350 - 500	air

VHGR21000781002
Material EDM200
Graphite

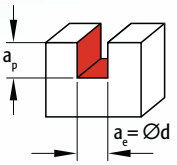
V_c	628 m/min
n	20000 rpm
F_z	* mm/t
V_f	6000 mm/min
a_p	12 mm
a_e	2 mm
Coolant	air
Q	**144 cm³/min**

VHGR for roughing applications on graphite:
VHGR für Schruppbearbeitung in Graphit:

- High material removal rate.
  Hohe Zerspanungsleistung.
- Special roughing pitch.
  Spezielle Schruppverzahnung.
- Designed for high feeds on graphite applications.
  Entwickelt für hohe Vorschübe in der Graphit-Bearbeitung.



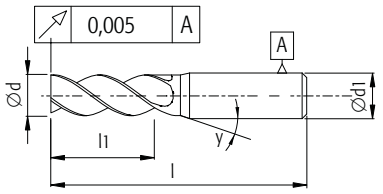
a_p up to 2,50 x d
a_e up to 0,50 x d



a_p up to 1,00 x d

	Shoulder milling / Eckfräsen			Slot milling / Nutfräsen		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
4,0	< 10,0	< 2,0	< 5000	< 4,0	4,0	< 3750
6,0	< 15,0	< 3,0	< 6000	< 6,0	6,0	< 4500
8,0	< 20,0	< 4,0	< 8000	< 8,0	8,0	< 6000
10,0	< 25,0	< 5,0	< 10000	< 10,0	10,0	< 7500
12,0	< 30,0	< 6,0	< 12000	< 12,0	12,0	< 9000
16,0	< 35,0	< 8,0	< 15000	< 16,0	16,0	< 11250

Standard



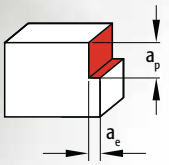
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHGT 3 020 050 03 02	2,0	-	3	50	10,00	-	-	3	15
VHGT 3 030 050 03 02	3,0	-	3	50	10,00	-	-	3	-
VHGT 3 040 060 04 02	4,0	-	4	60	15,00	-	-	3	-
VHGT 3 050 060 05 02	5,0	-	5	60	20,00	-	-	3	-
VHGT 3 060 078 06 02	6,0	-	6	78	30,00	-	-	3	-
VHGT 3 080 078 08 02	8,0	-	8	78	30,00	-	-	3	-
VHGT 3 100 078 10 02	10,0	-	10	78	30,00	-	-	3	-
VHGT 3 120 089 12 02	12,0	-	12	89	30,00	-	-	3	-

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.4			**< 600**	air
N5.5			**< 600**	air
N5.6			**350 - 500**	air

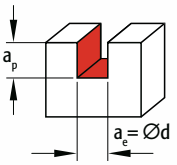
VHGT30600780602
Workpiece Material: Graphite

	Van Hoorn	Competitor
V_c	547 m/min	547 m/min
n	29000 rpm	29000 rpm
F_z	0,023 mm/t	0,005 mm/t
V_f	2000 mm/min	580 mm/min
a_p	3 mm	3 mm
a_e	0,5 mm	0,5 mm
Coolant	air	air
Q	**3,00 mm³/min**	**0,87 mm³/min**
Tool life	**7 h 14 min**	**2 h 37 min**

- More accuracy
  Höhere Genauigkeit
- Smooth surface on the workpiece
  Glatte Werkstückoberflächen
- Better tool life
  Längere Standzeit



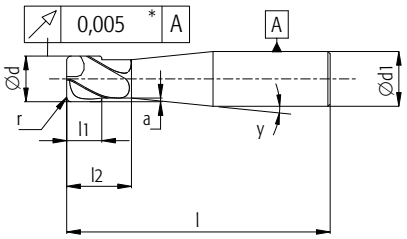
a_p up to 2,0 x d
a_e up to 0,2 x d



a_p up to 1,00 x d

	Shoulder milling / Eckfräsen			Slot milling / Nutfräsen		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
2,0	< 4,0	< 0,4	0,012 - 0,036	< 2,0	2,0	0,010 - 0,030
3,0	< 6,0	< 0,6	0,018 - 0,048	< 3,0	3,0	0,015 - 0,040
4,0	< 8,0	< 0,8	0,030 - 0,060	< 4,0	4,0	0,025 - 0,050
5,0	< 10,0	< 1,0	0,042 - 0,072	< 5,0	5,0	0,035 - 0,060
6,0	< 12,0	< 1,2	0,054 - 0,096	< 6,0	6,0	0,045 - 0,080
8,0	< 16,0	< 1,6	0,066 - 0,120	< 8,0	8,0	0,055 - 0,100
10,0	< 20,0	< 2,0	0,090 - 0,144	< 10,0	10,0	0,075 - 0,120
12,0	< 24,0	< 2,4	0,108 - 0,168	< 12,0	12,0	0,090 - 0,140

Standard



* For end mills / für Schaftfräser L < 100 mm.

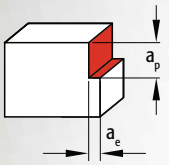
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
Short / Kurze Ausführung										
VHGTF 2 020 050 03 02 S	2,0	0,10	3	50	3,00	10,00	0,100	2	15	
VHGTF 2 030 051 06 02 S	3,0	0,10	6	51	4,00	10,00	0,100	2	15	
VHGTF 4 040 051 06 02 S	4,0	0,20	6	51	4,00	10,00	0,100	4	15	
VHGTF 4 050 051 06 02 S	5,0	0,20	6	51	5,00	10,00	0,150	4	15	
VHGTF 4 060 051 06 02 S	6,0	0,30	6	51	6,00	10,00	0,200	4	-	
VHGTF 4 080 064 08 02 S	8,0	0,30	8	64	8,00	15,00	0,300	4	-	
VHGTF 4 100 078 10 02 S	10,0	0,30	10	78	10,00	20,00	0,300	4	-	
VHGTF 4 120 078 12 02 S	12,0	0,30	12	78	10,00	20,00	0,300	4	-	
Standard										
VHGTF 3 020 050 02 02	2,0	0,10	2	50	10,00	-	-	3	-	
VHGTF 3 020 050 03 02	2,0	0,10	3	50	10,00	-	-	3	15	
VHGTF 3 020 050 03 02 L150	2,0	0,10	3	50	10,00	15,00	0,100	3	10	
VHGTF 3 020 050 03 02 L200	2,0	0,10	3	50	10,00	20,00	0,100	3	15	
VHGTF 3 020 065 03 02 L300	2,0	0,10	3	65	10,00	30,00	0,100	3	15	
VHGTF 3 020 080 03 02 L300	2,0	0,10	3	80	10,00	30,00	0,100	3	15	
VHGTF 3 030 050 03 02	3,0	0,10	3	50	10,00	-	-	3	-	
VHGTF 3 030 065 03 02 L200	3,0	0,10	3	65	10,00	20,00	0,100	3	-	
VHGTF 3 030 065 03 02 L300	3,0	0,10	3	65	10,00	30,00	0,100	3	-	
VHGTF 3 030 080 03 02 L300	3,0	0,10	3	80	10,00	30,00	0,100	3	-	
VHGTF 3 040 060 04 02	4,0	0,20	4	60	15,00	-	-	3	-	
VHGTF 3 050 060 05 02	5,0	0,20	5	60	20,00	-	-	3	-	
VHGTF 3 060 078 06 02	6,0	0,30	6	78	30,00	-	-	3	-	
VHGTF 3 080 078 08 02	8,0	0,30	8	78	30,00	-	-	3	-	
VHGTF 3 100 078 10 02	10,0	0,30	10	78	30,00	-	-	3	-	
VHGTF 3 120 089 12 02	12,0	0,30	12	89	30,00	-	-	3	-	
Long / Lange Ausführung										
VHGTF 2 040 080 04 02	4,0	0,20	4	80	10,00	-	-	2	-	new/neu
VHGTF 2 040 102 04 02	4,0	0,30	4	102	10,00	-	-	2	-	
VHGTF 2 050 102 05 02	5,0	0,50	5	102	13,00	-	-	2	-	
VHGTF 2 060 102 06 02	6,0	0,50	6	102	42,00	-	-	2	-	
VHGTF 2 060 150 06 02	6,0	0,50	6	150	26,00	-	-	2	-	
VHGTF 2 080 102 08 02	8,0	0,50	8	100	41,00	-	-	2	-	new/neu
VHGTF 2 080 150 08 02	8,0	0,50	8	150	41,00	-	-	2	-	
VHGTF 2 100 150 10 02	10,0	0,50	10	150	42,00	-	-	2	-	

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.4			< 600	air
N5.5			< 600	air
N5.6			350 - 500	air

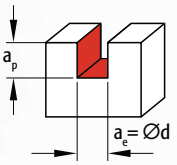
VHGTF30400600402
Material EDM-3 Graphite

V_c	440 m/min
n	35000 rpm
F_z	0,049 mm/t
V_f	5145 mm/min
a_p	0,8 mm
a_e	1,6 mm
Coolant	air
Q	**6,60 cm³/min**

- More accuracy.
  Höhere Genauigkeit.
- Smooth surface on the workpiece.
  Glatte Werkstückoberflächen.
- Longer tool life.
  Längere Standzeit.



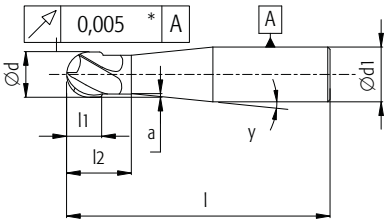
a_p up to 2,0 x d
a_e up to 0,2 x d



a_p up to 1,00 x d

	Shoulder milling / Eckfräsen			Slot milling / Nutfräsen		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
2,0	< 4,0	< 0,4	0,012 - 0,036	< 2,0	2,0	0,010 - 0,030
3,0	< 6,0	< 0,6	0,018 - 0,048	< 3,0	3,0	0,015 - 0,040
4,0	< 8,0	< 0,8	0,030 - 0,060	< 4,0	4,0	0,025 - 0,050
5,0	< 10,0	< 1,0	0,042 - 0,072	< 5,0	5,0	0,035 - 0,060
6,0	< 12,0	< 1,2	0,054 - 0,096	< 6,0	6,0	0,045 - 0,080
8,0	< 16,0	< 1,6	0,066 - 0,120	< 8,0	8,0	0,055 - 0,100
10,0	< 20,0	< 2,0	0,090 - 0,144	< 10,0	10,0	0,075 - 0,120
12,0	< 24,0	< 2,4	0,108 - 0,168	< 12,0	12,0	0,090 - 0,140

Standard



* For end mills / für Schaftfräser L < 100 mm.

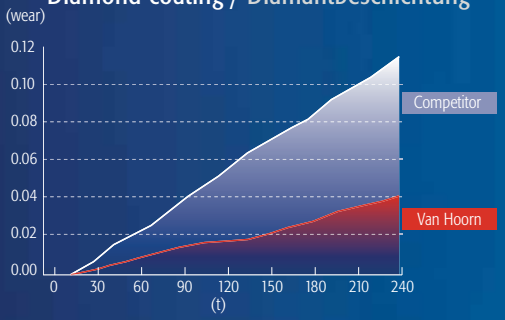
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	
Short / Kurze Ausführung										
VHGKF 2 020 050 03 02 S	2,0	1,00	3	50	3,00	10,00	0,100	2	15	
VHGKF 2 030 051 06 02 S	3,0	1,50	6	51	4,00	10,00	0,100	2	15	
VHGKF 4 040 051 06 02 S	4,0	2,00	6	51	4,00	10,00	0,100	4	15	
VHGKF 4 050 051 06 02 S	5,0	2,50	6	51	5,00	10,00	0,150	4	15	
VHGKF 4 060 051 06 02 S	6,0	3,00	6	51	6,00	10,00	0,200	4	-	
VHGKF 4 080 064 08 02 S	8,0	4,00	8	64	8,00	15,00	0,300	4	-	
VHGKF 4 100 078 10 02 S	10,0	5,00	10	78	10,00	20,00	0,300	4	-	
VHGKF 4 120 078 12 02 S	12,0	6,00	12	78	10,00	20,00	0,300	4	-	
Standard										
VHGKF 3 020 050 02 02	2,0	1,00	2	50	10,00	-	-	3	-	
VHGKF 3 020 050 03 02	2,0	1,00	3	50	10,00	-	-	3	15	
VHGKF 3 020 050 03 02 L150	2,0	1,00	3	50	10,00	15,00	0,100	3	15	
VHGKF 3 020 050 03 02 L200	2,0	1,00	3	50	10,00	20,00	0,100	3	15	
VHGKF 3 020 065 03 02 L300	2,0	1,00	3	65	10,00	30,00	0,100	3	15	
VHGKF 3 030 050 03 02	3,0	1,50	3	50	10,00	-	-	3	-	
VHGKF 3 030 050 03 02 L150	3,0	1,50	3	50	10,00	15,00	0,100	3	-	
VHGKF 3 030 050 03 02 L200	3,0	1,50	3	50	10,00	20,00	0,100	3	-	
VHGKF 3 030 065 03 02 L300	3,0	1,50	3	65	10,00	30,00	0,100	3	-	
VHGKF 3 040 060 04 02	4,0	2,00	4	60	15,00	-	-	3	-	
VHGKF 3 050 060 05 02	5,0	2,50	5	60	20,00	-	-	3	-	
VHGKF 3 060 078 06 02	6,0	3,00	6	78	30,00	-	-	3	-	
VHGKF 3 080 078 08 02	8,0	4,00	8	78	30,00	-	-	3	-	
VHGKF 3 100 078 10 02	10,0	5,00	10	78	30,00	-	-	3	-	
VHGKF 3 120 089 12 02	12,0	6,00	12	89	30,00	-	-	3	-	
Long / Lange Ausführung										
VHGKF 2 020 102 03 02	2,0	1,00	3	102	6,00	-	-	2	15	
VHGKF 2 030 102 03 02	3,0	1,50	3	102	16,00	-	-	2	-	
VHGKF 2 040 080 04 02	4,0	2,00	4	80	10,00	-	-	2	-	new/neu
VHGKF 2 040 102 04 02	4,0	2,00	4	102	16,00	-	-	2	-	
VHGKF 2 060 102 06 02	6,0	3,00	6	102	42,00	-	-	2	-	
VHGKF 2 060 150 06 02	6,0	3,00	6	150	42,00	-	-	2	-	
VHGKF 2 080 102 08 02	8,0	4,00	8	102	42,00	-	-	2	-	
VHGKF 2 080 150 08 02	8,0	4,00	8	150	42,00	-	-	2	-	
VHGKF 2 100 150 10 02	10,0	5,00	10	150	45,00	-	-	2	-	
VHGKF 2 120 150 12 02	12,0	6,00	12	150	65,00	-	-	2	-	

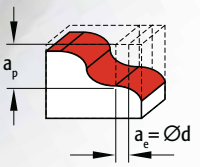
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.4			< 600	air
N5.5			< 600	air
N5.6			350 - 500	air

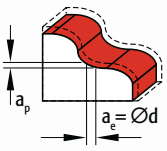
VHGKF30400600402
Material ISO 63

V_c	276 m/min
n	22000 rpm
F_z	0,121 mm/t
V_f	8000 mm/min
a_p	5,0 mm
a_e	0,1 mm
Coolant	air
Q	**4,0 cm³/min**

Wear / Verschleiß
Diamond coating / Diamantbeschichtung

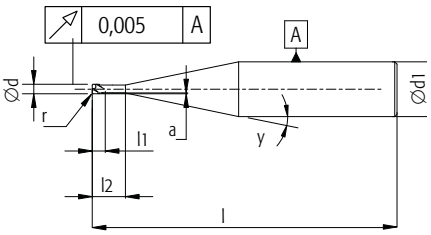


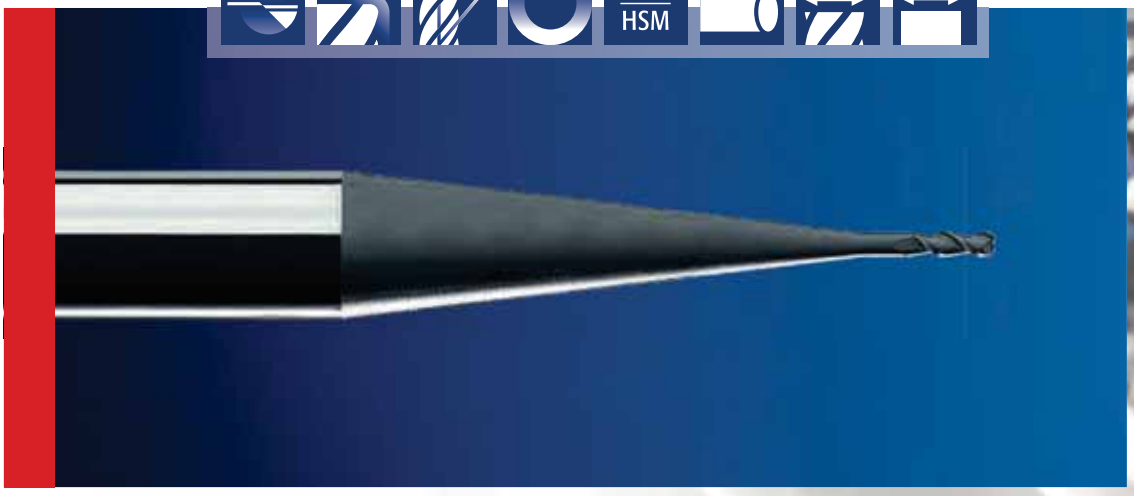




Ød (mm)	Roughing / Schruppfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	Finishing / Schlichtfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
2,0	< 4,0	< 0,4	0,012 - 0,036	< 0,4	0,2	0,012 - 0,036
3,0	< 6,0	< 0,6	0,018 - 0,048	< 0,6	0,3	0,018 - 0,048
4,0	< 8,0	< 0,8	0,030 - 0,060	< 0,8	0,4	0,030 - 0,060
5,0	< 10,0	< 1,0	0,042 - 0,072	< 1,0	0,5	0,042 - 0,072
6,0	< 12,0	< 1,2	0,054 - 0,096	< 1,2	0,6	0,054 - 0,096
8,0	< 16,0	< 1,6	0,066 - 0,120	< 1,6	0,8	0,066 - 0,120
10,0	< 20,0	< 2,0	0,090 - 0,144	< 2,0	1,0	0,090 - 0,144
12,0	< 24,0	< 2,4	0,108 - 0,168	< 2,4	1,2	0,108 - 0,168

