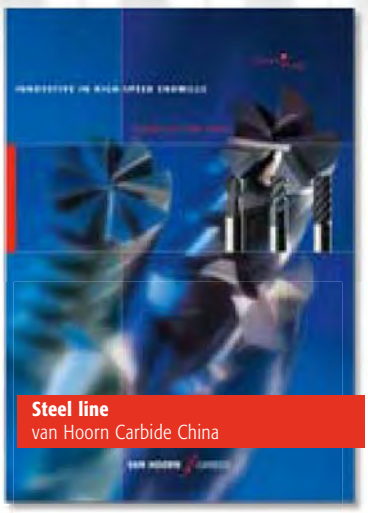
INNOVATIONS 2010

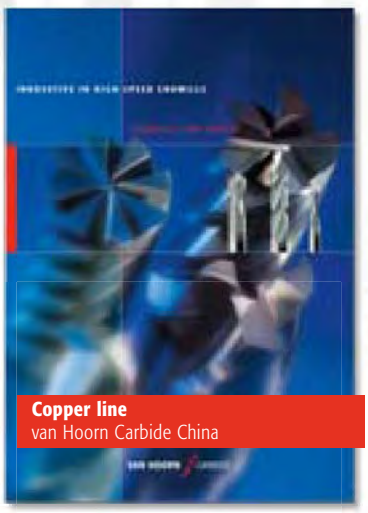
VAN HOORN CARBIDE

For each application the perfect endmill!

Standard catalogue
van Hoorn Carbide



Steel line
van Hoorn Carbide China



Copper line
van Hoorn Carbide China

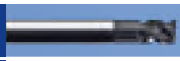
VAN HOORN CARBIDE

Innovations 2010

The philosophy of Van Hoorn Carbide is to manufacture solid carbide endmills and provide the best quality level, support and innovations. The recent developments of advanced materials and machine tools for milling, demand new technologies and more optimized combinations between solid carbide grades, geometries, grinding technologies and coatings. Innovations 2010 shows the latest technologies and developments of Van Hoorn Carbide, to provide more efficiency in your production processes, the possibility to improve your demanding applications and to reach higher quality standards.

	Carbon steel	Alloy steel	Tool steel	Steel 45-52 HRc	Steel 52-60 HRc	Steel 58-70 HRc	Stainless steel soft	Stainless steel hard	High temp alloys	Titanium alloys	Cast iron	Aluminium	Aluminium <5% Si	Aluminium >5% Si	Copper Copper	Brass, Bronze	Synthetics	Synthetics reinforced	Graphite	Number of Flutes	Coating	Size range	Application
VHKF2	◐	◐	◐	◐	●	◐													2	TiAlN	1,0 / 16,0	HPM / HSM
VHKF4	◐	◐	◐	◐	●	◐													4	TiAlN	3,0 / 16,0	HPM / HSM
VHKK	◐	◐	◐	◐	●	◐													2	TiAlN	3,0 / 16,0	HPM / HSM
VHPK					◐	●													2	TiAlN	0,5 / 12,0	HSM
VHTF4	◐	◐	◐	◐	●	◐													4	TiAlN	6,0 / 16,0	HPM / HSM
VHTF2	◐	◐	◐	◐	●	◐													2	TiAlN	1,5 / 16,0	HPM / HSM
VHMF	◐	◐	◐	◐	●	◐													6-8	TiAlN	6,0 / 20,0	HPM
VHMFR	◐	◐	◐	◐	●	◐													6-8	TiAlN	6,0 / 20,0	HPM / HSM
VHPM					◐	●													6-8	TiAlN	6,0 / 20,0	HPM
VHPMR					◐	●													6-8	TiAlN	6,0 / 20,0	HPM / HSM
VHMS	●	●	●	●	●	◐	◐	◐	◐	◐									2	TiAlN	0,1 / 3,0	HSM
VHMSR	●	●	●	●	●	◐	◐	◐	◐	◐									2	TiAlN	0,3 / 3,0	HSM
VHMSK	●	●	●	●	●	◐	◐	◐	◐	◐									2	TiAlN	0,2 / 3,0	HSM
VHGR																◐	◐	●		Diamond	4,0 / 12,0	HVM
VHGT													◐					●	3	Diamond	2,0 / 12,0	HPM / HSM
VHGTF													◐					●	2-3-4	Diamond	2,0 / 12,0	HPM / HSM
VHGKF													◐					●	2-3-4	Diamond	2,0 / 12,0	HPM / HSM
VHMG													◐					●	2	Diamond	0,3 / 1,5	HSM
VHMGK													◐					●	2	Diamond	0,3 / 1,5	HSM
VHDT											◐	◐	◐			◐	●	●	2		3,0 / 10,0	HPM / HSM
VHDB											◐	◐	◐			◐	●	●	2		3,0 / 10,0	HPM / HSM
VHKC											◐	◐	◐	●	●	◐			4	CrCN	3,0 / 16,0	HPM / HSM
VHTC											◐	◐	◐	●	●	◐			4	CrCN	3,0 / 16,0	HPM / HSM
VHSC											◐	◐	◐	●	●	◐	◐		3	CrCN	2,0 / 16,0	HPM
VHSCR											◐	◐	◐	●	●	◐	◐		3	CrCN	2,0 / 16,0	HPM
VHMC											◐	◐	◐	●	●	◐	◐		2	CrCN	0,3 / 3,0	HSM
VHMCK											◐	◐	◐	●	●	◐	◐		2	CrCN	0,3 / 3,0	HSM
VHAE											●	●	●	◐	◐	◐	◐		1	Uncoated	0,6 / 12,0	HVM / HPM