Standard



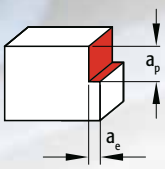


Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°	
VHMG 2 003 064 06 02 L010	0,3	0,05	6	64	1,00	-	-	2	7	1,743	1,896	2,304	2,944	
VHMG 2 003 064 06 02 L025	0,3	0,05	6	64	1,50	2,50	0,010	2	7	2,908	3,148	3,771	4,710	
VHMG 2 003 064 06 02	0,3	0,05	6	64	1,50	5,00	0,010	2	8	5,562	5,967	6,988	8,436	
VHMG 2 004 064 06 02 L010	0,4	0,05	6	64	1,50	-	-	2	6	2,286	2,492	3,046	3,925	
VHMG 2 004 064 06 02 L025	0,4	0,05	6	64	1,50	2,50	0,010	2	7	2,912	3,156	3,797	4,773	
VHMG 2 004 064 06 02	0,4	0,05	6	64	1,50	5,00	0,010	2	8	5,568	5,982	7,029	8,529	
VHMG 2 005 064 06 02 L015	0,5	0,05	6	64	1,50	-	-	2	6	2,286	2,492	3,043	3,918	
VHMG 2 005 064 06 02 L035	0,5	0,05	6	64	1,50	3,50	0,010	2	7	3,984	4,310	5,158	6,429	
VHMG 2 005 064 06 02	0,5	0,05	6	64	1,50	7,00	0,010	2	8	7,671	8,192	9,480	11,256	
VHMG 2 005 064 06 02 L100	0,5	0,05	6	64	1,50	10,00	0,010	2	10	10,772	11,375	12,813	14,671	
VHMG 2 006 064 06 02 L015	0,6	0,05	6	64	1,50	-	-	2	6	2,890	3,157	3,878	5,036	
VHMG 2 006 064 06 02 L035	0,6	0,05	6	64	2,00	3,50	0,025	2	7	4,185	4,534	5,442	6,815	
VHMG 2 006 064 06 02	0,6	0,05	6	64	2,00	7,00	0,025	2	8	7,864	8,405	9,750	11,614	
VHMG 2 006 064 06 02 L100	0,6	0,05	6	64	2,00	10,00	0,025	2	10	10,959	11,582	13,070	15,001	
VHMG 2 008 064 06 02 L020	0,8	0,05	6	64	2,00	-	-	2	6	3,435	3,760	4,642	6,078	
VHMG 2 008 064 06 02 L050	0,8	0,05	6	64	2,00	5,00	0,025	2	7	5,787	6,253	7,456	9,240	
VHMG 2 008 064 06 02 L075	0,8	0,05	6	64	2,00	7,50	0,025	2	8	8,402	8,987	10,447	12,478	
VHMG 2 008 064 06 02	0,8	0,05	6	64	2,00	10,00	0,025	2	9	10,978	11,629	13,195	15,253	
VHMG 2 008 064 06 02 L150	0,8	0,05	6	64	2,00	15,00	0,025	2	13	16,043	16,674	18,099	19,794	
VHMG 2 010 064 06 02 L025	1,0	0,05	6	64	2,50	-	-	2	6	3,982	4,368	5,423	7,163	
VHMG 2 010 064 06 02 L050	1,0	0,05	6	64	3,00	5,00	0,025	2	7	5,805	6,294	7,572	9,512	
VHMG 2 010 064 06 02 L075	1,0	0,05	6	64	3,00	7,50	0,025	2	8	8,422	9,036	10,581	12,772	
VHMG 2 010 055 04 02 L100	1,0	0,05	4	55	3,00	10,00	0,025	2	9	10,074	11,409	13,017	15,156	new/neu
VHMG 2 010 064 06 02	1,0	0,05	6	64	3,00	10,00	0,025	2	9	10,999	11,680	13,333	15,537	
VHMG 2 010 055 04 02 L150	1,0	0,05	4	55	3,00	15,00	0,025	2	13	15,700	16,340	17,792	19,530	new/neu
VHMG 2 010 064 06 02 L150	1,0	0,05	6	64	3,00	15,00	0,025	2	13	16,057	16,716	18,212	20,005	
VHMG 2 010 055 04 02 L200	1,0	0,05	4	55	3,00	20,00	0,025	2	18	20,620	21,214	22,489	23,928	new/neu
VHMG 2 010 064 06 02 L200	1,0	0,05	6	64	3,00	20,00	0,025	2	18	21,124	21,741	23,091	24,621	
VHMG 2 010 055 04 02 L250	1,0	0,05	4	55	3,00	25,00	0,025	2	18	25,768	26,498	28,091	29,890	new/neu
VHMG 2 010 064 06 02 L250	1,0	0,05	6	64	3,00	25,00	0,025	2	18	26,266	27,034	28,713	30,617	new/neu
VHMG 2 010 064 06 02 L300	1,0	0,05	6	64	3,00	30,00	0,025	2	18	31,408	32,326	34,335	36,612	new/neu
VHMG 2 012 064 06 02 L050	1,2	0,05	6	64	3,00	5,00	0,025	2	7	5,950	6,475	7,869	10,037	
VHMG 2 012 064 06 02	1,2	0,05	6	64	3,00	10,00	0,025	2	9	11,183	11,907	13,683	16,087	
VHMG 2 015 064 06 02 L050	1,5	0,05	6	64	3,00	5,00	0,025	2	6	5,978	6,548	8,094	10,609	
VHMG 2 015 064 06 02 L075	1,5	0,05	6	64	3,00	7,50	0,025	2	7	8,618	9,326	11,166	13,921	
VHMG 2 015 064 06 02	1,5	0,05	6	64	3,00	10,00	0,025	2	8	11,215	11,996	13,941	16,647	
VHMG 2 015 064 06 02 L150	1,5	0,05	6	64	3,00	15,0	0,025	2	12	16,319	17,069	18,798	20,921	
VHMG 2 015 064 06 02 L200	1,5	0,05	6	64	3,00	20,0	0,025	2	15	21,448	22,194	23,854	25,785	

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.4			**< 600**	air
N5.5			**< 600**	air
N5.6			**350 - 500**	air

VHC Diamond coated end mills:
VHC Diamant beschichtete Schaftfräser:

- Excellent accuracy and tolerances.
  Ausgezeichnete Genauigkeiten und Toleranzen.
- Optimized surface finish on workpiece.
  Optimierte Werkstückoberflächen.
- Leading diamond coating technology.
  Führende Diamant-Beschichtungstechnologie.
- Superior tool life.
  Hervorragende Standzeiten.

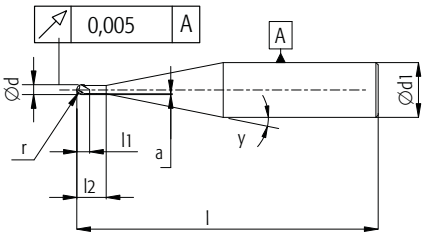


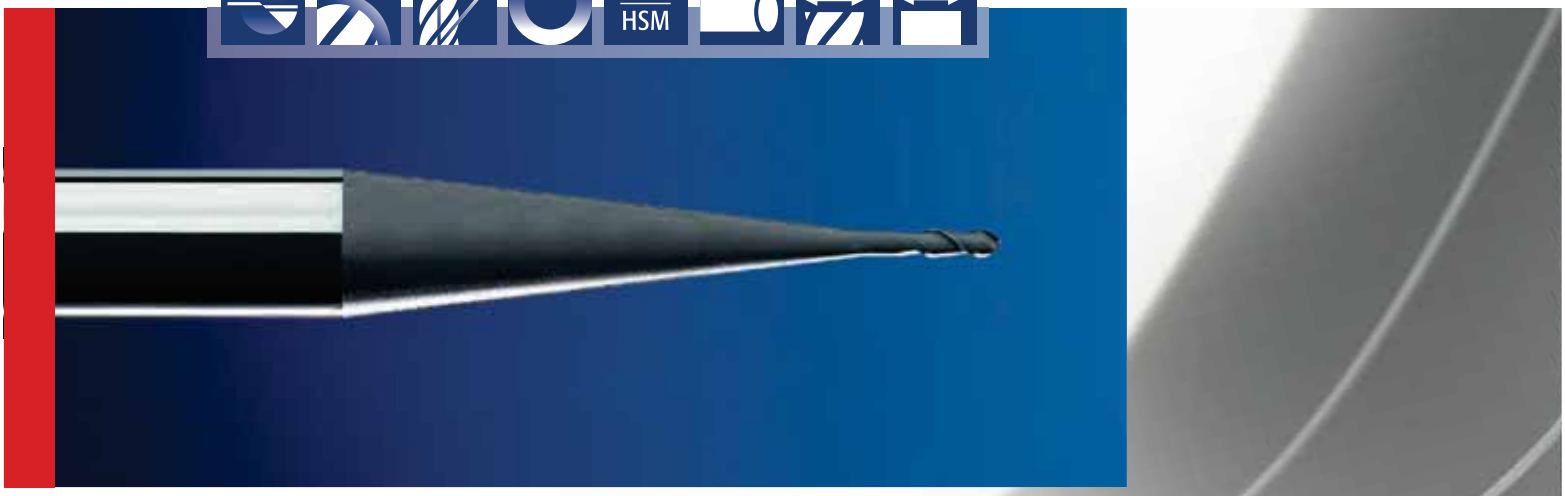
	Shoulder milling / Eckfräsen			Slot milling / Nutfräsen		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
0,3	< 0,6	< 0,03	0,007 - 0,014	< 0,15	0,3	0,006 - 0,012
0,4	< 0,8	< 0,04	0,010 - 0,018	< 0,20	0,4	0,008 - 0,015
0,5	< 1,0	< 0,05	0,012 - 0,024	< 0,25	0,5	0,010 - 0,020
0,6	< 1,2	< 0,06	0,014 - 0,026	< 0,30	0,6	0,012 - 0,022
0,8	< 1,6	< 0,08	0,018 - 0,030	< 0,40	0,8	0,015 - 0,025
1,0	< 2,0	< 0,10	0,022 - 0,036	< 0,50	1,0	0,018 - 0,030
1,2	< 2,4	< 0,12	0,024 - 0,042	< 0,60	1,2	0,020 - 0,035
1,5	< 3,0	< 0,15	0,030 - 0,048	< 0,75	1,5	0,025 - 0,040

- Cutting speed V_c is based on max. 40.000 rpm.
  Schnittgeschwindigkeit V_c bezogen auf max. 40.000 U/min.
- Given conditions are based on VHMGK short length end mills; when using end mills with longer L2-length, reduce F_z according table.
  Die angegebenen Schnittwerte beziehen sich auf die kurze VHMGK Ausführung; beim Einsatz von Schaftfräsern mit größerem L2-Maß, Vorschub F_z gemäß Tabellenangaben reduzieren.

L2-Length	Reduction
1-5 x d	0%
5-10 x d	30%
10 ~	50%

Standard





Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°	
VHMGK 2 003 064 06 02 L010	0,3	0,15	6	64	1,00	-	-	2	6	1,736	1,886	2,292	2,946	
VHMGK 2 003 064 06 02 L025	0,3	0,15	6	64	1,50	2,50	0,010	2	7	2,901	3,131	3,731	4,635	
VHMGK 2 003 064 06 02	0,3	0,15	6	64	1,50	5,00	0,010	2	8	5,555	5,953	6,953	8,373	
VHMGK 2 004 064 06 02 L010	0,4	0,20	6	64	1,50	-	-	2	6	2,276	2,476	3,023	3,916	
VHMGK 2 004 064 06 02 L025	0,4	0,20	6	64	1,50	2,50	0,010	2	7	2,900	3,131	3,735	4,656	
VHMGK 2 004 064 06 02	0,4	0,20	6	64	1,50	5,00	0,010	2	8	5,557	5,959	6,976	8,432	
VHMGK 2 005 064 06 02 L015	0,5	0,25	6	64	1,50	-	-	2	6	2,272	2,472	3,020	3,928	
VHMGK 2 005 064 06 02 L035	0,5	0,25	6	64	1,50	3,50	0,010	2	7	3,968	4,277	5,078	6,280	
VHMGK 2 005 064 06 02	0,5	0,25	6	64	1,50	7,00	0,010	2	8	7,658	8,164	9,417	11,143	
VHMGK 2 005 064 06 02 L100	0,5	0,25	6	64	1,50	10,00	0,010	2	10	10,761	11,353	12,762	14,584	
VHMGK 2 006 064 06 02 L015	0,6	0,30	6	64	1,50	-	-	2	6	2,871	3,131	3,849	5,055	
VHMGK 2 006 064 06 02 L035	0,6	0,30	6	64	2,00	3,50	0,025	2	7	4,166	4,492	5,341	6,624	
VHMGK 2 006 064 06 02	0,6	0,30	6	64	2,00	7,00	0,025	2	8	7,848	8,371	9,670	11,470	
VHMGK 2 006 064 06 02 L100	0,6	0,30	6	64	2,00	10,00	0,025	2	10	10,946	11,554	13,006	14,890	
VHMGK 2 008 064 06 02 L020	0,8	0,40	6	64	2,00	-	-	2	6	3,413	3,731	4,625	6,177	
VHMGK 2 008 064 06 02 L050	0,8	0,40	6	64	2,00	5,00	0,025	2	7	5,761	6,196	7,320	8,987	
VHMGK 2 008 064 06 02 L075	0,8	0,40	6	64	2,00	7,50	0,025	2	8	8,379	8,938	10,332	12,273	
VHMGK 2 008 064 06 02	0,8	0,40	6	64	2,00	10,00	0,025	2	9	10,958	11,587	13,100	15,089	
VHMGK 2 008 064 06 02 L150	0,8	0,40	6	64	2,00	15,00	0,025	2	13	16,029	16,646	18,039	19,695	
VHMGK 2 010 064 06 02 L025	1,0	0,50	6	64	2,50	-	-	2	5	3,958	4,341	5,437	7,410	
VHMGK 2 010 064 06 02 L050	1,0	0,50	6	64	3,00	5,00	0,025	2	7	5,770	6,218	7,388	9,164	
VHMGK 2 010 064 06 02 L075	1,0	0,50	6	64	3,00	7,50	0,025	2	8	8,392	8,970	10,427	12,491	
VHMGK 2 010 064 06 02	1,0	0,50	6	64	3,00	10,00	0,025	2	9	10,973	11,624	13,205	15,313	
VHMGK 2 010 064 06 02 L150	1,0	0,50	6	64	3,00	15,00	0,025	2	13	16,040	16,679	18,131	19,872	
VHMGK 2 010 064 06 02 L200	1,0	0,50	6	64	3,00	20,00	0,025	2	18	21,111	21,715	23,035	24,532	
VHMGK 2 010 064 06 02 L250	1,0	0,05	6	64	3,00	25,00	0,025	2	18	26,266	27,034	28,713	30,617	new/neu
VHMGK 2 010 064 06 02 L300	1,0	0,05	6	64	3,00	30,00	0,025	2	18	31,408	32,326	34,335	36,612	new/neu
VHMGK 2 012 064 06 02 L050	1,2	0,60	6	64	3,00	5,00	0,025	2	7	5,905	6,378	7,630	9,579	
VHMGK 2 012 064 06 02	1,2	0,60	6	64	3,00	10,00	0,025	2	9	11,149	11,836	13,518	15,796	
VHMGK 2 015 064 06 02 L050	1,5	0,75	6	64	3,00	5,00	0,025	2	6	5,917	6,413	7,761	9,953	
VHMGK 2 015 064 06 02 L075	1,5	0,75	6	64	3,00	7,50	0,025	2	7	8,564	9,210	10,889	13,401	
VHMGK 2 015 064 06 02	1,5	0,75	6	64	3,00	10,00	0,025	2	8	11,169	11,898	13,713	16,238	
VHMGK 2 015 064 06 02 L150	1,5	0,75	6	64	3,00	15,00	0,025	2	12	16,288	17,004	18,656	20,684	
VHMGK 2 015 064 06 02 L200	1,5	0,75	6	64	3,00	20,00	0,025	2	15	21,425	22,145	23,749	25,615	

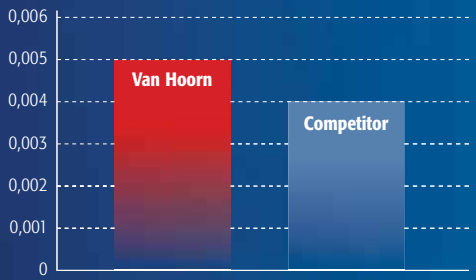
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.4			**< 600**	air
N5.5			**< 600**	air
N5.6			**350 - 500**	air

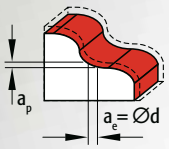
VHMGK20100640602
Workpiece Material: Poco Graphite
Hardness: 1700

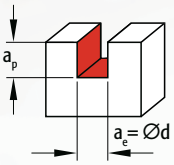
	Van Hoorn	Competitor
V_c	126 m/min	126 m/min
n	40000 rpm	40000 rpm
F_z	0,013 mm/t	0,010 mm/t
V_f	1000 mm/min	800 mm/min
a_p	0,05 mm	0,05 mm
a_e	0,10 mm	0,10 mm
Coolant	air	air
Q	**0,005 mm³/min**	**0,004 mm³/min**

Finishing application

Metal removal rate
Zeitspanvolumen







	Shoulder milling / Eckfräsen			Profiling / Kopierfräsen		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
0,3	< 0,3	<0,03	0,007 - 0,014	< 0,03	0,03	0,007 - 0,014
0,4	< 0,4	<0,04	0,010 - 0,018	< 0,04	0,04	0,010 - 0,018
0,5	< 0,5	<0,05	0,012 - 0,024	< 0,05	0,05	0,012 - 0,024
0,6	< 0,6	<0,06	0,014 - 0,026	< 0,06	0,06	0,014 - 0,026
0,8	< 0,8	<0,08	0,018 - 0,030	< 0,08	0,08	0,018 - 0,030
1,0	< 1,0	<0,10	0,022 - 0,036	< 0,10	0,10	0,022 - 0,036
1,2	< 1,2	<0,12	0,024 - 0,042	< 0,12	0,12	0,024 - 0,042
1,5	< 1,5	<0,15	0,030 - 0,048	< 0,15	0,15	0,030 - 0,048

- Cutting speed V_c is based on max. 40.000 rpm.
  Schnittgeschwindigkeit V_c bezogen auf max. 40.000 U/min.
- Given conditions are based on VHMGK short length end mills; when using end mills with longer L2-length, reduce F_z according table.
  Die angegebenen Schnittwerte beziehen sich auf die kurze VHMGK Ausführung; beim Einsatz von Schaftfräsern mit größerem L2-Maß, Vorschub F_z gemäß Tabellenangaben reduzieren.

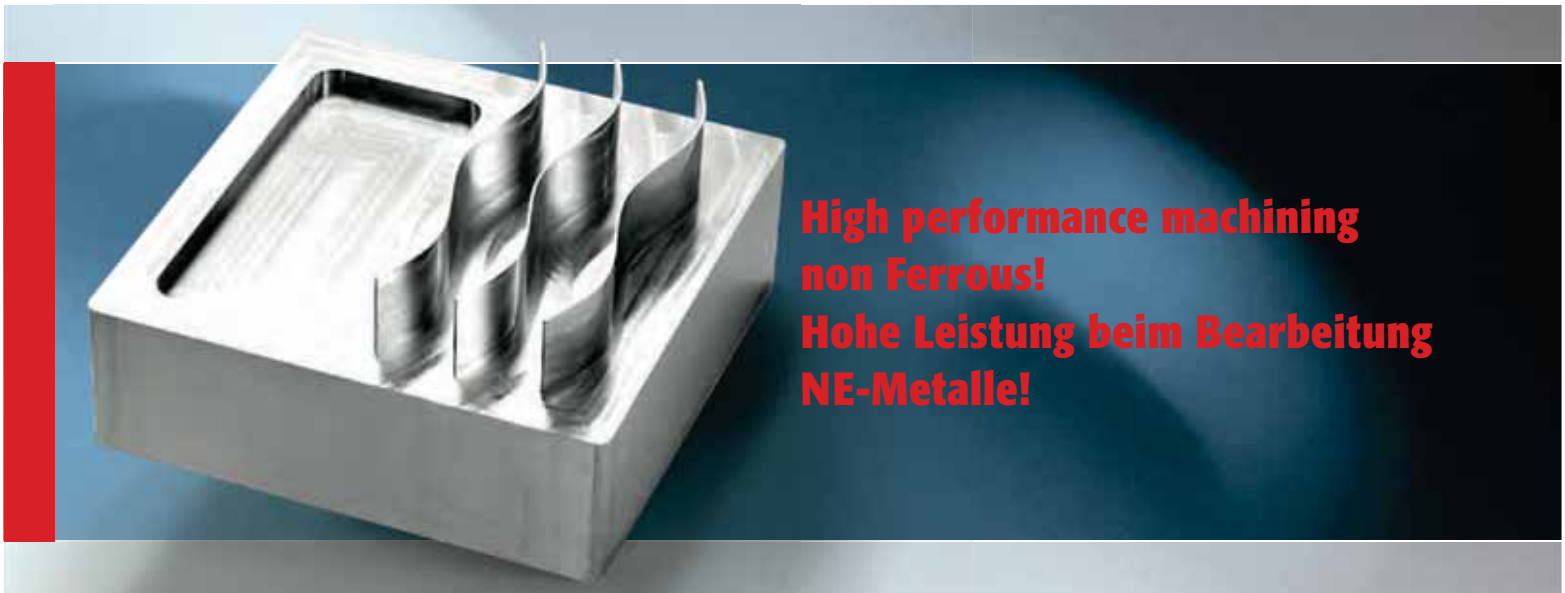
L2-Length	Reduction
1-5 x d	0%
5-10 x d	30%
10 ~	50%

Milling of non Ferrous... an absolute strength.

Fräsen von Nichteisen - Werkstoffe (NE)... unsere Stärke.

With a number of superior end mills for applications on non Ferrous materials, we prove our strength every day: Now we expand the possibilities with the VHMA, VHMAK, VHKE, VHAD.

Mit einer großen Zahl an Top-Fräsern für die NE-Metall beweisen wir täglich aufs Neue unsere Stärke. Jetzt haben wir unsere Lösungen mit den VHMA, VHMAK, VHKE, VHAD erweitert.



High performance machining non Ferrous!
Hohe Leistung beim Bearbeitung NE-Metalle!

Advantages / Vorteile VHAD

- **Allround end mill**
  Allround-Schaftfräser
- **High material removal rates & a smooth surface finish**
  Hohe Zerspanungsleistung und glatte Oberflächen
- **Polished flutes for optimized chip evacuation**
  Polierte Spannkammer für optimale Späneabfuhr
- **Excellent chip flow: high material removal rates**
  Hervorragende Spanabfuhr: hohe Zerspanungsleistung

High productivity
Hohe Produktivität

Workpiece Material: 3.2315
End mill: VHAD3100072
Hardness: Aluminium 51ST

V_c	500 m/min
n	15915 rpm
F_z	0,25 mm/t
Z	3
V_f	11936 mm/min
a_p	10 mm
a_e	10 mm
Coolant	emulsion
Q	**1193,7 cm3/min**

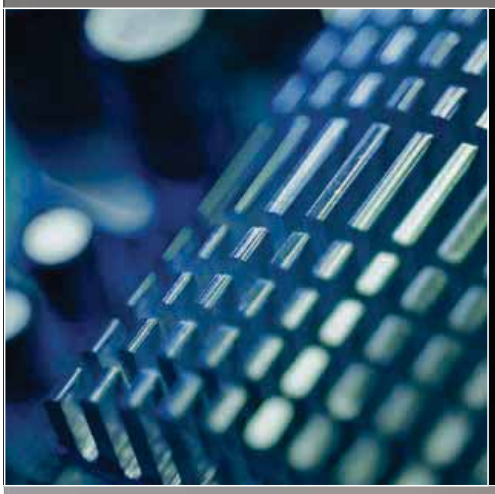
Application demands on aluminium:

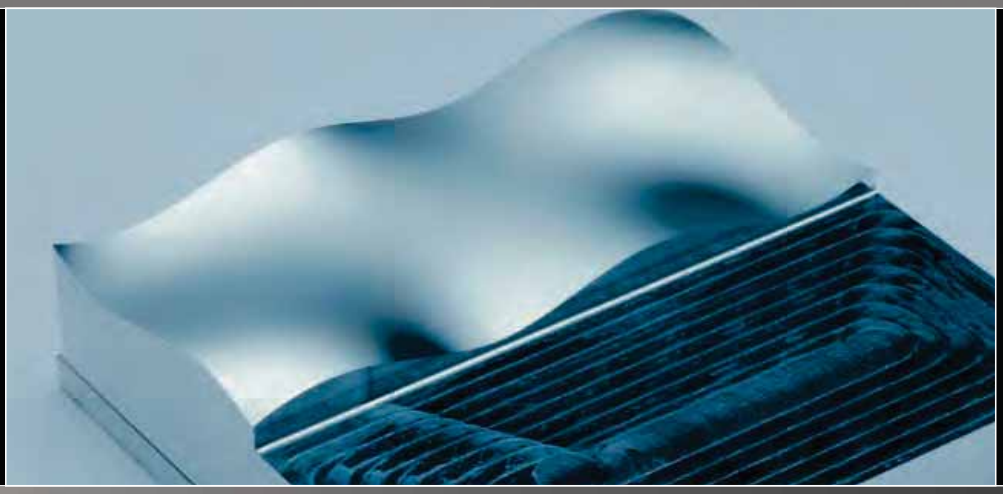
Anforderungen in der Aluminium-Bearbeitung:

- **Large chipping volumes: VHRAW.**
  Großes Zeitspanvolumen: VHRAW.
- **Burr-free or thin wall applications: VHLA2 and VHLA3.**
  Gratfreie oder Bearbeitung dünnwändigere. Werkstücke: VHLA.
- **Operation flexibility: VHAE.**
  Flexible Anwendung: VHAE.
- **Multiple demands: VHAD.**
  Wechselnde Einsatzbedingungen: VHAD.

Micro milling
Mikro fräsen

- **Straight - VHMA.**
  Gerade - VHMA.
- **Ball nose - VHMAK.**
  Kugel - VHMAK.

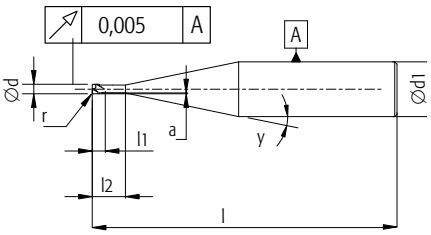


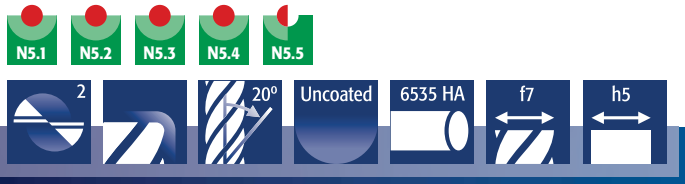


Non Ferrous materials are / NE-Metalle sind

- Aluminium / Aluminium
- Copper / Kupfer
- Bronze / Bronze
- Lead / Blei
- Brass / Messing
- Zinc / Zink
- Plastics / Kunststoff

Standard



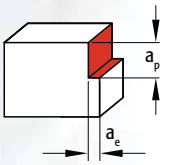


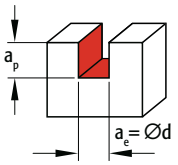
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°
VHMA 2 003 064 06 10 L010	0,3	0,05	6	64	0,60	1,00	0,025	2	10	1,383	1,456	1,630	1,852
VHMA 2 003 064 06 10 L025	0,3	0,05	6	64	0,60	2,50	0,025	2	10	2,961	3,121	3,500	3,987
VHMA 2 004 064 06 10 L015	0,4	0,05	6	64	0,80	1,50	0,050	2	10	2,058	2,168	2,430	2,766
VHMA 2 004 064 06 10 L032	0,4	0,05	6	64	0,80	3,20	0,050	2	10	3,846	4,055	4,550	5,185
VHMA 2 005 064 06 10 L015	0,5	0,05	6	64	1,00	1,50	0,100	2	10	2,356	2,483	2,783	3,169
VHMA 2 005 064 06 10 L040	0,5	0,05	6	64	1,00	4,00	0,100	2	10	4,986	5,258	5,901	6,726
VHMA 2 006 064 06 10 L020	0,6	0,05	6	64	1,20	2,00	0,100	2	12	2,903	3,031	3,324	3,681
VHMA 2 006 064 06 10 L050	0,6	0,05	6	64	1,20	5,00	0,100	2	12	6,031	6,299	6,913	7,663
VHMA 2 008 064 06 10 L040	0,8	0,05	6	64	1,60	4,00	0,100	2	12	4,989	5,209	5,717	6,336
VHMA 2 010 064 06 10 L050	1,0	0,05	6	64	2,00	5,00	0,100	2	12	6,031	6,299	6,913	7,663
VHMA 2 012 064 06 10 L060	1,2	0,05	6	64	2,40	6,00	0,100	2	12	7,293	7,617	8,361	9,269
VHMA 2 015 064 06 10 L080	1,5	0,05	6	64	3,00	8,00	0,100	2	12	9,379	9,796	10,755	11,924
VHMA 2 020 064 06 10 L100	2,0	0,05	6	64	3,00	10,00	0,100	2	12	11,465	11,975	13,148	14,578
VHMA 2 025 064 06 10 L120	2,5	0,05	6	64	3,00	12,00	0,100	2	12	13,550	14,154	15,541	17,232
VHMA 2 030 064 06 10 L120	3,0	0,05	6	64	3,00	12,00	0,100	2	12	13,550	14,154	15,541	17,232

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.1	< 500	< 150	**350 - 650**	emulsion / air
N5.2	< 400	< 120	**200 - 500**	emulsion / air
N5.3	< 350	< 100	**350 - 500**	emulsion / air
N5.4			**400 - 1000**	emulsion / air
N5.5			**400 - 1000**	emulsion / air

Micro milling of non Ferrous
Mikro Fräsen von Nichteisen - Werkstoffe

- **High accuracy**
  Hohe Genauigkeit
- **Optimized chip evacuation**
  Optimale Späneabfuhr
- **Smooth surface finish**
  Glatte Oberflachen

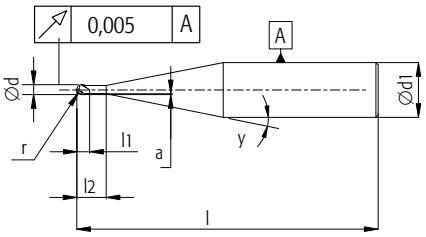


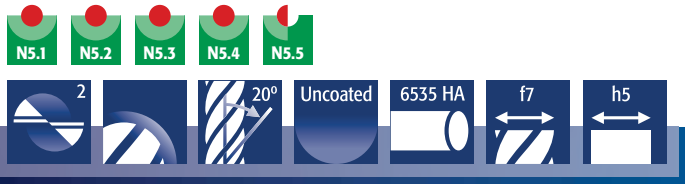


Ød (mm)	Shoulder milling / Eckfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	Slot milling / Nutfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
0,3	< 0,3	<0,03	0,005 - 0,009	< 0,12	0,3	0,003 - 0,006
0,4	< 0,4	<0,04	0,007 - 0,012	< 0,16	0,4	0,005 - 0,009
0,5	< 0,5	<0,05	0,009 - 0,015	< 0,20	0,5	0,007 - 0,012
0,6	< 0,6	<0,06	0,011 - 0,018	< 0,24	0,6	0,009 - 0,014
0,8	< 0,8	<0,08	0,013 - 0,021	< 0,32	0,8	0,010 - 0,016
1,0	< 1,0	<0,10	0,016 - 0,025	< 0,40	1,0	0,012 - 0,019
1,2	< 1,2	<0,12	0,020 - 0,030	< 0,48	1,2	0,015 - 0,023
1,5	< 1,5	<0,15	0,030 - 0,040	< 0,60	1,5	0,023 - 0,030
2,0	< 2,0	<0,20	0,035 - 0,050	< 0,80	2,0	0,026 - 0,038
2,5	< 2,5	<0,25	0,040 - 0,060	< 1,00	2,5	0,030 - 0,045
3,0	< 3,0	<0,30	0,050 - 0,075	< 1,20	3,0	0,038 - 0,056

- Cutting speed V_c is based on max. 50.000 rpm.
  Schnittgeschwindigkeit V_c bezogen auf max. 50.000 U/min.
- End mills can be used also for drilling with reduced cutting conditions.
  Mit verringerten Schnittwerten können die Fräser auch zur Herstellung von Bohrungen verwendet werden.

Standard





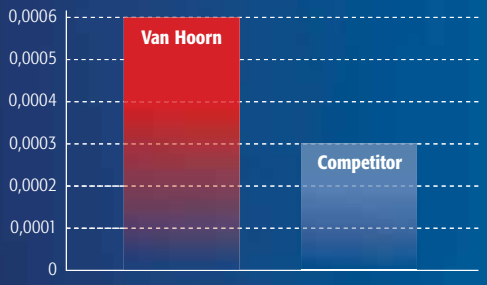
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)	Effective length compared with Inclined Angle 0,5°	 1°	 2°	 3°
VHMAK 2 003 064 06 10 L010	0,3	0,15	6	64	0,60	1,00	0,025	2	10	1,378	1,445	1,605	1,810
VHMAK 2 003 064 06 10 L025	0,3	0,15	6	64	0,60	2,50	0,025	2	10	2,956	3,110	3,475	3,945
VHMAK 2 004 064 06 10 L015	0,4	0,20	6	64	0,80	1,50	0,050	2	10	2,050	2,152	2,393	2,702
VHMAK 2 004 064 06 10 L032	0,4	0,20	6	64	0,80	3,20	0,050	2	10	3,839	4,039	4,513	5,121
VHMAK 2 005 064 06 10 L015	0,5	0,25	6	64	1,00	1,50	0,100	2	10	2,346	2,461	2,734	3,085
VHMAK 2 005 064 06 10 L040	0,5	0,25	6	64	1,00	4,00	0,100	2	10	4,976	5,236	5,851	6,642
VHMAK 2 006 064 06 10 L020	0,6	0,30	6	64	1,20	2,00	0,100	2	12	2,892	3,008	3,274	3,599
VHMAK 2 006 064 06 10 L050	0,6	0,30	6	64	1,20	5,00	0,100	2	12	6,021	6,277	6,864	7,581
VHMAK 2 008 064 06 10 L040	0,8	0,40	6	64	1,60	4,00	0,100	2	12	4,974	5,178	5,648	6,221
VHMAK 2 010 064 06 10 L050	1,0	0,50	6	64	2,00	5,00	0,100	2	12	6,012	6,259	6,825	7,516
VHMAK 2 012 064 06 10 L060	1,2	0,60	6	64	2,40	6,00	0,100	2	12	7,270	7,568	8,253	9,089
VHMAK 2 015 064 06 10 L080	1,5	0,75	6	64	3,00	8,00	0,100	2	12	9,349	9,734	10,617	11,694
VHMAK 2 020 064 06 10 L100	2,0	1,00	6	64	3,00	10,00	0,100	2	12	11,424	11,890	12,961	14,267
VHMAK 2 025 064 06 10 L120	2,5	1,25	6	64	3,00	12,00	0,100	2	12	13,499	14,047	15,305	16,840
VHMAK 2 030 064 06 10 L120	3,0	1,50	6	64	3,00	12,00	0,100	2	12	13,488	14,024	15,256	16,758

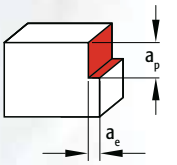
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.1	< 500	< 150	**350 - 650**	emulsion / air
N5.2	< 400	< 120	**200 - 500**	emulsion / air
N5.3	< 350	< 100	**350 - 500**	emulsion / air
N5.4			**400 - 1000**	emulsion / air
N5.5			**400 - 1000**	emulsion / air

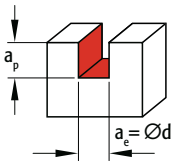
VHMAK 2 015 064 06 10 L080
Workpiece Material: Tungsten Copper
Hardness: -

	Van Hoorn	Competitor
V_c	180 m/min	120 m/min
n	38.200 rpm	25.500 rpm
F_z mm/t	0,021	0,015
V_f mm/min	1500	750
a_p	0,02 mm	0,02 mm
a_e	0,02 mm	0,02 mm
Coolant	emulsion	emulsion
Q mm³/min	**0,0006**	**0,0003**

Material removal rate
Zerspanungsleistung



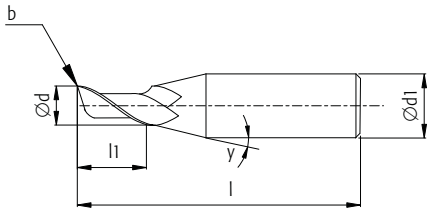


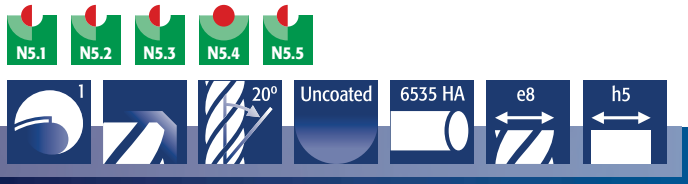


Ød (mm)	Shoulder milling / Eckfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	Slot milling / Nutfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
0,3	< 0,3	< 0,03	0,005 - 0,009	< 0,03	< 0,03	0,005 - 0,009
0,4	< 0,4	< 0,04	0,007 - 0,012	< 0,04	< 0,04	0,007 - 0,012
0,5	< 0,5	< 0,05	0,009 - 0,015	< 0,05	< 0,05	0,009 - 0,015
0,6	< 0,6	< 0,06	0,011 - 0,018	< 0,06	< 0,06	0,011 - 0,018
0,8	< 0,8	< 0,08	0,013 - 0,021	< 0,08	< 0,08	0,013 - 0,021
1,0	< 1,0	< 0,10	0,016 - 0,025	< 0,10	< 0,10	0,016 - 0,025
1,2	< 1,2	< 0,12	0,020 - 0,030	< 0,12	< 0,12	0,020 - 0,030
1,5	< 1,5	< 0,15	0,030 - 0,040	< 0,15	< 0,15	0,030 - 0,040
2,0	< 2,0	< 0,20	0,035 - 0,050	< 0,20	< 0,20	0,035 - 0,050
2,5	< 2,5	< 0,25	0,040 - 0,060	< 0,25	< 0,25	0,040 - 0,060
3,0	< 3,0	< 0,30	0,050 - 0,075	< 0,30	< 0,30	0,050 - 0,075

- Cutting speed V_c is based on max. 50.000 rpm.
  Schnittgeschwindigkeit V_c bezogen auf max. 50.000 U/min.
- End mills can be used also for drilling with reduced cutting conditions.
  Mit verringerten Schnittwerten können die Fräser auch zur Herstellung von Bohrungen verwendet werden.

Standard





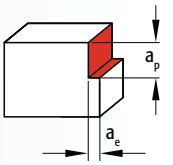
Article Number *Artikelnummer*	Ød (mm)	b (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
Standard									
VHKE 1 010 039 03 10 L 020	1,0	-	3	39	2,00	-	-	1	15
VHKE 1 010 039 03 10 L 040	1,0	-	3	39	4,00	-	-	1	15
VHKE 1 015 039 03 10 L 025	1,5	-	3	39	2,50	-	-	1	15
VHKE 1 015 039 03 10 L 050	1,5	-	3	39	5,00	-	-	1	15
VHKE 1 020 039 03 10 L 030	2,0	-	3	39	3,00	-	-	1	15
VHKE 1 020 039 03 10 L 060	2,0	-	3	39	6,00	-	-	1	15
VHKE 1 025 039 03 10 L 040	2,5	-	3	39	4,00	-	-	1	15
VHKE 1 025 039 03 10 L 060	2,5	-	3	39	6,00	-	-	1	15
VHKE 1 030 051 06 10 L 040	3,0	0,05	6	51	4,00	-	-	1	15
VHKE 1 030 051 06 10 L 060	3,0	0,05	6	51	6,00	-	-	1	15
VHKE 1 030 051 06 10 L 080	3,0	0,05	6	51	8,00	-	-	1	15
VHKE 1 030 051 06 10 L 120	3,0	0,05	6	51	12,00	-	-	1	15
VHKE 1 040 051 06 10 L 050	4,0	0,05	6	51	5,00	-	-	1	15
VHKE 1 040 051 06 10 L 080	4,0	0,05	6	51	8,00	-	-	1	15
VHKE 1 040 051 06 10 L 100	4,0	0,05	6	51	10,00	-	-	1	15
VHKE 1 040 051 06 10 L 140	4,0	0,05	6	51	14,00	-	-	1	15
VHKE 1 050 051 06 10 L 060	5,0	0,08	6	51	6,00	-	-	1	15
VHKE 1 050 051 06 10 L 100	5,0	0,08	6	51	10,00	-	-	1	15
VHKE 1 050 051 06 10 L 120	5,0	0,08	6	51	12,00	-	-	1	15
VHKE 1 060 051 06 10 L 080	6,0	0,10	6	51	8,00	-	-	1	-
VHKE 1 060 051 06 10 L 120	6,0	0,10	6	51	12,00	-	-	1	-
VHKE 1 060 051 06 10 L 140	6,0	0,10	6	51	14,00	-	-	1	-
VHKE 1 080 060 08 10 L 100	8,0	0,12	8	60	10,00	-	-	1	-
VHKE 1 080 060 08 10 L 160	8,0	0,12	8	60	16,00	-	-	1	-
VHKE 1 100 070 10 10 L 120	10,0	0,15	10	70	12,00	-	-	1	-
VHKE 1 100 070 10 10 L 220	10,0	0,15	10	70	22,00	-	-	1	-
VHKE 1 120 078 12 10 L 150	12,0	0,20	12	78	15,00	-	-	1	-
Long / Lange Ausführung									
VHKE 1 030 060 06 10 L 220	3,0	-	6	60	22,00	-	-	1	15
VHKE 1 040 060 06 10 L 220	4,0	-	6	60	22,00	-	-	1	15
VHKE 1 060 064 06 10 L 250	6,0	-	6	64	25,00	-	-	1	-
VHKE 1 060 070 06 10 L 320	6,0	-	6	70	32,00	-	-	1	-
VHKE 1 080 078 08 10 L 420	8,0	-	8	78	42,00	-	-	1	-

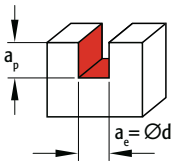
Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.1	< 500	< 150	**350 - 650**	emulsion / air
N5.2	< 400	< 120	**200 - 500**	emulsion / air
N5.3	< 350	< 100	**350 - 500**	emulsion / air
N5.4			**400 - 1000**	emulsion / air
N5.5			**400 - 1000**	emulsion / air

VHKE10300510610L060

V_c	226 m/min
n	24000 rpm
F_z	0,167 mm/t
V_f	4000 mm/min
a_p	5,0 mm
a_e	3,0 mm
Coolant	air
Q	**60,0 cm³/min**

- Burr free milling!
  Gratfrei fräsen!
- Excellent chip evacuation!
  Ausgezeichnete Spanabfuhr!