● Well suited
◐ Average suited

		Carbon steel	Alloy steel	Tool steel	Steel 45-52 HRc	Steel 52-60 HRc	Steel 58-70 HRc	Stainless steel soft	Stanles steel hard	High temp alloys	Titanium alloys	Cast iron	Aluminium	Aluminium <5% Si	Aluminium >5% Si	Copper Copper	Brass, Bronze	Synthetics	Synthetics reinforced	Graphite	Number of Flutes	Coating	Size range	Application
VHKE												◐	●	◐	◐	◐	●	●		1	Uncoated	1,0 / 12,0	HVM / HPM
VHRAW												●	●	●	◐	◐	◐	◐		3	Uncoated	6,0 / 25,0	HVM / HPM
VHLAW												●	●	●	◐	◐	◐	◐		3	Uncoated	4,0 / 25,0	HVM / HPM
VHTA												●	●	●	◐	◐	◐			2	Uncoated	6,0 / 25,0	HSM
VHKA												●	●	●	◐	◐	◐			2	Uncoated	6,0 / 25,0	HSM
VHSA												●	●	●	◐	◐	●	◐	◐	2	Uncoated	3,0 / 20,0	HVM / HPM
VHSAB												●	●	●	◐	◐	●	◐	◐	2	Uncoated	3,0 / 20,0	HVM / HPM
VHVFR		●	●	●	◐			●	●	◐	●	●					◐			3	TiAlN	2,0 / 16,0	HVM / HPM
VHVF		●	●	●	◐			●	●	◐	●	●					◐			3	TiAlN	2,0 / 16,0	HVM / HPM
VHVFF3		●	●	●	◐			●	●	◐	●	●					◐			3	TiAlN	2,0 / 16,0	HVM / HPM
VHVFF4		●	●	●	●			◐	◐	◐	◐	◐								4	TiAlN	4,0 / 20,0	HVM / HPM
VHVTR		◐	◐	◐	●			●	●	●	●	◐								4	TiAlN	3,0 / 25,0	HVM / HPM
VHDRS		●	●	●							●									4	TiAlN	6,0 / 16,0	HVM / HPM
VHDRH				◐	●															4	TiAlN	6,0 / 16,0	HVM / HPM
VHRFF		●	●	●							●									3	TiAlN	6,0 / 20,0	HVM / HPM
VHRVR4							●	●												4	TiAlN	6,0 / 20,0	HVM / HPM
HABM		●	●	●	●			●	◐	◐	◐	◐								2	TiAlN	0,4 / 12,0	HSM
HATM		●	●	●	●			●	◐	◐	◐	◐								2	TiAlN	3,0 / 12,0	HPM / HSM
HAFM		●	●	●	●			●	◐	◐	◐	◐								4	TiAlN	0,4 / 12,0	HPM / HSM
HAMM		●	●	●	●			●	◐	◐	◐	◐								4	TiAlN	0,4 / 12,0	HPM / HSM
HAMF		●	●	●	●			●	◐	◐	◐	◐								6-8	TiAlN	6,0 / 20,0	HPM
VHAF		●	●	●						●	●	●	●				◐	◐	◐	4	TiAlN	4,0 / 12,0	
VHSF2		●	◐	◐						◐	◐	◐	◐				◐	●	◐	2	Uncoated	1,0 / 20,0	
VHSFB2		●	◐	◐						◐	◐	◐	◐				◐	●	◐	2	Uncoated	1,0 / 20,0	
VHSF3		●	◐	◐						◐	◐	◐	◐				◐	●	◐	3	Uncoated	1,0 / 20,0	
VHSFB3		●	◐	◐						◐	◐	◐	◐				◐	●	◐	3	Uncoated	1,0 / 20,0	
VHSF4		●	◐	◐						◐	◐	◐	◐				◐	●	◐	4	Uncoated	1,0 / 20,0	
VHSFB4		●	◐	◐						◐	◐	◐	◐				◐	●	◐	4	Uncoated	1,0 / 20,0	