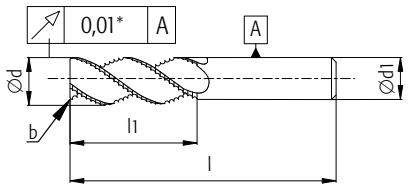




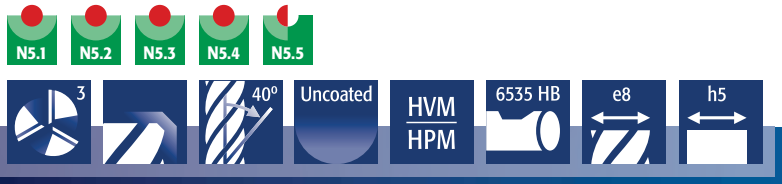
	Shoulder milling / Eckfräsen			Slot milling / Nutfräsen		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
1,0	< 2,0	< 0,4	0,020 - 0,030	< 1,0	1,0	0,015 - 0,022
1,5	< 3,0	< 0,6	0,030 - 0,050	< 1,5	1,5	0,022 - 0,037
2,0	< 4,0	< 0,8	0,045 - 0,065	< 2,0	2,0	0,034 - 0,048
2,5	< 5,0	< 1,0	0,060 - 0,080	< 2,5	2,5	0,045 - 0,060
3,0	< 6,0	< 1,2	0,070 -0,100	< 3,0	3,0	0,053 -0,075
4,0	< 8,0	< 1,6	0,085 - 0,115	< 4,0	4,0	0,064 - 0,086
5,0	< 10,0	< 2,0	0,100 - 0,140	< 5,0	5,0	0,075 - 0,105
6,0	< 12,0	< 2,4	0,125 - 0,175	< 6,0	6,0	0,094 - 0,131
8,0	< 16,0	< 3,2	0,140 - 0,220	< 8,0	8,0	0,105 - 0,165
10,0	< 20,0	< 4,0	0,180 - 0,270	< 10,0	10,0	0,135 - 0,200
12,0	< 15,0	< 4,8	0,220 - 0,300	< 12,0	12,0	0,165 - 0,225

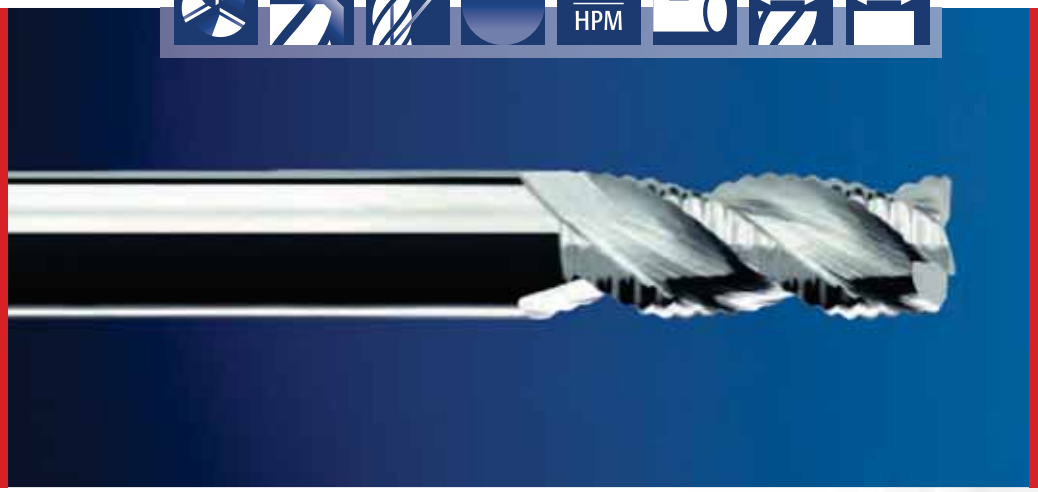
- Cutting speed V_c is based on max. 50.000 rpm.
  Schnittgeschwindigkeit V_c bezogen auf max. 50.000 U/min.
- End mills can be used also for drilling with reduced cutting conditions.
  Mit verringerten Schnittwerten können die Fräser auch zur Herstellung von Bohrungen verwendet werden.

Standard



* For end mills / für Schaftfräser L < 100 mm.





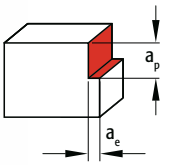
Ripper formed for optimized chip flow
Kordelprofil für optimale Spanabfuhr

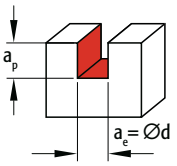
Article Number *Artikelnummer*	Ød (mm)	b (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHRAW 3 060 064 06 15	6,0	0,25	6	64	16,00	-	-	3	-
VHRAW 3 080 064 08 15	8,0	0,50	8	64	20,00	-	-	3	-
VHRAW 3 100 070 10 15	10,0	0,50	10	70	22,00	-	-	3	-
VHRAW 3 120 078 12 15	12,0	0,50	12	78	25,00	-	-	3	-
VHRAW 3 160 089 16 15	16,0	1,00	16	89	35,00	-	-	3	-
VHRAW 3 200 102 20 15	20,0	1,00	20	102	40,00	-	-	3	-
VHRAW 3 250 120 25 15	25,0	1,00	25	120	50,00	-	-	3	-

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.1	< 500	< 150	**350 - 650**	emulsion / air
N5.2	< 400	< 120	**200 - 500**	emulsion / air
N5.3	< 350	< 100	**350 - 500**	emulsion / air
N5.4			**400 - 1000**	emulsion / air
N5.5			**400 - 1000**	emulsion / air

VHRAW31200781215
Material 51ST Aluminium

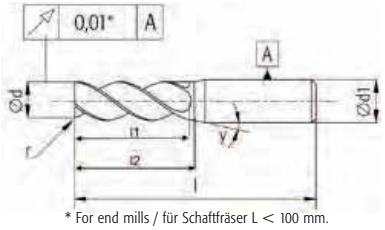
V_c	829 m/min
n	22000 rpm
F_z	0,067 mm/t
V_f	4400 mm/min
a_p	12 mm
a_e	5,5 mm
Coolant	emulsion
Q	**290,4 cm³/min**



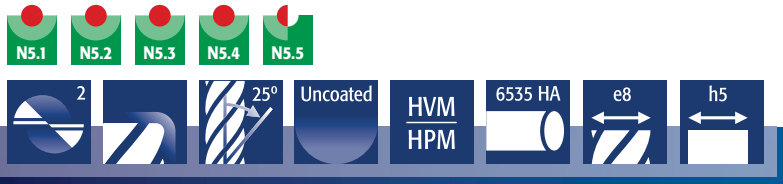


	Shoulder milling / Eckfräsen			Slot milling / Nutfräsen		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
6,0	< 12,0	< 2,70	0,040 - 0,080	< 6,00	6,00	0,032 - 0,064
8,0	< 16,0	< 3,60	0,060 - 0,100	< 8,00	8,00	0,048 - 0,080
10,0	< 20,0	< 4,50	0,080 - 0,120	< 10,00	10,00	0,064 - 0,096
12,0	< 24,0	< 5,40	0,090 - 0,150	< 12,00	12,00	0,072 - 0,120
16,0	< 32,0	< 7,20	0,120 - 0,180	< 16,00	16,00	0,096 - 0,144
20,0	< 40,0	< 9,00	0,150 - 0,230	< 20,00	20,00	0,120 - 0,184
25,0	< 50,0	< 11,25	0,180 - 0,280	< 25,00	25,00	0,144 - 0,224

Standard



* For end mills / für Schaftfräser L < 100 mm.



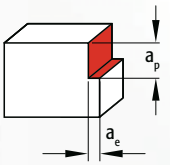
2 flute
2 Schneiden

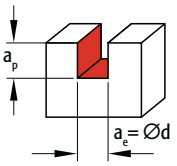
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHLA 2 020 039 03 15	2,0	0,10	3	39	3,00	6,00	0,050	2	15
VHLA 2 030 064 03 15	3,0	0,10	3	64	4,00	9,00	0,050	2	-
VHLA 2 040 064 04 15	4,0	0,10	4	64	5,00	12,00	0,100	2	-
VHLA 2 040 064 06 15	4,0	-	6	64	11,00	-	-	2	15
VHLA 2 050 064 05 15	5,0	0,10	5	64	8,00	15,00	0,100	2	-
VHLA 2 050 064 06 15	5,0	-	6	64	13,00	-	-	2	15
VHLA 2 060 064 06 15	6,0	0,10	6	64	8,00	18,00	0,100	2	-
VHLA 2 060 102 06 15	6,0	0,10	6	102	8,00	24,00	0,100	2	-
VHLA 2 080 070 08 15	8,0	0,10	8	70	10,00	24,00	0,100	2	-
VHLA 2 080 102 08 15	8,0	0,10	8	102	10,00	32,00	0,100	2	-
VHLA 2 100 070 10 15	10,0	0,10	10	70	14,00	26,00	0,150	2	-
VHLA 2 100 102 10 15	10,0	0,10	10	102	14,00	30,00	0,150	2	-
VHLA 2 120 089 12 15	12,0	0,10	12	89	16,00	36,00	0,150	2	-
VHLA 2 120 125 12 15	12,0	0,10	12	125	16,00	48,00	0,150	2	-
VHLA 2 160 089 16 15	16,0	0,10	16	89	20,00	40,00	0,250	2	-
VHLA 2 200 102 20 15	20,0	0,10	20	102	25,00	50,00	0,250	2	-

Material group	TSR (N/mm²)	Hardness HB	Cutting speed Vc m/min	Coolant
N5.1	< 500	< 150	**350 - 650**	emulsion / air
N5.2	< 400	< 120	**200 - 500**	emulsion / air
N5.3	< 350	< 100	**350 - 500**	emulsion / air
N5.4			**400 - 1000**	emulsion / air
N5.5			**400 - 1000**	emulsion / air

VHLA21001021015
Material PEEK 30

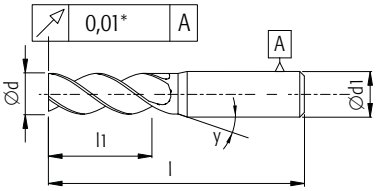
V_c	157 m/min
n	5000 rpm
F_z	0,08 mm/t
V_f	800 mm/min
a_p	10 mm
a_e	4 mm
Coolant	emulsion
Q	**32 cm³/min**



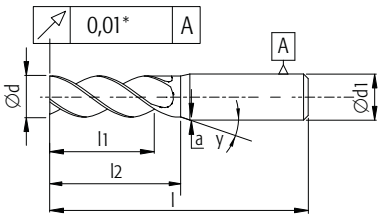


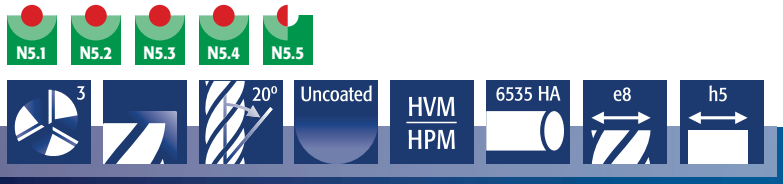
	Shoulder milling / Eckfräsen			Slot milling / Nutfräsen		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
4,0	< 4,0	< 1,80	0,025 - 0,050	< 4,00	4,00	0,020 - 0,040
5,0	< 5,0	< 2,25	0,030 - 0,060	< 5,00	5,00	0,024 - 0,048
6,0	< 6,0	< 2,70	0,040 - 0,080	< 6,00	6,00	0,032 - 0,064
8,0	< 8,0	< 3,60	0,060 - 0,100	< 8,00	8,00	0,048 - 0,080
10,0	< 10,0	< 4,50	0,080 - 0,120	< 10,00	10,00	0,064 - 0,096
12,0	< 12,0	< 5,40	0,090 - 0,150	< 12,00	12,00	0,072 - 0,120
16,0	< 16,0	< 7,20	0,120 - 0,180	< 16,00	16,00	0,096 - 0,144
20,0	< 20,0	< 9,00	0,150 - 0,230	< 20,00	20,00	0,120 - 0,184
25,0	< 25,0	< 11,25	0,200 - 0,300	< 25,00	25,00	0,160 - 0,240

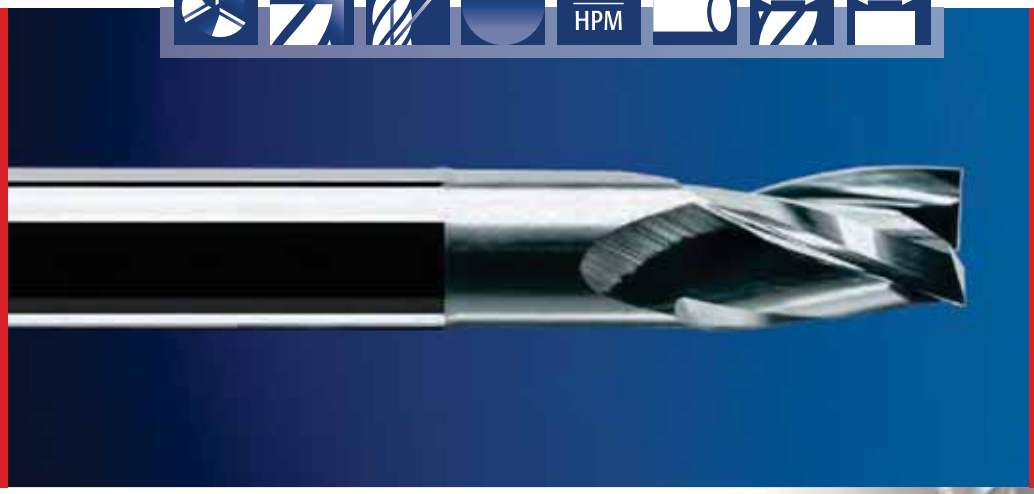
Standard



* For end mills / für Schaftfräser L < 100 mm.







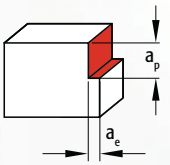
3 flute
3 Schneiden

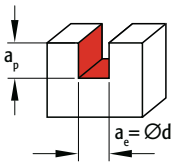
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
Standard									
VHLA 3 040 064 06 15	4,0	-	6	64	11,0	-	-	3	15
VHLA 3 050 064 06 15	5,0	-	6	64	13,0	-	-	3	15
VHLA 3 060 064 06 15	6,0	-	6	64	13,0	-	-	3	-
VHLA 3 080 064 08 15	8,0	-	8	64	19,0	-	-	3	-
VHLA 3 100 070 10 15	10,0	-	10	70	22,0	-	-	3	-
VHLA 3 120 078 12 15	12,0	-	12	78	26,0	-	-	3	-
VHLA 3 160 089 16 15	16,0	-	16	89	32,0	-	-	3	-
VHLA 3 200 102 20 15	20,0	-	20	102	38,0	-	-	3	-
VHLA 3 250 120 25 15	25,0	-	25	120	45,0	-	-	3	-
3xD									
VHLA 3 040 064 06 15 L012	4,0	-	6	64	6,0	12,0	0,100	3	15
VHLA 3 050 064 06 15 L015	5,0	-	6	64	7,0	15,0	0,100	3	15
VHLA 3 060 064 06 15 L018	6,0	-	6	64	9,0	18,0	0,100	3	-
VHLA 3 080 064 08 15 L024	8,0	-	8	64	12,0	24,0	0,100	3	-
VHLA 3 100 072 10 15 L030	10,0	-	10	72	15,0	30,0	0,150	3	-
VHLA 3 120 083 12 15 L036	12,0	-	12	83	18,0	36,0	0,150	3	-
VHLA 3 160 100 16 15 L048	16,0	-	16	100	24,0	48,0	0,200	3	-
VHLA 3 200 110 20 15 L060	20,0	-	20	110	30,0	60,0	0,250	3	-
5xD									
VHLA 3 040 064 06 15 L020	4,0	-	6	64	6,00	20,0	0,100	3	15
VHLA 3 050 064 06 15 L025	5,0	-	6	64	7,00	25,0	0,100	3	15
VHLA 3 060 072 06 15 L030	6,0	-	6	72	9,00	30,0	0,100	3	-
VHLA 3 080 078 08 15 L040	8,0	-	8	78	12,00	40,0	0,100	3	-
VHLA 3 100 092 10 15 L050	10,0	-	10	92	15,00	50,0	0,150	3	-
VHLA 3 120 100 12 15 L060	12,0	-	12	100	18,00	60,0	0,150	3	-
VHLA 3 160 130 16 15 L080	16,0	-	16	130	24,00	80,0	0,200	3	-
VHLA 3 200 150 20 15 L100	20,0	-	20	150	30,00	100,0	0,250	3	-

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.1	< 500	< 150	**350 - 650**	emulsion / air
N5.2	< 400	< 120	**200 - 500**	emulsion / air
N5.3	< 350	< 100	**350 - 500**	emulsion / air
N5.4			**400 - 1000**	emulsion / air
N5.5			**400 - 1000**	emulsion / air

VHLA31000701015
Material PA 6 PLM

V_c	550 m/min
n	17500 rpm
F_z	0,171 mm/t
V_f	9000 mm/min
a_p	20 mm
a_e	10 mm
Coolant	air
Q	**1800 cm³/min**

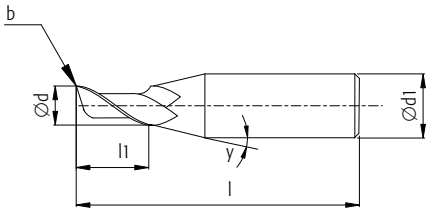


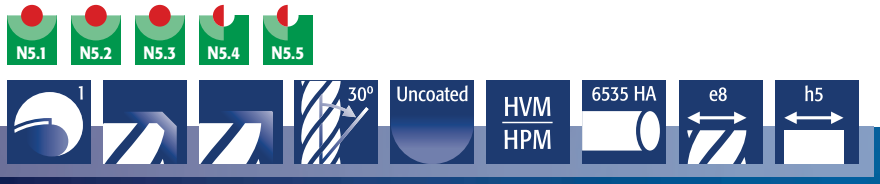


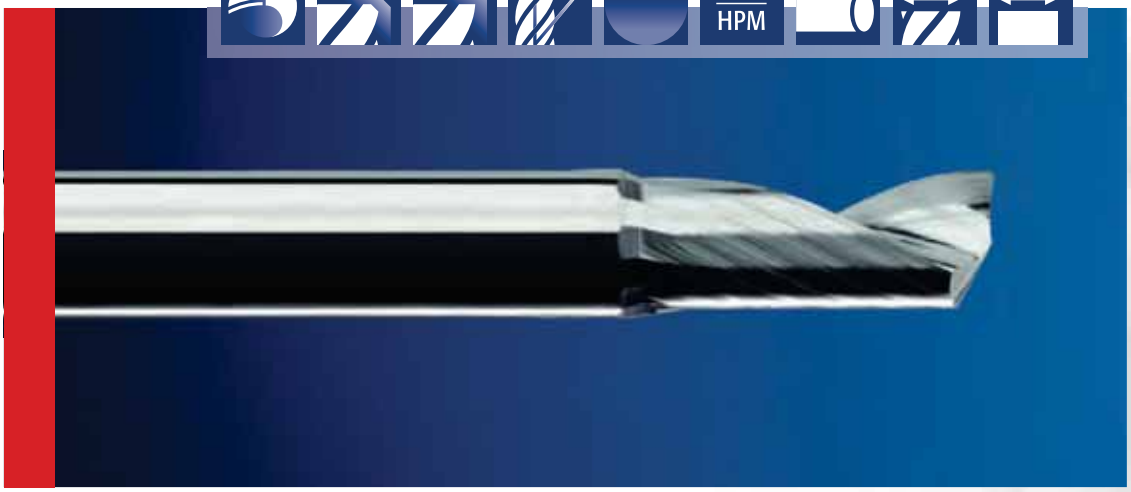
Ød (mm)	Shoulder milling / Eckfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	Slot milling / Nutfräsen a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
4,0	< 4,0	< 1,80	0,025 - 0,050	< 4,00	4,00	0,020 - 0,040
5,0	< 5,0	< 2,25	0,030 - 0,060	< 5,00	5,00	0,024 - 0,048
6,0	< 6,0	< 2,70	0,040 - 0,080	< 6,00	6,00	0,032 - 0,064
8,0	< 8,0	< 3,60	0,060 - 0,100	< 8,00	8,00	0,048 - 0,080
10,0	< 10,0	< 4,50	0,080 - 0,120	< 10,00	10,00	0,064 - 0,096
12,0	< 12,0	< 5,40	0,090 - 0,150	< 12,00	12,00	0,072 - 0,120
16,0	< 16,0	< 7,20	0,120 - 0,180	< 16,00	16,00	0,096 - 0,144
20,0	< 20,0	< 9,00	0,150 - 0,230	< 20,00	20,00	0,120 - 0,184
25,0	< 25,0	< 11,25	0,200 - 0,300	< 25,00	25,00	0,160 - 0,240

Ø x D	Recalculation / Neuberechnung a_p %	a_e %	Fz %	Recalculation / Neuberechnung a_p %	a_e %	Fz %
3 x D	150	50	85	60	100	85
5 x D	150	25	60	40	100	60

Standard





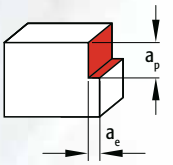


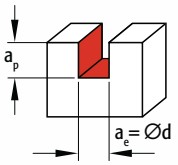
Article Number *Artikelnummer*	Ød (mm)	b (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
VHAE 1 005 038 03 10	0,5	-	3	38	2,50	-	-	1	15
VHAE 1 006 038 03 10	0,6	-	3	38	3,00	-	-	1	15
VHAE 1 008 038 03 10	0,8	-	3	38	4,00	-	-	1	15
VHAE 1 010 038 03 10	1,0	-	3	38	5,00	-	-	1	15
VHAE 1 012 038 03 10	1,2	-	3	38	5,00	-	-	1	15
VHAE 1 015 038 03 10	1,5	-	3	38	5,00	-	-	1	15
VHAE 1 016 038 03 10	1,6	-	3	38	6,00	-	-	1	15
VHAE 1 018 038 03 10	1,8	-	3	38	7,00	-	-	1	15
VHAE 1 020 038 03 10	2,0	-	3	38	8,00	-	-	1	15
VHAE 1 025 038 03 10	2,5	-	3	38	9,00	-	-	1	15
VHAE 1 030 038 03 10	3,0	0,10	3	38	12,00	-	-	1	-
VHAE 1 040 050 04 10	4,0	0,10	4	50	12,00	-	-	1	-
VHAE 1 050 050 05 10	5,0	0,15	5	50	15,00	-	-	1	-
VHAE 1 060 050 06 10	6,0	0,20	6	50	16,00	-	-	1	-
VHAE 1 070 060 07 10	7,0	0,20	7	60	20,00	-	-	1	-
VHAE 1 080 060 08 10	8,0	0,25	8	60	20,00	-	-	1	-
VHAE 1 100 070 10 10	10,0	0,30	10	70	22,00	-	-	1	-
VHAE 1 120 075 12 10	12,0	0,35	12	75	25,00	-	-	1	-
VHAE 1 160 081 16 10	16,0	0,40	16	81	33,00	-	-	1	-

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
N5.1	< 500	< 150	**350 - 650**	emulsion / air
N5.2	< 400	< 120	**200 - 500**	emulsion / air
N5.3	< 350	< 100	**350 - 500**	emulsion / air
N5.4			**400 - 1000**	emulsion / air
N5.5			**400 - 1000**	emulsion / air

VHAE11000701010

Material	Aluminium
V_c	471 m/min
n	15000 rpm
F_z	0,102 mm/t
V_f	1525 mm/min
a_p	10 mm
a_e	10 mm
Coolant	emulsion
Q	**152,5 cm³/min**





	Shoulder milling / Eckfräsen			Slot milling / Nutfräsen		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
0,5	< 1,0	< 0,15	0,010 - 0,018	< 0,5	0,5	0,007 - 0,012
0,6	< 1,2	< 0,18	0,012 - 0,020	< 0,6	0,6	0,009 - 0,015
0,8	< 1,6	< 0,24	0,016 - 0,024	< 0,8	0,8	0,012 - 0,018
1,0	< 2,0	< 0,30	0,020 - 0,030	< 1,0	1,0	0,015 - 0,022
1,2	< 2,4	< 0,36	0,025 - 0,040	< 1,2	1,2	0,019 - 0,030
1,5	3,0	< 0,45	0,030 - 0,050	< 1,5	1,5	0,022 - 0,037
1,6	3,2	< 0,48	0,035 - 0,055	< 1,6	1,6	0,026 - 0,041
1,8	3,6	< 0,54	0,040 - 0,060	< 1,8	1,8	0,030 - 0,045
2,0	4,0	< 0,60	0,045 - 0,065	< 2,0	2,0	0,034 - 0,048
2,5	5,0	< 0,75	0,060 - 0,080	< 2,5	2,5	0,045 - 0,060
3,0	< 6,0	< 0,90	0,070 -0,100	< 3,0	3,0	0,053 -0,075
4,0	< 8,0	< 1,20	0,085 - 0,115	< 4,0	4,0	0,064 - 0,086
5,0	< 10,0	< 1,50	0,100 - 0,140	< 5,0	5,0	0,075 - 0,105
6,0	< 12,0	< 1,80	0,125 - 0,175	< 6,0	6,0	0,094 - 0,131
7,0	14,0	< 2,10	0,132 - 0,200	< 7,0	7,0	0,100 - 0,150
8,0	< 16,0	< 2,40	0,140 - 0,220	< 8,0	8,0	0,105 - 0,165
10,0	< 20,0	< 3,00	0,180 - 0,270	< 10,0	10,0	0,135 - 0,200
12,0	< 15,0	< 3,60	0,220 - 0,300	< 12,0	12,0	0,165 - 0,225
16,0	< 16,0	< 4,80	0,250 - 0,350	< 16,0	16,0	0,180 - 0,250

- Cutting speed V_c is based on max. 20.000 rpm.

  Schnittgeschwindigkeit V_c bezogen auf max. 20.000 U/min.

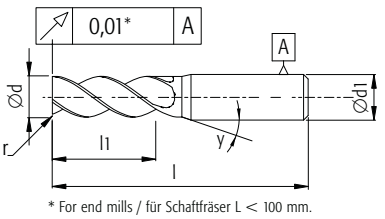
- Conditions are based on pure aluminium for < 5% Si reduce feed per tooth F_z up to 10% and for > 5% Si reduce F_z up to 20%.

  Schnittwerte sind auf die Bearbeitung von Rein-Aluminum ausgelegt. Für Aluminium < 5% Si den Zahnvorschub F_z um 10%, für Aluminium > 5% Si um 20% reduzieren.

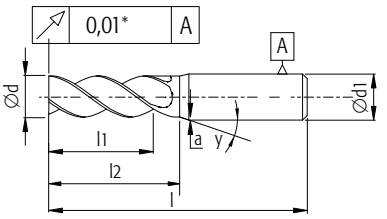
- End mills can be used also for drilling with the same cutting conditions.

  Die Schaftfräser können mit gleichen Schnittwerten auch für die Herstellung von Bohrungen verwendet werden.

Standard



* For end mills / für Schaftfräser L < 100 mm.



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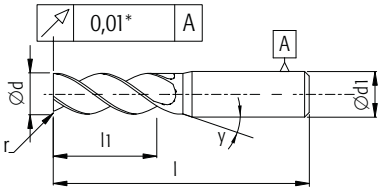
Complete program for all your demands!

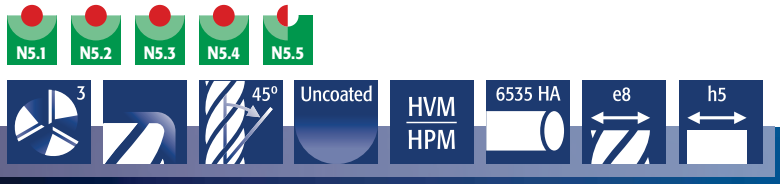
Komplettes Programm für Ihre Wünschen!

Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
Standard									
VHAD 3 020 057 06 10	2,0	0,05	6	57	5,0	-	-	3	15
VHAD 3 030 057 06 10	3,0	0,10	6	57	8,0	-	-	3	15
VHAD 3 040 057 06 10	4,0	0,10	6	57	11,0	-	-	3	15
VHAD 3 050 057 06 10	5,0	0,20	6	57	13,0	-	-	3	15
VHAD 3 060 057 06 10	6,0	0,20	6	57	16,0	-	-	3	-
VHAD 3 080 063 08 10	8,0	0,20	8	63	19,0	-	-	3	-
VHAD 3 100 072 10 10	10,0	0,20	10	72	22,0	-	-	3	-
VHAD 3 120 083 12 10	12,0	0,20	12	83	26,0	-	-	3	-
VHAD 3 160 092 16 10	16,0	0,20	16	92	32,0	-	-	3	-
VHAD 3 200 104 20 10	20,0	0,20	20	104	40,0	-	-	3	-
3xD									
VHAD 3 020 057 06 10 L060	2,0	0,05	6	57	5,0	6,0	0,050	3	15
VHAD 3 030 057 06 10 L090	3,0	0,10	6	57	8,0	9,0	0,050	3	15
VHAD 3 040 057 06 10 L120	4,0	0,10	6	57	11,0	12,0	0,100	3	15
VHAD 3 050 057 06 10 L150	5,0	0,20	6	57	13,0	15,0	0,100	3	15
VHAD 3 060 057 06 10 L200	6,0	0,20	6	57	16,0	20,0	0,100	3	15
VHAD 3 080 063 08 10 L250	8,0	0,20	8	63	19,0	25,0	0,100	3	15
VHAD 3 100 072 10 10 L300	10,0	0,20	10	72	22,0	30,0	0,150	3	15
VHAD 3 120 083 12 10 L360	12,0	0,20	12	83	26,0	36,0	0,150	3	15
VHAD 3 160 100 16 10 L480	16,0	0,20	16	100	32,0	48,0	0,200	3	15
VHAD 3 200 110 20 10 L600	20,0	0,20	20	110	40,0	60,0	0,250	3	15
5xD									
VHAD 3 020 063 06 10 L100	2,0	0,05	6	63	5,0	10,0	0,050	3	15
VHAD 3 030 063 06 10 L150	3,0	0,10	6	63	8,0	15,0	0,050	3	15
VHAD 3 040 063 06 10 L200	4,0	0,10	6	63	11,0	20,0	0,100	3	15
VHAD 3 050 063 06 10 L250	5,0	0,20	6	63	13,0	25,0	0,100	3	15
VHAD 3 060 072 06 10 L300	6,0	0,20	6	72	16,0	30,0	0,100	3	15
VHAD 3 080 078 08 10 L400	8,0	0,20	8	78	19,0	40,0	0,100	3	15
VHAD 3 100 092 10 10 L500	10,0	0,20	10	92	22,0	50,0	0,150	3	15
VHAD 3 120 100 12 10 L600	12,0	0,20	12	100	26,0	60,0	0,150	3	15
VHAD 3 160 130 16 10 L800	16,0	0,20	16	130	32,0	80,0	0,200	3	15
VHAD 3 200 150 20 10 L100	20,0	0,20	20	150	40,0	100,0	0,250	3	15

Standard



* For end mills / für Schaftfräser L < 100 mm.



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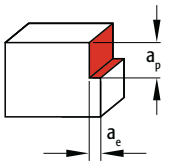
Article Number *Artikelnummer*	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	Z	γ (°)
Long									
VHADL 3 020 057 06 10	2,0	0,05	6	57	6,0	-	-	3	15
VHADL 3 030 057 06 10	3,0	0,10	6	57	11,0	-	-	3	15
VHADL 3 040 057 06 10	4,0	0,10	6	57	14,0	-	-	3	15
VHADL 3 050 057 06 10	5,0	0,20	6	57	18,0	-	-	3	15
VHADL 3 060 057 06 10	6,0	0,20	6	57	20,0	-	-	3	-
VHADL 3 080 063 08 10	8,0	0,20	8	63	25,0	-	-	3	-
VHADL 3 100 072 10 10	10,0	0,20	10	72	30,0	-	-	3	-
VHADL 3 120 083 12 10	12,0	0,20	12	83	36,0	-	-	3	-
VHADL 3 160 100 16 10	16,0	0,20	16	100	48,0	-	-	3	-
VHADL 3 200 110 20 10	20,0	0,20	20	110	60,0	-	-	3	-

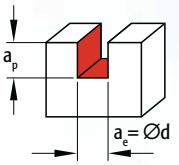
Cutting conditions / Schnittwertempfehlungen VHAD

Material group	TSR (N/mm²)	Hardness HB	Cutting speed Vc m/min	Coolant
N5.1	< 500	< 150	**350 - 650**	emulsion / air
N5.2	< 400	< 120	**200 - 500**	emulsion / air
N5.3	< 350	< 100	**350 - 500**	emulsion / air
N5.4			**400 - 1000**	emulsion / air
N5.5			**400 - 1000**	emulsion / air

VHAD
Material Aluminium 7075

V_c	800 m/min
n	25.465 rpm
F_z	0,250 mm/t
V_f	19.099 mm/min
a_p	10 mm
a_e	5 mm
Coolant	emulsion
Q	**954,95 cm³/min**





	Shoulder milling / Eckfräsen			Slot milling / Nutfräsen		
Ød (mm)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)	a_p max. (mm)	a_e max. (mm)	F_z (mm/tooth)
2,0	< 4,0	< 0,90	0,015 - 0,030	< 2,00	2,00	0,012 - 0,024
3,0	< 6,0	< 1,35	0,020 - 0,040	< 3,00	3,00	0,016 - 0,032
4,0	< 8,0	< 1,80	0,025 - 0,050	< 4,00	4,00	0,020 - 0,040
5,0	< 10,0	< 2,25	0,030 - 0,060	< 5,00	5,00	0,024 - 0,048
6,0	< 12,0	< 2,70	0,040 - 0,080	< 6,00	6,00	0,032 - 0,064
8,0	< 16,0	< 3,60	0,060 - 0,100	< 8,00	8,00	0,048 - 0,080
10,0	< 20,0	< 4,50	0,080 - 0,120	< 10,00	10,00	0,064 - 0,096
12,0	< 24,0	< 5,40	0,090 - 0,150	< 12,00	12,00	0,072 - 0,120
16,0	< 32,0	< 7,20	0,120 - 0,180	< 16,00	16,00	0,096 - 0,144
20,0	< 38,0	< 9,00	0,150 - 0,230	< 20,00	20,00	0,120 - 0,184

	Recalculation / Neuberechnung			Recalculation / Neuberechnung		
Ø x D	a_p %	a_e %	Fz %	a_p %	a_e %	Fz %
3 x D	150	50	85	60	100	85
5 x D	150	25	60	40	100	60

End mill designation
Fräserbezeichnung

VHMFR	6	060	064	06	03	...
1	2	3	4	5	6	7	8

1 Van Hoorn Carbide or Van Hoorn Asia line / Van Hoorn Carbide oder Van Hoorn Asia line

2 Type of end mill / Typ Fräser

AD	A aluminium D three flute L long	LA	L long A aluminium	PK	P performance K ball nose
AE	A aluminium E single flute	MA	M micro A aluminium	PT	P performance T torus
BM	B ball nose M end mill	MAK	M micro A aluminium K ball nose	RAW	R rougher A aluminium W weldon
DR	D double R radius	MF	M multiple F flute	RS	R rougher S steel
DB	D diamond B ball nose	MFR	M multiple F flute R radius	RFF	R rougher F end mill F chamfer
DT	D diamond T torus	MG	M micro G graphite	TF	T torus F end mill
GKF	G graphite K ball nose F end mill	MGK	M micro G graphite K ball nose	TR	T trochoidal R stainless/titanium
GR	G graphite R rougher	MS	M micro S steel	TS	T trochoidal S steel
GT	G graphite T straight	MSK	M micro S steel K ball nose	VF	V 45 degree F end mill
GTF	G graphite T torus F end mill	MSR	M micro S steel R radius	VFF	V 45 degree F end mill F chamfer
KE	K plastic E single flute	PM	P performance M multiple flute	VFR	V 45 degree F end mill R radius
KF	K ball nose F end mill	PMR	P performance M multiple flute R radius	VTR	V variable T titanium R radius

3 Number of teeth (Z) / Zähnezahl (Z)

4 End mill diameter Ød (mm) / Fräserdurchmesser Ød (mm)

5 Overall length l (mm) / Gesamtlänge l (mm)

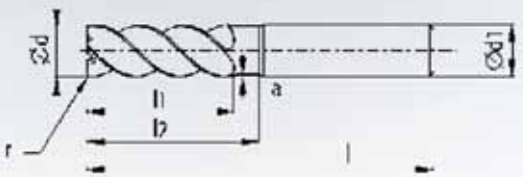
6 Shank diameter Ød1 (mm) / Schaftdurchmesser Ød1 (mm)

7 Coating / Beschichtung

02	**Diamond coating /** Diamant Beschichtung	40	**TiAlN Gold coating /** TiAlN Gold Beschichtung
10	**Uncoated /** Nicht Beschichtet	03	**TiAlN coating /** TiAlN Beschichtung
23	**DLC coating /** DLC Beschichtung	15	**Uncoated /** Nicht Beschichtet
40	**TiAlN+ coating /** TiAlN+ Beschichtung		

8 Alternative measurements / Alternative maßen

- **cutting length l2 (mm) /** Schneidenlänge l2 (mm)
- **corner radius r (mm) /** Eckenradius r (mm)



PARA Tooling

Solid carbide end mills for standard machining

Vollhartmetall Fräser für Standard Zerspanung

Produced at the same high tech machines but for different applications!

Produziert an den gleichen high tech Maschinen aber für unterschiedliche Anwendungen!