● Well suited
◐ Average suited

Milling in steels with hardness above 55 HRc

This strategy of milling in hardened steels is used because, when using the right setup and circumstances, this saves production time compared to EDM.

Advantages:

1. No EDM is required (milling is much faster)
2. Polishing can be minimized
3. One single clamping, so it is easier to achieve accurate results

Both development in milling machines and cutting tools have made it possible to use this revolutionary strategy. This is possible due to new carbide grades, improved cutting geometries and new coating developments.

Several strategies are possible

HPM (High Perfomance Machining)

- High cutting speed (Vc)
- Large cutting depth (Ap)
- Small cutting width (Ae)
- Medium feed per tooth (Fz)/ table feed (Vf)

HSM (High Speed Machining)

- High cutting speed (Vc)
- Small cutting depth (Ap)
- Small cutting width (Ae)
- High feed per tooth (Fz) / table feed (Vf)

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

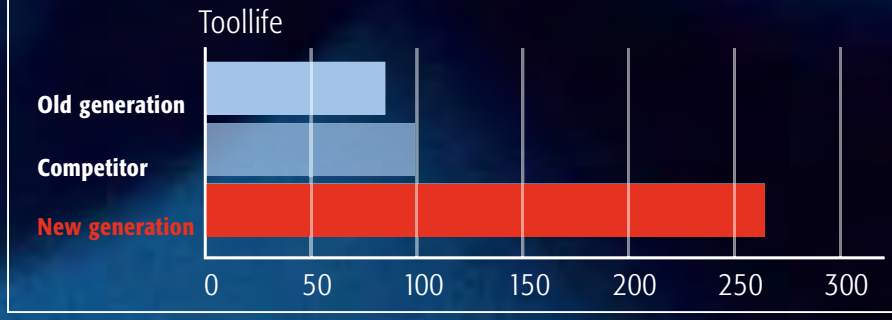
Tips:

- Use a rigid milling machine and clamping method.
- Try to minimize entering and exiting the workpiece.
- Use minimum lubrication or oil-mist-spray.

Old vs New generation

Endmill: VHPK206006406L070, Ø6,0

v_c	280 m/min
n	15.000 rpm
F_z	0,25 mm/t
v_f	7500 mm/min
a_p	0,4 mm
a_e	1,5 mm
Coolant	min. lubrication



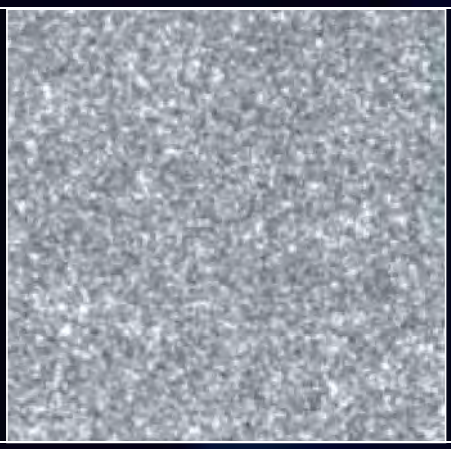
New generation ballnose endmill for milling hardened steels up to 70 HRc

Smooth surface finish, accurate tolerances and precision are essential features when milling hardened steels. The combination of special developed carbide, coating and new developed geometry of the VHPK includes these features.

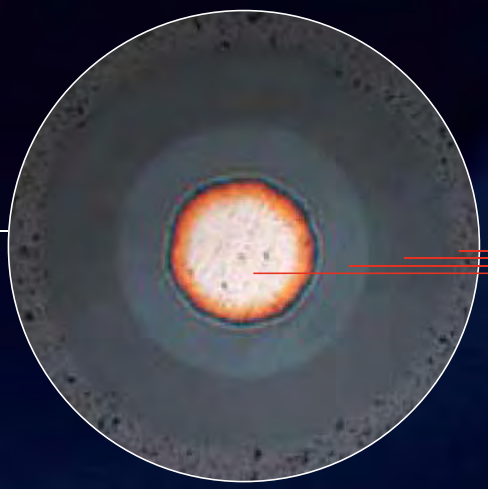
The VHPK offers excellent performance, much longer toollife and more precision. Numerous in-house tests and customers' feedback have proven the outstanding performance of this new development.

New designed ballnose geometry for finishing applications.

Mirror finish for longer toollife and high precision.

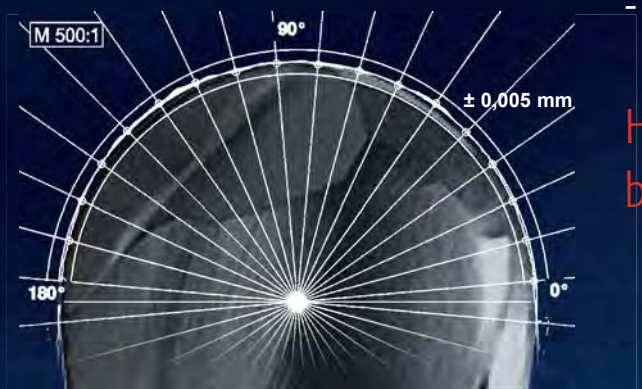


Carbide with ultra fine grain structure of 0,3-0,5 micron and high tensile strength.



Coating

- Multi layer coating
- Nano structure
- Extreme hardness
- Longer toollife

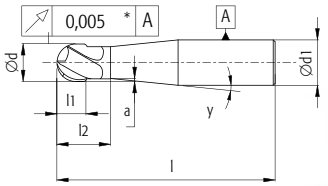


High precision ballnose profile.

Tolerances

Diameter range	Cutting diameter ∅d-g7	Shank ∅d1-h5
d ≤ 3	-0,002	0
	-0,012	-0,004
3 < d ≤ 6	-0,004	0
	-0,016	-0,005
6 < d ≤ 10	-0,005	0
	-0,020	-0,006
10 < d ≤ 18	-0,006	0
	-0,024	-0,008