All round machining

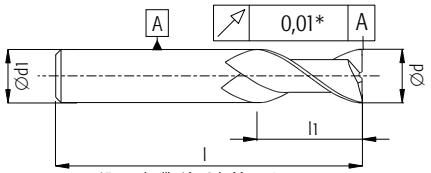
Allgemeine Zerspanung

		P1.1	P1.2	P1.3	H2.1	H2.2	H2.3	M3.1	M3.2	K4.1	N5.1	N5.2	N5.3	N5.4	N5.5	N5.6	S6.1	S6.2	S6.3	S6.4	Number of flutes / Anzahl der Schneiden	Coating / Beschichtung	Size range / Durchmesserbereich	Page / Seite
AS2											●	●	●	●							2	Uncoated	3,0 / 20,0	134
AS3											●	●	●	●							3	Uncoated	3,0 / 20,0	135
BT2		●	●	◐	◐			◐	◐	◐	◐	◐	◐	◐							2	TiAlN	1,0 / 20,0	136
BTL2		●	●	◐	◐			◐	◐	◐	◐	◐	◐	◐							2	TiAlN	1,0 / 12,0	137
BT4		●	●	◐	◐			◐	◐	◐			◐	◐							4	TiAlN	1,0 / 20,0	138
MS		●	●	●	◐			◐	◐	◐			◐				◐	◐	◐	◐	6-8	TiAlN	6,0 / 20,0	139
ST2		●	●	◐	◐			◐	◐	◐	◐	◐	◐								2	TiAlN	1,0 / 20,0	140
ST3		●	●	◐	◐			◐	◐	◐	◐	◐	◐								3	TiAlN	1,0 / 20,0	141
ST4		●	●	◐	◐			◐	◐	◐	◐	◐	◐								4	TiAlN	1,0 / 20,0	142
STR2		●	●	◐	◐			◐	◐	◐	◐	◐	◐								2	TiAlN	3,0 / 20,0	143
STR4		●	●	◐	◐			◐	◐	◐	◐	◐	◐								4	TiAlN	3,0 / 20,0	144
RS3		●	●	◐	◐			◐	◐	◐			◐				◐	◐	◐	◐	3	TiAlN	2,0 / 20,0	145
RS4		●	●	◐	◐			◐	◐	◐			◐				◐	◐	◐	◐	4	TiAlN	3,0 / 20,0	146
RV4		●	●	●	◐			●	●	◐			◐				◐	◐	◐	◐	4	TiAlN	4,0 / 20,0	147
RVR4		●	●	●	◐			●	●	◐			◐				◐	◐	◐	◐	4	TiAlN	3,0 / 16,0	148
RVR5		●	●	●	◐			●	●	◐			◐				◐	◐	◐	◐	5	TiAlN	3,0 / 16,0	150
RSR4		●	●	●	◐			◐	◐	◐			◐								4	TiAlN	4,0 / 20,0	152
RR		●	●	●				◐	◐	◐			◐								3-6	TiAlN	4,0 / 20,0	153
CH 60°		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	3-6	TiAlN	1,0 / 16,0	154
CH 90°		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	3-6	TiAlN	1,0 / 20,0	155
CH 120°		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	3-6	TiAlN	1,0 / 16,0	156

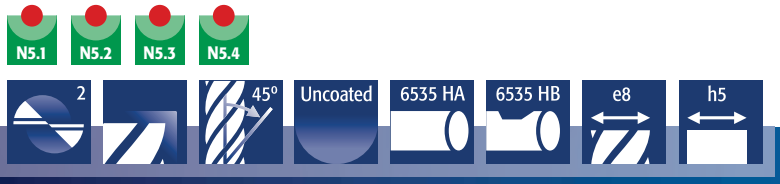
● Well suited / besonders geeignet

◐ Suited / geeignet

Standard



*For end mills / für Schaftfräser L < 100 mm



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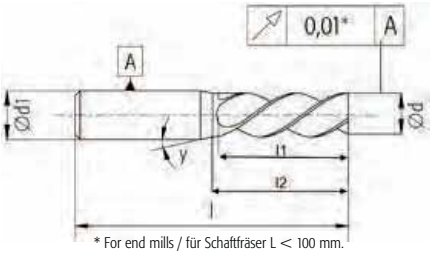
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z
AS2 3,0x57	3,0	-	6	57	8	-	-	2
AS2 4,0x57	4,0	-	6	57	11	-	-	2
AS2 5,0x57	5,0	-	6	57	13	-	-	2
AS2 6,0x57	6,0	-	6	57	13	-	-	2
AS2 8,0x63	8,0	-	8	63	19	-	-	2
AS2 10,0x72	10,0	-	10	72	22	-	-	2
AS2 12,0x83	12,0	-	12	83	26	-	-	2
AS2 16,0x92	16,0	-	16	92	32	-	-	2
AS2 20,0x104	20,0	-	20	104	38	-	-	2

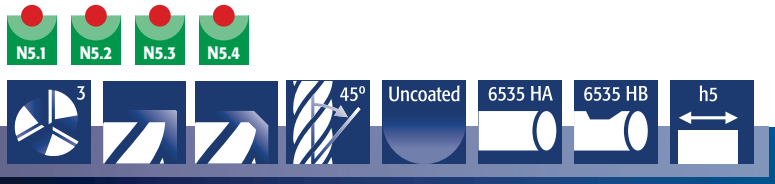
Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard



* For end mills / für Schaftfräser L < 100 mm.



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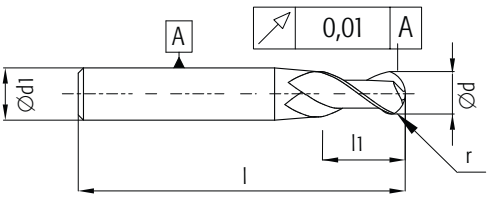
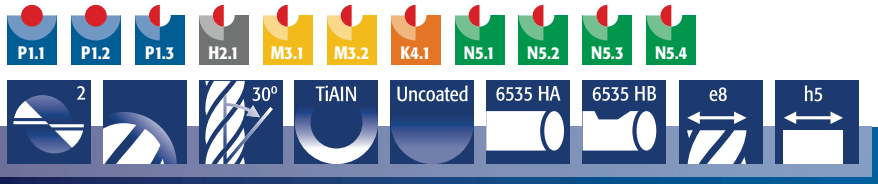
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z
AS3 3,0x57	3,0	-	6	57	6	-	0,10	3
AS3 4,0x57	4,0	-	6	57	8	-	0,10	3
AS3 5,0x57	5,0	-	6	57	10	-	0,15	3
AS3 6,0x57	6,0	-	6	57	12	-	0,15	3
AS3 8,0x63	8,0	-	8	63	16	-	0,20	3
AS3 10,0x72	10,0	-	10	72	20	-	0,20	3
AS3 12,0x83	12,0	-	12	83	24	-	0,25	3
AS3 16,0x92	16,0	-	16	92	32	-	0,25	3
AS3 20,0x104	20,0	-	20	104	40	-	0,25	3
AS3 3,0x57 L009	3,0	-	6	57	6	9	0,10	3
AS3 4,0x57 L012	4,0	-	6	57	8	12	0,10	3
AS3 5,0x57 L015	5,0	-	6	57	10	15	0,15	3
AS3 6,0x57 L018	6,0	-	6	57	12	18	0,15	3
AS3 8,0x63 L024	8,0	-	8	63	16	24	0,20	3
AS3 10,0x72 L030	10,0	-	10	72	20	30	0,20	3
AS3 12,0x83 L036	12,0	-	12	83	24	36	0,25	3
AS3 16,0x100 L048	16,0	-	16	100	32	48	0,25	3
AS3 20,0x110 L060	20,0	-	20	110	40	60	0,25	3

Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard





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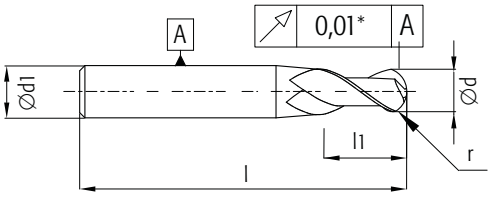
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z
BT2 1,0x40	1,0	0,50	3	40	3	-	-	2
BT2 1,5x40	1,5	0,75	3	40	5	-	-	2
BT2 2,0x40	2,0	1,00	3	40	7	-	-	2
BT2 2,5x40	2,5	1,25	3	40	7	-	-	2
BT2 3,0x40	3,0	1,50	3	40	10	-	-	2
BT2 3,5x50	3,5	1,75	4	50	12	-	-	2
BT2 4,0x50	4,0	2,00	4	50	15	-	-	2
BT2 4,5x50	4,5	2,25	5	50	15	-	-	2
BT2 5,0x50	5,0	2,50	5	50	15	-	-	2
BT2 6,0x65	6,0	3,00	6	65	20	-	-	2
BT2 7,0x65	7,0	3,50	8	65	20	-	-	2
BT2 8,0x65	8,0	4,00	8	65	20	-	-	2
BT2 9,0x70	9,0	4,50	10	70	22	-	-	2
BT2 10,0x70	10,0	5,00	10	70	22	-	-	2
BT2 11,0x70	11,0	5,50	11	70	25	-	-	2
BT2 12,0x80	12,0	6,00	12	80	25	-	-	2
BT2 14,0x90	14,0	7,00	14	90	30	-	-	2
BT2 16,0x90	16,0	8,00	16	90	32	-	-	2
BT2 18,0x100	18,0	9,00	18	100	35	-	-	2
BT2 20,0x100	20,0	10,00	20	100	38	-	-	2

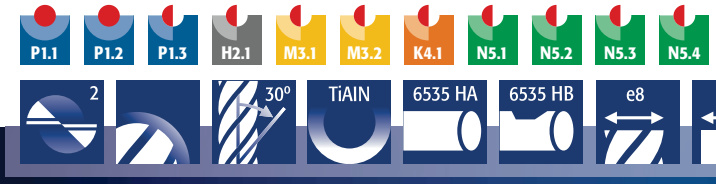
Only even shanks starting from Ø6 mm available with Weldon shank.
All items are available uncoated for the same price.

Nur gerade Schäfte ab Ø6 mm verfügbar mit Weldonfläche.
Alle Positionen auch Unbeschichtet lieferbar für den Beschichteten Preis.

Standard



* For end mills / für Schaftfräser L < 100 mm.



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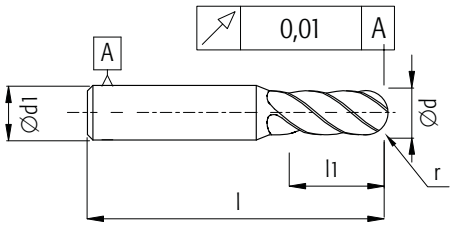
Long length / Lange länge

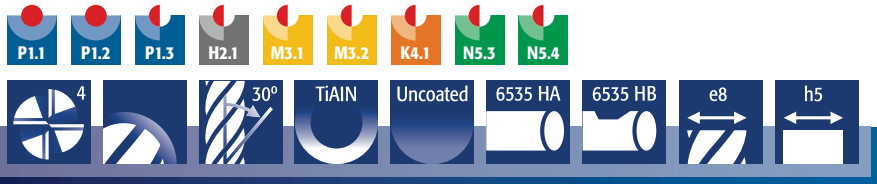
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z
BTL2 1,0x50	1,0	0,50	4	50	2,5	-	-	2
BTL2 1,5x50	1,5	0,75	4	50	4	-	-	2
BTL2 2,0x50	2,0	1,00	6	50	5	-	-	2
BTL2 3,0x60	3,0	1,50	6	60	8	-	-	2
BTL2 4,0x70	4,0	2,00	6	70	8	-	-	2
BTL2 5,0x80	5,0	2,50	6	80	10	-	-	2
BTL2 6,0x90	6,0	3,00	6	90	12	-	-	2
BTL2 8,0x100	8,0	4,00	8	100	14	-	-	2
BTL2 10,0x100	10,0	5,00	10	100	18	-	-	2
BTL2 12,0x110	12,0	6,00	12	110	22	-	-	2
					-			
BTXL2 2,0x80	2,0	1,00	3	80	6	-	-	2
BTXL2 3,0x100	3,0	1,50	3	100	8	-	-	2
BTXL2 4,0x100	4,0	2,00	4	100	8	-	-	2
BTXL2 5,0x120	5,0	2,50	6	120	10	-	-	2
BTXL2 6,0x120	6,0	3,00	6	120	10	-	-	2
BTXL2 8,0x140	8,0	4,00	8	140	14	-	-	2
BTXL2 10,0x180	10,0	5,00	10	180	18	-	-	2
BTXL2 12,0x200	12,0	6,00	12	200	22	-	-	2

Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard





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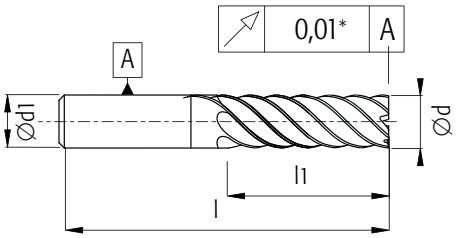
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z
BT4 1,0x40	1,0	0,50	3	40	3	-	-	4
BT4 1,5x40	1,5	0,75	3	40	5	-	-	4
BT4 2,0x40	2,0	1,00	3	40	7	-	-	4
BT4 2,5x40	2,5	1,25	3	40	7	-	-	4
BT4 3,0x40	3,0	1,50	3	40	10	-	-	4
BT4 3,5x50	3,5	1,75	4	50	12	-	-	4
BT4 4,0x50	4,0	2,00	4	50	15	-	-	4
BT4 4,5x50	4,5	2,25	5	50	15	-	-	4
BT4 5,0x50	5,0	2,50	5	50	15	-	-	4
BT4 6,0x65	6,0	3,00	6	65	20	-	-	4
BT4 7,0x65	7,0	3,50	8	65	20	-	-	4
BT4 8,0x65	8,0	4,00	8	65	20	-	-	4
BT4 9,0x70	9,0	4,50	10	70	22	-	-	4
BT4 10,0x70	10,0	5,00	10	70	22	-	-	4
BT4 11,0x70	11,0	5,50	11	70	25	-	-	4
BT4 12,0x80	12,0	6,00	12	80	25	-	-	4
BT4 14,0x90	14,0	7,00	14	90	30	-	-	4
BT4 16,0x90	16,0	8,00	16	90	32	-	-	4
BT4 18,0x100	18,0	9,00	18	100	35	-	-	4
BT4 20,0x100	20,0	10,00	20	100	38	-	-	4

Only even shanks starting from Ø6 mm available with Weldon shank.
All items are available uncoated for the same price.

Nur gerade Schäfte ab Ø6 mm verfügbar mit Weldonfläche.
Alle Positionen auch Unbeschichtet lieferbar für den Beschichteten Preis.

Standard



* For end mills / für Schaftfräser L < 100 mm.

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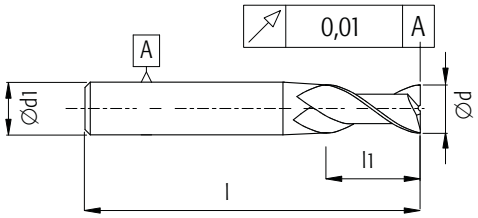
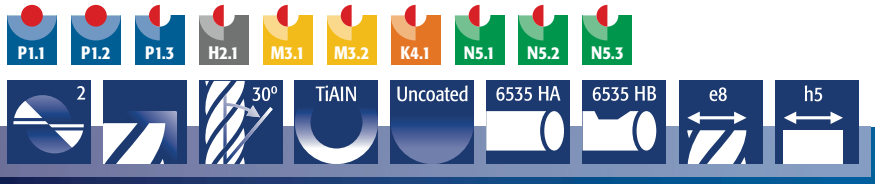
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z	
MS 6,0x58	6,0	-	6	58	13	-	-	6	
MS 8,0x65	8,0	-	8	65	19	-	-	6	
MS 10,0x72	10,0	-	10	72	22	-	-	6	
MS 12,0x83	12,0	-	12	83	26	-	-	6	
MS 16,0x92	16,0	-	16	92	32	-	-	6	
MS 18,0x92	18,0	-	20	92	32	-	-	8	new/neu
MS 20,0x103	20,0	-	20	103	38	-	-	8	
MSL 6,0x70	6,0	-	6	70	26	-	-	6	
MSL 8,0x90	8,0	-	8	90	36	-	-	6	
MSL 10,0x100	10,0	-	10	100	46	-	-	6	
MSL 12,0x110	12,0	-	12	110	56	-	-	6	
MSL 16,0x130	16,0	-	16	130	66	-	-	6	
MSL 20,0x140	20,0	-	20	140	76	-	-	6	

Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard





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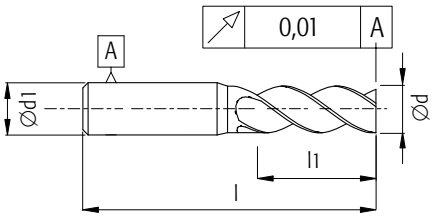
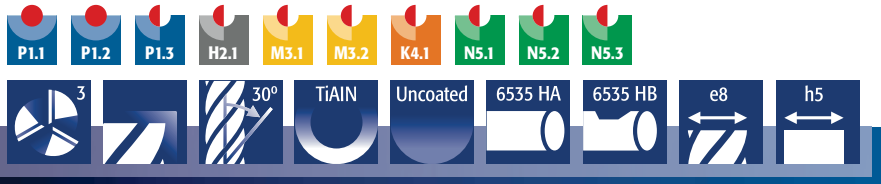
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z	
ST2 1,0x40	1,0	-	3	40	3	-	-	2	
ST2 1,5x40	1,5	-	3	40	5	-	-	2	
ST2 2,0x40	2,0	-	3	40	7	-	-	2	
ST2 2,5x40	2,5	-	3	40	7	-	-	2	
ST2 3,0x40	3,0	-	3	40	10	-	-	2	
ST2 3,5x50	3,5	-	4	50	12	-	-	2	
ST2 4,0x50	4,0	-	4	50	15	-	-	2	
ST2 4,5x50	4,5	-	5	50	15	-	-	2	
ST2 5,0x50	5,0	-	5	50	15	-	-	2	
ST2 5,5x65	5,5	-	6	65	18	-	-	2	new/neu
ST2 6,0x65	6,0	-	6	65	20	-	-	2	
ST2 7,0x65	7,0	-	8	65	20	-	-	2	
ST2 8,0x65	8,0	-	8	65	20	-	-	2	
ST2 9,0x70	9,0	-	10	70	22	-	-	2	
ST2 10,0x70	10,0	-	10	70	22	-	-	2	
ST2 11,0x70	11,0	-	11	70	25	-	-	2	
ST2 12,0x80	12,0	-	12	80	25	-	-	2	
ST2 14,0x90	14,0	-	14	90	30	-	-	2	
ST2 16,0x90	16,0	-	16	90	32	-	-	2	
ST2 18,0x100	18,0	-	18	100	35	-	-	2	
ST2 20,0x100	20,0	-	20	100	38	-	-	2	

Only even shanks starting from Ø6 mm available with Weldon shank.
All items are available uncoated for the same price.

Nur gerade Schäfte ab Ø6 mm verfügbar mit Weldonfläche.
Alle Positionen auch Unbeschichtet lieferbar für den Beschichteten Preis.

Standard





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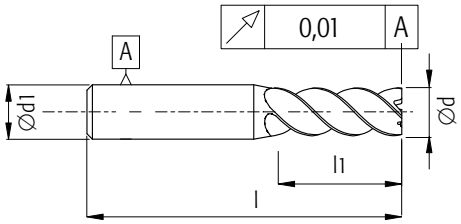
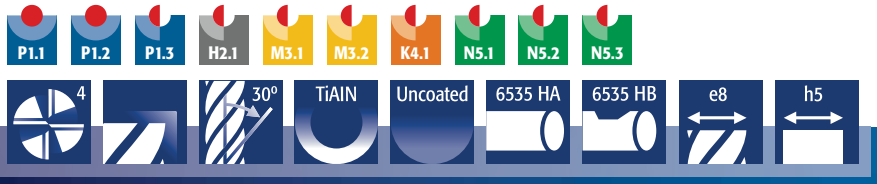
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z
ST3 1,0x40	1,0	-	3	40	3	-	-	3
ST3 1,5x40	1,5	-	3	40	5	-	-	3
ST3 2,0x40	2,0	-	3	40	7	-	-	3
ST3 2,5x40	2,5	-	3	40	7	-	-	3
ST3 3,0x40	3,0	-	3	40	10	-	-	3
ST3 3,5x50	3,5	-	4	50	12	-	-	3
ST3 4,0x50	4,0	-	4	50	15	-	-	3
ST3 4,5x50	4,5	-	5	50	15	-	-	3
ST3 5,0x50	5,0	-	5	50	15	-	-	3
ST3 6,0x65	6,0	-	6	65	20	-	-	3
ST3 7,0x65	7,0	-	8	65	20	-	-	3
ST3 8,0x65	8,0	-	8	65	20	-	-	3
ST3 9,0x70	9,0	-	10	70	22	-	-	3
ST3 10,0x70	10,0	-	10	70	22	-	-	3
ST3 11,0x70	11,0	-	11	70	25	-	-	3
ST3 12,0x80	12,0	-	12	80	25	-	-	3
ST3 14,0x90	14,0	-	14	90	30	-	-	3
ST3 16,0x90	16,0	-	16	90	32	-	-	3
ST3 18,0x100	18,0	-	18	100	35	-	-	3
ST3 20,0x100	20,0	-	20	100	38	-	-	3

Only even shanks starting from Ø6 mm available with Weldon shank.
All items are available uncoated for the same price.