Standard

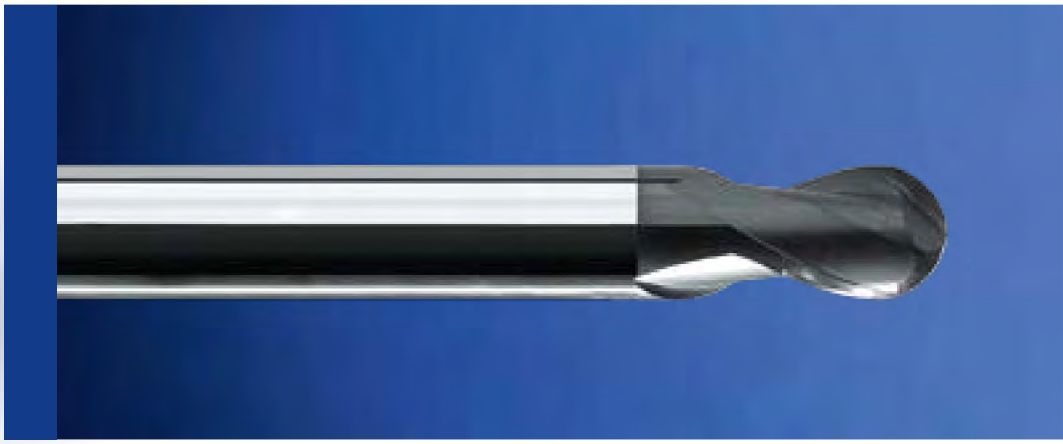


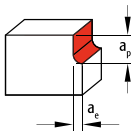
NEW GENERATION

Article Number	∅d (mm)	r (mm)	∅d1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	z	γ (°)	
VHPK200506406L007	0,5	0,25	6	64	0,7			2	10	New
VHPK200606406L008	0,6	0,30	6	64	0,8	-	-	2	10	New
VHPK200606406L020	0,6	0,30	6	64	0,8	2,0	0,025	2	11	New
VHPK200806406L010	0,8	0,40	6	64	1,0	-	-	2	10	New
VHPK201006406L012	1,0	0,50	6	64	1,2	-	-	2	15	New
VHPK201006406L020	1,0	0,50	6	64	1,2	2,0	0,025	2	10	New
VHPK201006406L040	1,0	0,50	6	64	1,2	4,0	0,025	2	12	New
VHPK201506406L018	1,5	0,75	6	64	1,8	-	-	2	15v	New
VHPK202006406L025	2,0	1,00	6	64	2,5	-	-	2	15	New
VHPK202506406L030	2,5	1,25	6	64	3,0	-	-	2	15	New
VHPK203006406L035	3,0	1,50	6	64	3,5			2	15	New
VHPK203006406L070	3,0	1,50	6	64	3,5	7,0	0,050	2	5	New
VHPK204006406L105	4,0	2,00	6	64	4,5	10,5	-	2	15	New
VHPK205006406L125	5,0	2,50	6	64	6,0	12,5		2	15	New
VHPK206006406L070	6,0	3,00	6	64	7,0	-	-	2	-	New
VHPK206006406L250	6,0	3,00	6	64	7,0	25	0,150	2	-	New
VHPK208006408L090	8,0	4,00	8	64	9,0	-	-	2	-	New
VHPK208006408L250	8,0	4,00	8	64	9,0	25	0,200	2	-	New
VHPK210007810L120	10,0	5,00	10	78	12,0	-	-	2	-	New
VHPK212007812L150	12,0	6,00	12	78	15,0	-	-	2	-	New

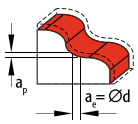
For an extra charge we offer an inspection report of the tool geometry

Material group	TSR (N/mm²)	Hardness HB	Cutting speed Vc m/min
Carbon steel	< 750	< 250	
Alloy steel	< 1000	< 300	
Tool steel	> 850	> 250	
	> 1000	> 300	
Stainless steel	< 600	< 200	
	< 850	< 250	
High temp. alloys	< 900	< 300	
Titanium alloys	< 900	< 300	
Hardened steel		45-52 HRc	
		52-60 HRc	200 - 250
		58-70 HRc	150 - 250
Cast iron		< 260	
Aluminium	< 350	< 100	
Aluminium < 5% Si	< 500	< 150	
Aluminium > 5% Si	< 400	< 120	
Copper	< 350	< 100	
Brass, bronze	< 700	< 200	
Graphite			
Synthetics			