Nur gerade Schäfte ab Ø6 mm verfügbar mit Weldonfläche.
Alle Positionen auch Unbeschichtet lieferbar für den Beschichteten Preis.

Standard





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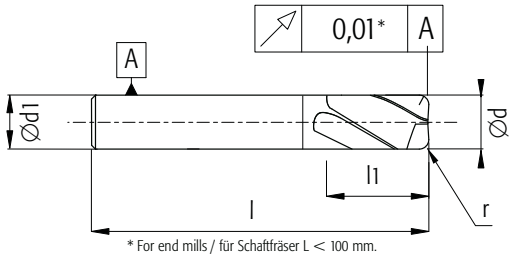
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z
ST4 1,0x40	1,0	-	3	40	3	-	-	4
ST4 1,5x40	1,5	-	3	40	5	-	-	4
ST4 2,0x40	2,0	-	3	40	7	-	-	4
ST4 2,5x40	2,5	-	3	40	7	-	-	4
ST4 3,0x40	3,0	-	3	40	10	-	-	4
ST4 3,5x50	3,5	-	4	50	12	-	-	4
ST4 4,0x50	4,0	-	4	50	15	-	-	4
ST4 4,5x50	4,5	-	5	50	15	-	-	4
ST4 5,0x50	5,0	-	5	50	15	-	-	4
ST4 6,0x65	6,0	-	6	65	20	-	-	4
ST4 7,0x65	7,0	-	8	65	20	-	-	4
ST4 8,0x65	8,0	-	8	65	20	-	-	4
ST4 9,0x70	9,0	-	10	70	22	-	-	4
ST4 10,0x70	10,0	-	10	70	22	-	-	4
ST4 11,0x70	11,0	-	11	70	25	-	-	4
ST4 12,0x80	12,0	-	12	80	25	-	-	4
ST4 14,0x90	14,0	-	14	90	30	-	-	4
ST4 16,0x90	16,0	-	16	90	32	-	-	4
ST4 18,0x100	18,0	-	18	100	35	-	-	4
ST4 20,0x100	20,0	-	20	100	38	-	-	4

Only even shanks starting from Ø6 mm available with Weldon shank.
All items are available uncoated for the same price.

Nur gerade Schäfte ab Ø6 mm verfügbar mit Weldonfläche.
Alle Positionen auch Unbeschichtet lieferbar für den Beschichteten Preis.

Standard



* For end mills / für Schaftfräser L < 100 mm.

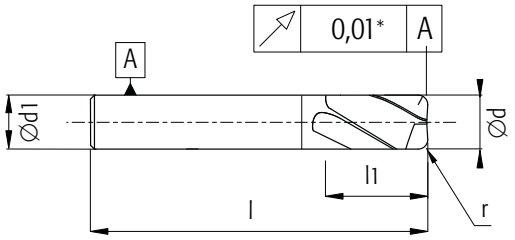
PAGE 157

Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z
STR2 3,0x50 R=0,3	3,0	0,3	6	50	12	-	-	2
STR2 4,0x50 R=0,3	4,0	0,3	6	50	15	-	-	2
STR2 4,0x50 R=0,5	4,0	0,5	6	50	15	-	-	2
STR2 5,0x60 R=0,3	5,0	0,3	6	60	20	-	-	2
STR2 5,0x60 R=0,5	5,0	0,5	6	60	20	-	-	2
STR2 6,0x60 R=0,3	6,0	0,3	6	60	20	-	-	2
STR2 6,0x60 R=0,5	6,0	0,5	6	60	20	-	-	2
STR2 6,0x60 R=1,0	6,0	1,0	6	60	20	-	-	2
STR2 8,0x70 R=0,3	8,0	0,3	8	70	25	-	-	2
STR2 8,0x70 R=0,5	8,0	0,5	8	70	25	-	-	2
STR2 8,0x70 R=1,0	8,0	1,0	8	70	25	-	-	2
STR2 8,0x70 R=1,5	8,0	1,5	8	70	25	-	-	2
STR2 8,0x70 R=2,0	8,0	2,0	8	70	25	-	-	2
STR2 10,0x90 R=0,3	10,0	0,3	10	90	30	-	-	2
STR2 10,0x90 R=0,5	10,0	0,5	10	90	30	-	-	2
STR2 10,0x90 R=1,0	10,0	1,0	10	90	30	-	-	2
STR2 10,0x90 R=1,5	10,0	1,5	10	90	30	-	-	2
STR2 10,0x90 R=2,0	10,0	2,0	10	90	30	-	-	2
STR2 12,0x90 R=0,5	12,0	0,5	12	90	30	-	-	2
STR2 12,0x90 R=1,0	12,0	1,0	12	90	30	-	-	2
STR2 12,0x90 R=1,5	12,0	1,5	12	90	30	-	-	2
STR2 12,0x90 R=2,0	12,0	2,0	12	90	30	-	-	2
STR2 16,0x110 R=0,5	16,0	0,5	16	110	50	-	-	2
STR2 16,0x110 R=1,0	16,0	1,0	16	110	50	-	-	2
STR2 16,0x110 R=1,5	16,0	1,5	16	110	50	-	-	2
STR2 16,0x110 R=2,0	16,0	2,0	16	110	50	-	-	2
STR2 20,0x110 R=0,5	20,0	0,5	20	110	50	-	-	2
STR2 20,0x110 R=1,0	20,0	1,0	20	110	50	-	-	2
STR2 20,0x110 R=1,5	20,0	1,5	20	110	50	-	-	2
STR2 20,0x110 R=2,0	20,0	2,0	20	110	50	-	-	2

Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard



* For end mills / für Schaftfräser L < 100 mm.

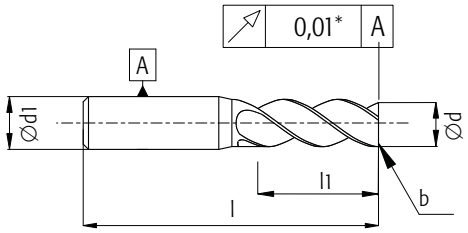
PAGE 157

Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z	
STR4 3,0x50 R=0,3	3,0	0,3	6	50	12	-	-	4	
STR4 4,0x50 R=0,3	4,0	0,3	6	50	15	-	-	4	
STR4 4,0x50 R=0,5	4,0	0,5	6	50	15	-	-	4	
STR4 5,0x60 R=0,3	5,0	0,3	6	60	20	-	-	4	
STR4 5,0x60 R=0,5	5,0	0,5	6	60	20	-	-	4	
STR4 6,0x60 R=0,3	6,0	0,3	6	60	20	-	-	4	
STR4 6,0x60 R=0,5	6,0	0,5	6	60	20	-	-	4	
STR4 6,0x60 R=1,0	6,0	1,0	6	60	20	-	-	4	
STR4 8,0x70 R=0,3	8,0	0,3	8	70	25	-	-	4	
STR4 8,0x70 R=0,5	8,0	0,5	8	70	25	-	-	4	
STR4 8,0x70 R=0,75	8,0	0,75	8	70	25	-	-	4	new/neu
STR4 8,0x70 R=1,0	8,0	1,0	8	70	25	-	-	4	
STR4 8,0x70 R=1,5	8,0	1,5	8	70	25	-	-	4	
STR4 8,0x70 R=2,0	8,0	2,0	8	70	25	-	-	4	
STR4 10,0x90 R=0,3	10,0	0,3	10	90	30	-	-	4	
STR4 10,0x90 R=0,5	10,0	0,5	10	90	30	-	-	4	
STR4 10,0x90 R=1,0	10,0	1,0	10	90	30	-	-	4	
STR4 10,0x90 R=1,5	10,0	1,5	10	90	30	-	-	4	
STR4 10,0x90 R=2,0	10,0	2,0	10	90	30	-	-	4	
STR4 12,0x90 R=0,5	12,0	0,5	12	90	30	-	-	4	
STR4 12,0x90 R=1,0	12,0	1,0	12	90	30	-	-	4	
STR4 12,0x90 R=1,5	12,0	1,5	12	90	30	-	-	4	
STR4 12,0x90 R=2,0	12,0	2,0	12	90	30	-	-	4	
STR4 16,0x110 R=0,5	16,0	0,5	16	110	50	-	-	4	
STR4 16,0x110 R=1,0	16,0	1,0	16	110	50	-	-	4	
STR4 16,0x110 R=1,5	16,0	1,5	16	110	50	-	-	4	
STR4 16,0x110 R=2,0	16,0	2,0	16	110	50	-	-	4	
STR4 20,0x110 R=0,5	20,0	0,5	20	110	50	-	-	4	
STR4 20,0x110 R=1,0	20,0	1,0	20	110	50	-	-	4	
STR4 20,0x110 R=1,5	20,0	1,5	20	110	50	-	-	4	
STR4 20,0x110 R=2,0	20,0	2,0	20	110	50	-	-	4	

Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard



* For end mills / für Schaftfräser L < 100 mm.

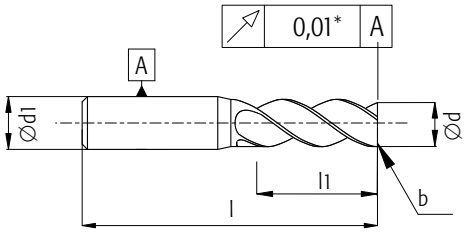
PAGE 157

Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z
RS3 2,0x40	2,0	-	3	40	8	-	0,10	3
RS3 3,0x40	3,0	-	3	40	10	-	0,10	3
RS3 4,0x50	4,0	-	4	50	12	-	0,10	3
RS3 5,0x50	5,0	-	5	50	15	-	0,15	3
RS3 6,0x65	6,0	-	6	65	15	-	0,15	3
RS3 8,0x65	8,0	-	8	65	20	-	0,20	3
RS3 10,0x70	10,0	-	10	70	22	-	0,20	3
RS3 12,0x80	12,0	-	12	80	25	-	0,25	3
RS3 16,0x90	16,0	-	16	90	35	-	0,25	3
RS3 20,0x102	20,0	-	20	102	40	-	0,25	3

Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard



* For end mills / für Schaftfräser L < 100 mm.

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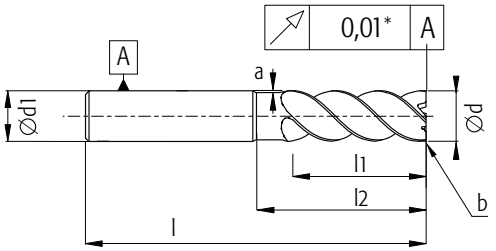
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z
RS4 3,0x40	3,0	-	3	40	10	-	0,10	4
RS4 4,0x50	4,0	-	4	50	12	-	0,10	4
RS4 5,0x50	5,0	-	5	50	15	-	0,15	4
RS4 6,0x65	6,0	-	6	65	15	-	0,15	4
RS4 8,0x65	8,0	-	8	65	20	-	0,20	4
RS4 10,0x70	10,0	-	10	70	22	-	0,20	4
RS4 12,0x80	12,0	-	12	80	25	-	0,25	4
RS4 16,0x90	16,0	-	16	90	35	-	0,25	4
RS4 20,0x102	20,0	-	20	102	40	-	0,25	4

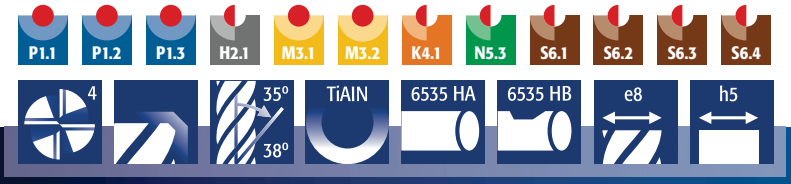
Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard / Neck relief



* For end mills / für Schaftfräser L < 100 mm.



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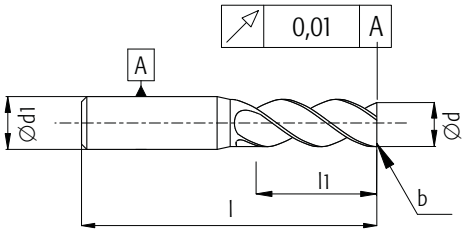
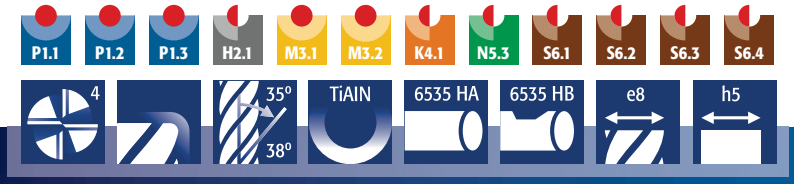
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z
RV4 4,0x57	4,0	-	6	57	11	-	0,25	4
RV4 5,0x57	5,0	-	6	57	13	-	0,25	4
RV4 6,0x57	6,0	-	6	57	13	-	0,25	4
RV4 8,0x63	8,0	-	8	63	19	-	0,25	4
RV4 10,0x72	10,0	-	10	72	22	-	0,25	4
RV4 12,0x83	12,0	-	12	83	26	-	0,25	4
RV4 16,0x92	16,0	-	16	92	32	-	0,25	4
RV4 20,0x104	20,0	-	20	104	38	-	0,40	4
RV4 4,0x57 L021	4,0	-	6	57	11	21	0,25	4
RV4 5,0x57 L021	5,0	-	6	57	13	21	0,25	4
RV4 6,0x57 L021	6,0	-	6	57	13	21	0,25	4
RV4 8,0x63 L028	8,0	-	8	63	19	28	0,25	4
RV4 10,0x72 L032	10,0	-	10	72	22	32	0,25	4
RV4 12,0x83 L038	12,0	-	12	83	26	38	0,25	4
RV4 16,0x92 L044	16,0	-	16	92	32	44	0,25	4
RV4 20,0x104 L054	20,0	-	20	104	38	54	0,40	4

Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard





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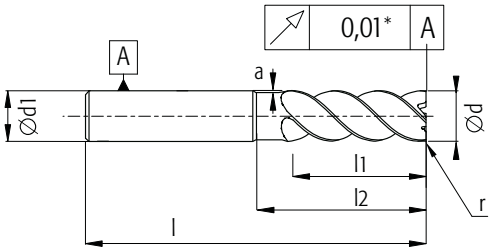
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z	
RVR 3,0x57 R=0,25	3,0	0,25	6	57	11	-	-	4	
RVR 3,0x57 R=0,50	3,0	0,50	6	57	13	-	-	4	
RVR 4,0x57 R=0,50	4,0	0,50	6	57	13	-	-	4	
RVR 5,0x57 R=0,50	5,0	0,50	6	57	13	-	-	4	
RVR 6,0x57 R=0,50	6,0	0,50	6	57	13	-	-	4	
RVR 6,0x57 R=1,00	6,0	1,00	6	57	13	-	-	4	
RVR 6,0x57 R=1,50	6,0	1,50	6	57	13	-	-	4	
RVR 8,0x63 R=0,50	8,0	0,50	8	63	19	-	-	4	
RVR 8,0x63 R=1,00	8,0	1,00	8	63	19	-	-	4	
RVR 8,0x63 R=1,50	8,0	1,50	8	63	19	-	-	4	
RVR 10,0x72 R=0,50	10,0	0,50	10	72	22	-	-	4	
RVR 10,0x72 R=1,00	10,0	1,00	10	72	22	-	-	4	
RVR 10,0x72 R=1,50	10,0	1,50	10	72	22	-	-	4	
RVR 12,0x83 R=0,50	12,0	0,50	12	83	26	-	-	4	
RVR 12,0x83 R=1,50	12,0	1,50	12	83	26	-	-	4	
RVR 16,0x92 R=0,50	16,0	0,50	16	92	32	-	-	4	new/neu
RVR 16,0x92 R=1,50	16,0	1,50	16	92	32	-	-	4	
RVR 16,0x92 R=3,00	16,0	3,00	16	92	32	-	-	4	

Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Neck relief



* For end mills / für Schaftfräser L < 100 mm.

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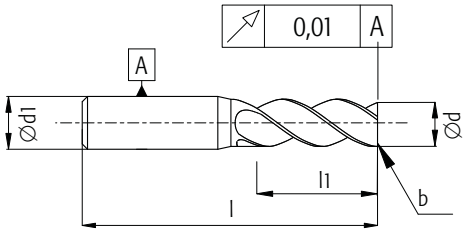
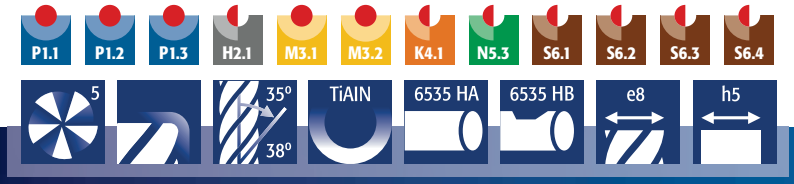
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z	
RVR 3,0x57 L021 R=0,25	3,0	0,25	6	57	11	21	-	4	
RVR 3,0x57 L021 R=0,50	3,0	0,50	6	57	13	21	-	4	
RVR 4,0x57 L021 R=0,50	4,0	0,50	6	57	13	21	-	4	
RVR 5,0x57 L021 R=0,50	5,0	0,50	6	57	13	21	-	4	
RVR 6,0x57 L021 R=0,50	6,0	0,50	6	57	13	21	-	4	
RVR 6,0x57 L021 R=1,00	6,0	1,00	6	57	13	21	-	4	
RVR 6,0x57 L021 R=1,50	6,0	1,50	6	57	13	21	-	4	
RVR 6,0x63 L026 R=0,50	6,0	0,50	6	63	13	26	-	4	
RVR 8,0x63 L028 R=0,50	8,0	0,50	8	63	19	28	-	4	
RVR 8,0x63 L028 R=1,00	8,0	1,00	8	63	19	28	-	4	
RVR 8,0x63 L028 R=1,50	8,0	1,50	8	63	19	28	-	4	
RVR 8,0x72 L034 R=0,50	8,0	0,50	8	72	19	34	-	4	
RVR 10,0x72 L032 R=0,50	10,0	0,50	10	72	22	32	-	4	
RVR 10,0x72 L032 R=1,00	10,0	1,00	10	72	22	32	-	4	
RVR 10,0x72 L032 R=1,50	10,0	1,50	10	72	22	32	-	4	
RVR 10,0x83 L042 R=0,50	10,0	0,50	10	83	22	42	-	4	
RVR 12,0x83 L038 R=0,50	12,0	0,50	12	83	26	38	-	4	
RVR 12,0x83 L038 R=1,50	12,0	1,50	12	83	26	38	-	4	
RVR 12,0x100 L050 R=0,50	12,0	0,50	12	100	26	50	-	4	
RVR 16,0x92 L044 R=0,50	16,0	0,50	16	92	32	44	-	4	new/neu
RVR 16,0x92 L044 R=1,50	16,0	1,50	16	92	32	44	-	4	
RVR 16,0x92 L044 R=2,50	16,0	2,50	16	92	32	44	-	4	new/neu
RVR 16,0x92 L044 R=3,00	16,0	3,00	16	92	32	44	-	4	
RVR 16,0x120 L066 R=1,50	16,0	1,50	16	120	32	66	-	4	
RVR 6,0x57 L026 R=0,50	6,0	0,50	6	57	13	26	-	4	
RVR 8,0x63 L034 R=0,50	8,0	0,50	8	63	19	34	-	4	
RVR 10,0x72 L042 R=0,50	10,0	0,50	10	72	22	42	-	4	
RVR 12,0x83 L050 R=0,50	12,0	0,50	12	83	26	50	-	4	
RVR 16,0x92 L066 R=1,50	16,0	1,50	16	92	32	66	-	4	

Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard





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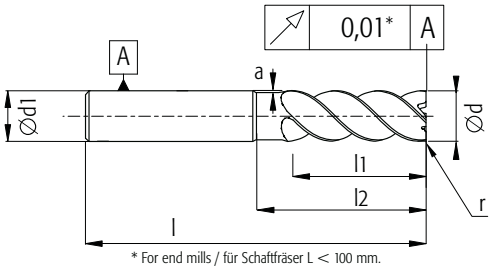
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z	
RVR5 3,0x57 R=0,25	3,0	0,25	6	57	11	-	-	5	
RVR5 3,0x57 R=0,50	3,0	0,50	6	57	13	-	-	5	
RVR5 4,0x57 R=0,50	4,0	0,50	6	57	13	-	-	5	
RVR5 5,0x57 R=0,50	5,0	0,50	6	57	13	-	-	5	
RVR5 6,0x57 R=0,50	6,0	0,50	6	57	13	-	-	5	
RVR5 6,0x57 R=1,00	6,0	1,00	6	57	13	-	-	5	
RVR5 6,0x57 R=1,50	6,0	1,50	6	57	13	-	-	5	
RVR5 8,0x63 R=0,50	8,0	0,50	8	63	19	-	-	5	
RVR5 8,0x63 R=1,00	8,0	1,00	8	63	19	-	-	5	
RVR5 8,0x63 R=1,50	8,0	1,50	8	63	19	-	-	5	
RVR5 10,0x72 R=0,50	10,0	0,50	10	72	22	-	-	5	
RVR5 10,0x72 R=1,00	10,0	1,00	10	72	22	-	-	5	
RVR5 10,0x72 R=1,50	10,0	1,50	10	72	22	-	-	5	
RVR5 12,0x83 R=0,50	12,0	0,50	12	83	26	-	-	5	
RVR5 12,0x83 R=1,50	12,0	1,50	12	83	26	-	-	5	
RVR5 16,0x92 R=0,50	16,0	0,50	16	92	32	-	-	5	new/neu
RVR5 16,0x92 R=1,50	16,0	1,50	16	92	32	-	-	5	
RVR5 16,0x92 R=3,00	16,0	3,00	16	92	32	-	-	5	

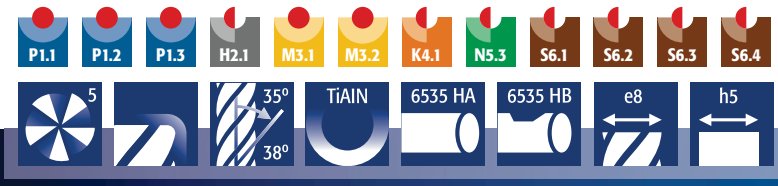
Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Neck relief



* For end mills / für Schaftfräser L < 100 mm.



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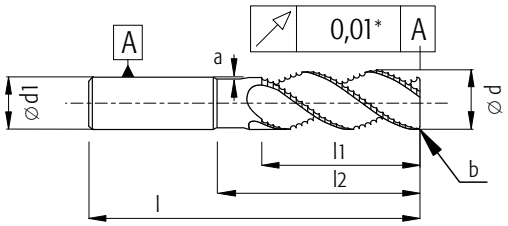
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z	
RVR5 3,0x57 L021 R=0,25	3,0	0,25	6	57	11	21	-	5	
RVR5 3,0x57 L021 R=0,50	3,0	0,50	6	57	13	21	-	5	
RVR5 4,0x57 L021 R=0,50	4,0	0,50	6	57	13	21	-	5	
RVR5 5,0x57 L021 R=0,50	5,0	0,50	6	57	13	21	-	5	
RVR5 6,0x57 L021 R=0,50	6,0	0,50	6	57	13	21	-	5	
RVR5 6,0x57 L021 R=1,00	6,0	1,00	6	57	13	21	-	5	
RVR5 6,0x57 L021 R=1,50	6,0	1,50	6	57	13	21	-	5	
RVR5 6,0x63 L026 R=0,50	6,0	0,50	6	63	13	26	-	5	
RVR5 8,0x63 L028 R=0,50	8,0	0,50	8	63	19	28	-	5	
RVR5 8,0x63 L028 R=1,00	8,0	1,00	8	63	19	28	-	5	
RVR5 8,0x63 L028 R=1,50	8,0	1,50	8	63	19	28	-	5	
RVR5 8,0x72 L034 R=0,50	8,0	0,50	8	72	19	34	-	5	
RVR5 10,0x72 L032 R=0,50	10,0	0,50	10	72	22	32	-	5	
RVR5 10,0x72 L032 R=1,00	10,0	1,00	10	72	22	32	-	5	
RVR5 10,0x72 L032 R=1,50	10,0	1,50	10	72	22	32	-	5	
RVR5 10,0x83 L042 R=0,50	10,0	0,50	10	83	22	42	-	5	
RVR5 12,0x83 L038 R=0,50	12,0	0,50	12	83	26	38	-	5	
RVR5 12,0x83 L038 R=1,50	12,0	1,50	12	83	26	38	-	5	
RVR5 12,0x100 L050 R=0,50	12,0	0,50	12	100	26	50	-	5	
RVR5 16,0x92 L044 R=0,50	16,0	0,50	16	92	32	44	-	5	new/neu
RVR5 16,0x92 L044 R=1,50	16,0	1,50	16	92	32	44	-	5	
RVR5 16,0x92 L044 R=3,00	16,0	3,00	16	92	32	44	-	5	
RVR5 16,0x120 L066 R=1,50	16,0	1,50	16	120	32	66	-	5	

Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard / Neck relief



* For end mills / für Schaftfräser L < 100 mm.

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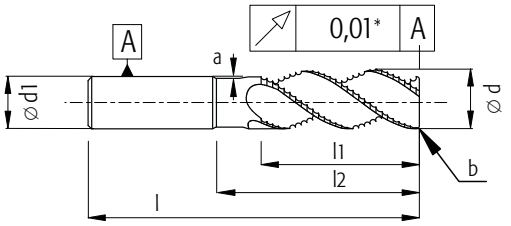
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z	
RSR4 4,0x57	4,0	-	6	57	11	-	0,25	4	
RSR4 5,0x57	5,0	-	6	57	13	-	0,25	4	
RSR4 6,0x57	6,0	-	6	57	13	-	0,25	4	
RSR4 8,0x63	8,0	-	8	63	19	-	0,25	4	
RSR4 10,0x72	10,0	-	10	72	22	-	0,25	4	
RSR4 12,0x83	12,0	-	12	83	26	-	0,25	4	
RSR4 16,0x92	16,0	-	16	92	32	-	0,25	4	
RSR4 20,0x104	20,0	-	20	104	38	-	0,40	4	
RSR4 6,0x57 L021	6,0	-	6	57	13	21	0,25	4	new/neu
RSR4 8,0x63 L027	8,0	-	8	63	19	27	0,25	4	new/neu
RSR4 10,0x72 L032	10,0	-	10	72	22	32	0,25	4	new/neu
RSR4 12,0x83 L038	12,0	-	12	83	26	38	0,25	4	new/neu
RSR4 16,0x92 L044	16,0	-	16	92	32	44	0,25	4	new/neu
RSR4 20,0x104 L054	20,0	-	20	104	38	54	0,40	4	new/neu

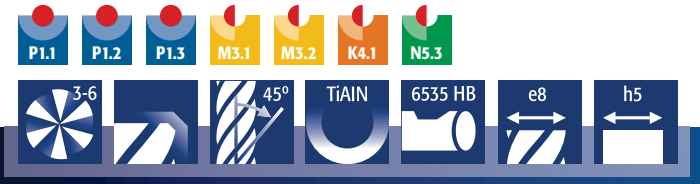
Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard



* For end mills / für Schaftfräser L < 100 mm.



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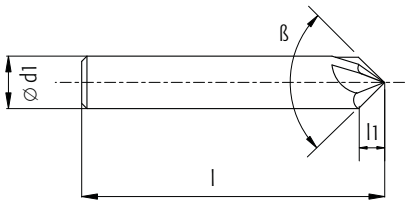
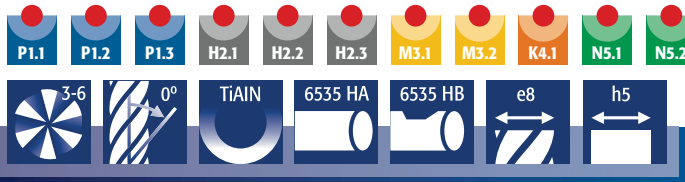
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z
RR 4,0x57	4,0	-	6	57	11	-	0,25	3
RR 5,0x57	5,0	-	6	57	13	-	0,25	4
RR 6,0x57	6,0	-	6	57	13	-	0,25	4
RR 8,0x63	8,0	-	8	63	19	-	0,25	4
RR 10,0x72	10,0	-	10	72	22	-	0,25	4
RR 12,0x83	12,0	-	12	83	26	-	0,25	4
RR 16,0x92	16,0	-	16	92	32	-	0,25	5
RR 20,0x104	20,0	-	20	104	38	-	0,40	6
RR 6,0x57 L021	6,0	-	6	57	13	21	0,25	4
RR 8,0x63 L027	8,0	-	8	63	19	27	0,25	4
RR 10,0x72 L032	10,0	-	10	72	22	32	0,25	4
RR 12,0x83 L038	12,0	-	12	83	26	38	0,25	4
RR 16,0x92 L044	16,0	-	16	92	32	44	0,25	5
RR 20,0x104 L054	20,0	-	20	104	38	54	0,40	6

Standard with Weldon shank.

Standard mit Weldonfläche.

Standard





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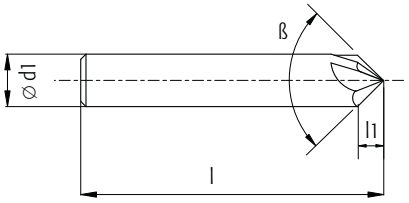
Deburring 60° / Entgrater 60°

Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z	
CH3 1,0x39 60°	1,0	-	3	39	0,8	-	-	3	
CH3 2,0x39 60°	2,0	-	3	39	1,7	-	-	3	
CH3 3,0x39 60°	3,0	-	3	39	2,6	-	-	3	
CH4 4,0x51 60°	4,0	-	4	51	3,5	-	-	4	
CH4 6,0x64 60°	6,0	-	6	64	5,2	-	-	4	
CH5 6,0x64 60°	6,0	-	6	64	5,2	-	-	5	new/neu
CH4 8,0x64 60°	8,0	-	8	64	6,9	-	-	4	
CH5 8,0x64 60°	8,0	-	8	64	6,9	-	-	5	
CH4 10,0x70 60°	10,0	-	10	70	8,7	-	-	4	
CH6 10,0x70 60°	10,0	-	10	70	8,7	-	-	6	
CH4 12,0x78 60°	12,0	-	12	78	10,4	-	-	4	
CH6 12,0x78 60°	12,0	-	12	78	10,4	-	-	6	
CH6 16,0x89 60°	16,0	-	16	89	13,8	-	-	6	

Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard



P1.1 P1.2 P1.3 H2.1 H2.2 H2.3 M3.1 M3.2 K4.1 N5.1 N5.2 N5.3 N5.4 N5.5 N5.6 S6.1 S6.2 S6.3 S6.4

3-6 | 0° | TiAlN | 6535 HA | 6535 HB | e8 | h5

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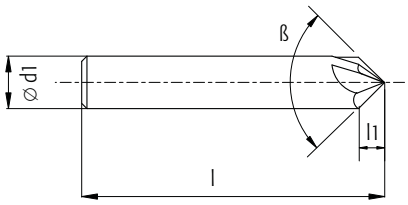
Deburring 90° / Entgrater 90°

Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z	
CH3 1,0x39 90°	1,0	-	3	39	0,5	-	-	3	
CH3 2,0x39 90°	2,0	-	3	39	1,0	-	-	3	
CH3 3,0x39 90°	3,0	-	3	39	1,5	-	-	3	
CH4 4,0x51 90°	4,0	-	4	51	2,0	-	-	4	
CH4 6,0x64 90°	6,0	-	6	64	3,0	-	-	4	
CH5 6,0x64 90°	6,0	-	6	64	3,0	-	-	5	new/neu
CH4 8,0x64 90°	8,0	-	8	64	4,0	-	-	4	
CH5 8,0x64 90°	8,0	-	8	64	4,0	-	-	5	
CH4 10,0x70 90°	10,0	-	10	70	5,0	-	-	4	
CH6 10,0x70 90°	10,0	-	10	70	5,0	-	-	6	
CH4 12,0x78 90°	12,0	-	12	78	6,0	-	-	4	
CH6 12,0x78 90°	12,0	-	12	78	6,0	-	-	6	
CH6 16,0x89 90°	16,0	-	16	89	8,0	-	-	6	
CH6 20,0x104 90°	20,0	-	20	104	10,0	-	-	6	

Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Standard



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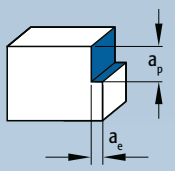
Deburring 120° / Entgrater 120°

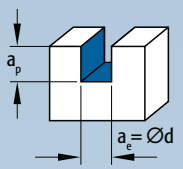
Article Number Artikelnummer	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	b (mm)	Z	
CH3 1,0x39 120°	1,0	-	3	39	0,2	-	-	3	
CH3 2,0x39 120°	2,0	-	3	39	0,5	-	-	3	
CH3 3,0x39 120°	3,0	-	3	39	0,8	-	-	3	
CH4 4,0x51 120°	4,0	-	4	51	1,1	-	-	4	
CH4 6,0x64 120°	6,0	-	6	64	1,7	-	-	4	
CH5 6,0x64 120°	6,0	-	6	64	1,7	-	-	5	new/neu
CH4 8,0x64 120°	8,0	-	8	64	2,3	-	-	4	
CH5 8,0x64 120°	8,0	-	8	64	2,3	-	-	5	
CH4 10,0x70 120°	10,0	-	10	70	2,8	-	-	4	
CH6 10,0x70 120°	10,0	-	10	70	2,8	-	-	6	
CH4 12,0x78 120°	12,0	-	12	78	3,4	-	-	4	
CH6 12,0x78 120°	12,0	-	12	78	3,4	-	-	6	
CH6 16,0x89 120°	16,0	-	16	89	4,6`	-	-	6	

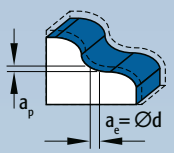
Starting from shank Ø6 mm available with Weldon shank.

Ab Schaft Ø6 mm verfügbar mit Weldonfläche.

Material group	TSR (N/mm²)	Hardness HB	Cutting speed V_c m/min	Coolant
P1.1	< 750	< 250	**140 - 220**	emulsion
P1.2	< 1000	< 300	**100 - 180**	emulsion
P1.3	< 1400	< 400	**70 - 160**	emulsion
H2.1		42-50 HRc	**80 - 140**	emulsion
M3.1	< 950		**80 - 130**	emulsion
M3.2	< 1250		**60 - 100**	emulsion
K4.1	< 800		**100 - 160**	emulsion
S6.1	< 1500		**40 - 60**	emulsion
S6.2	< 1600		**45 - 70**	emulsion
S6.3	< 1600		**30 - 50**	emulsion
S6.4	< 1250		**60 -90**	emulsion







Roughing	Semi finishing	Finishing	0,5xD	1,0xD	Semi finishing	Finishing
a_p up to 1,25 x d	a_p up to 1,50 x d	a_p up to 2,0 x d	a_p up to 0,5 x d	a_p up to 1,0 x d	a_p up to 0,10 x d	a_p up to 0,05 x d
a_e up to 0,40 x d	a_e up to 0,20 x d	a_e up to 0,05 x d	a_e up to 1,0 x d	a_e up to 1,0 x d	a_e up to 0,40 x d	a_e up to 0,20 x d

	Contouring / Konturierung			Slot milling / Nutfräsen		Profile milling / Profilfräsen	
Ød (mm)	Rouching / Eckfräsen F_z	Semi finishing / Halbbearbeitung F_z	Finishing / Weiterverarbeitung F_z	0,5xD F_z	1,0xD F_z	Semi finishing / Halbbearbeitung F_z	Finishing / Weiterverarbeitung F_z
1	0,005	0,007	0,009	0,008	0,005	0,020	0,040
2	0,008	0,009	0,011	0,010	0,008	0,030	0,050
3	0,015	0,025	0,035	0,020	0,010	0,040	0,060
4	0,020	0,030	0,045	0,025	0,013	0,050	0,080
5	0,025	0,035	0,055	0,030	0,015	0,060	0,100
6	0,030	0,040	0,065	0,035	0,020	0,070	0,120
8	0,035	0,045	0,075	0,045	0,030	0,080	0,140
10	0,040	0,055	0,085	0,055	0,040	0,100	0,180
12	0,050	0,065	0,095	0,065	0,050	0,120	0,200
16	0,070	0,090	0,115	0,075	0,060	0,140	0,220
20	0,090	0,110	0,130	0,085	0,075	0,160	0,250

Symbols / Piktogramme

Number of Flutes
Schneidenzahl

Centre cutting
Centrum Schneidend

1 flute | 2 flutes | 3 flutes | 3-6 flutes | 4 flutes | 5 flutes | 6-8 flutes

Non centre cutting
Nicht centrum Schneidend

3-6 flutes | 4-7 flutes | 6-8 flutes | 6-16 flutes

Shank
Schaftausführung

Cylinder | Cylinder Weldon

Helix angle
Spiralwinkel

Angle 0° | Angle 10° | Angle 20° | Angle 25° | Angle 30° | Angle 35-38° | Angle 40° | Angle 45° | Angle 50° | Variable

Diameter Tolerance
Durchmessertoleranz

Shank | Cutting diameter

Version
Ausführung

Sharp | Chamfer | Corner radius | Ball nose

Coating
Beschichtung

Diamond | TiAlN | TiAlN+ | TiAlN GOLD | Uncoated | Diamond

Strategy
Strategie

HVM | HPM | HSM | HVM/HPM | HPM/HSM

Tolerances / Toleranzen

Diameter range	Shank ∅d1-h5	Cutting diameter ∅d-e8	Cutting diameter ∅d-f7	Cutting diameter VHC
$d \leq 3$	0 -0,004	-0,014 -0,028	-0,006 -0,016	0 0,015
$3 < d \leq 6$	0 -0,005	-0,020 -0,038	-0,010 -0,022	0 0,017
$6 < d \leq 10$	0 -0,006	-0,025 -0,047	-0,013 -0,028	0 0,020
$10 < d \leq 18$	0 -0,008	-0,032 -0,059	-0,016 -0,034	0 0,024
$18 < d \leq 30$	0 -0,009	-0,040 -0,073	-0,020 -0,041	0 0,028

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formulas / Formeln

Spindle speed:

$$n = \frac{V_c * 1000}{d * \pi}$$

Feedrate:

$$V_f = F_z * Z * n$$

Cutting speed:

$$V_c = \frac{d * \pi * n}{1000}$$

Feed per tooth:

$$F_z = \frac{V_f}{Z * n}$$

Material removal rate:

$$Q = \frac{a_e * a_p * V_f}{1000} \quad (mm^3/min)$$

Average chip thickness:

$$hm = Fz * \sqrt{\frac{a_e}{d}} \quad (mm)$$

Effective diameter at ball nose end mills:

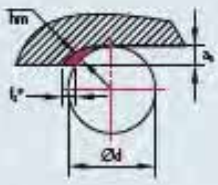
$\beta = 0$: $d_{ef} = 2 * \sqrt{d * a_p - a_p^2}$

$\beta \neq 0$: $d_{ef} = d * \sin\left[\beta \pm \arccos\left(\frac{d - 2a_p}{d}\right)\right]$

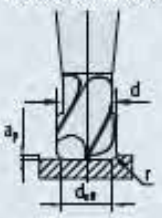
Effective diameter at torus end mills:

$$d_{ef} = d - 2r + 2 * \sqrt{a_p(2r - a_p)} \quad (mm)$$

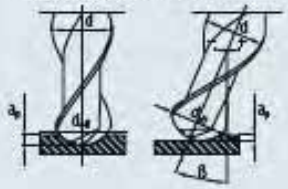
Average chip thickness



Effective diameter torus



Effective diameter ball nose



a_e	:	Width of cut	mm
a_p	:	Depth of cut	mm
V_c	:	Cutting speed	m/min
F_z	:	Feed per tooth	mm
V_f	:	Feedrate	mm/min
d	:	Cutting diameter	mm
Z	:	Number of teeth	
hm	:	Average chip thickness	mm

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