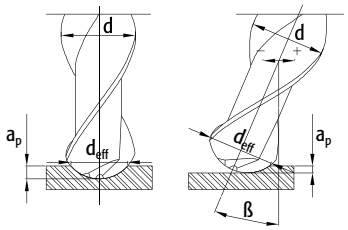


Hardened material
a_p up to 0,50 x d
a_e up to 0,10 x d



Hardened material
a_p up to 0,020 x d
a_e up to 0,15 mm

Ød (mm)	Shoulder milling a_p max. (mm)	Shoulder milling a_e max. (mm)	Shoulder milling f_z (mm/tooth)	Profile milling a_p max. (mm)	Profile milling a_e max. (mm)	Profile milling f_z (mm/tooth)
0,5	< 0,25	< 0,01	0,005 - 0,008	< 0,01	< 0,005	0,005 - 0,009
0,6	< 0,3	< 0,012	0,007 - 0,010	< 0,02	< 0,006	0,007 - 0,012
0,8	< 0,4	< 0,015	0,010 - 0,015	< 0,03	< 0,008	0,010 - 0,015
1,0	< 0,5	< 0,02	0,015 - 0,025	< 0,04	< 0,01	0,015 - 0,030
1,5	< 0,8	< 0,03	0,020 - 0,030	< 0,06	< 0,015	0,020 - 0,035
2,0	< 1,0	< 0,04	0,030 - 0,050	< 0,08	< 0,02	0,030 - 0,050
2,5	< 1,25	< 0,05	0,035 - 0,055	< 0,04	< 0,01	0,035 - 0,055
3,0	< 1,5	< 0,06	0,040 - 0,060	< 0,11	< 0,03	0,040 - 0,060
4,0	< 2,0	< 0,10	0,050 - 0,080	< 0,14	< 0,05	0,050 - 0,080
5,0	< 2,5	< 0,13	0,060 - 0,120	< 0,18	< 0,07	0,075 - 0,120
6,0	< 3,0	< 0,18	0,065 - 0,125	< 0,20	< 0,09	0,080 - 0,125
8,0	< 4,0	< 0,24	0,080 - 0,130	< 0,25	< 0,12	0,090 - 0,130
10,0	< 5,0	< 0,30	0,085 - 0,135	< 0,30	< 0,15	0,100 - 0,135
12,0	< 6,0	< 0,36	0,100 - 0,140	< 0,36	< 0,20	0,110 - 0,140



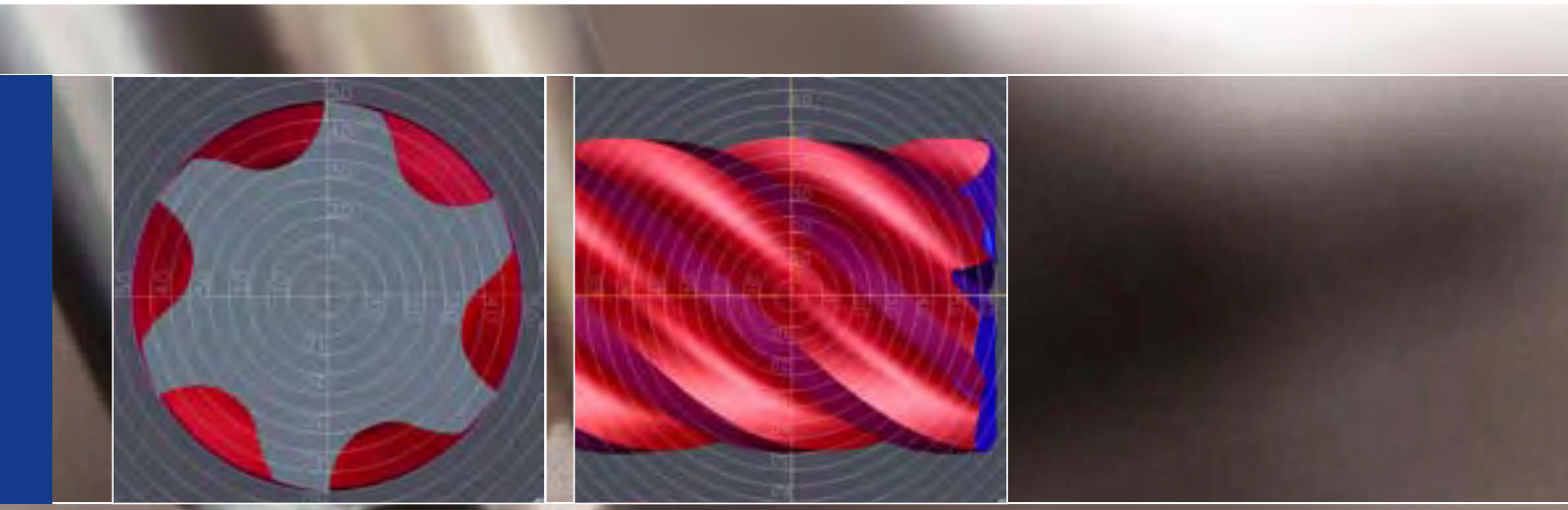
With the mentioned cutting speeds for ballnose endmills the effective cutting diameter has to be taken into account:

ß = 0: $d_{eff} = 2 \bullet \sqrt{d \bullet a_p - a_p^2}$

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

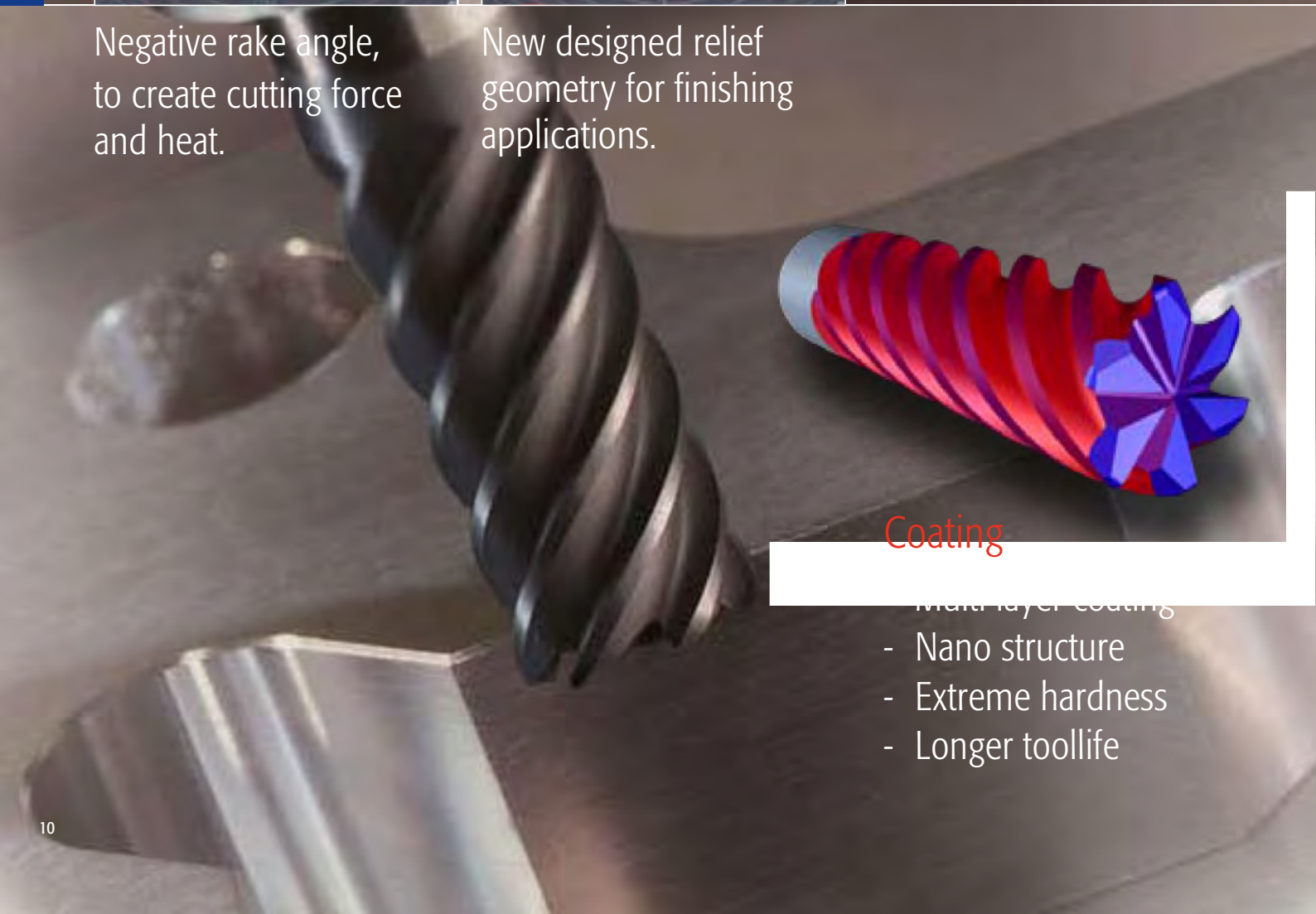
New generation multiple flute endmill for milling hardened steels up to 70 HRc

Smooth surface finish, accurate tolerances and precision are essential features when milling hardened steels. We improved our current geometry and implemented a new coating and a new carbide grade. The combination of these three factors, gives the VHPM(R) a head start. Because of these changes we are able to improve toollife, efficiency and precision. The VHPM(R) makes it profitable to machine hardened steels.



Negative rake angle, to create cutting force and heat.

New designed relief geometry for finishing applications.



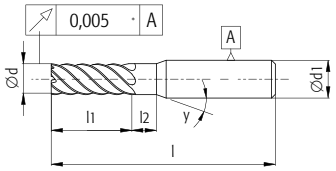
Coating

- Multi layer coating
- Nano structure
- Extreme hardness
- Longer toollife

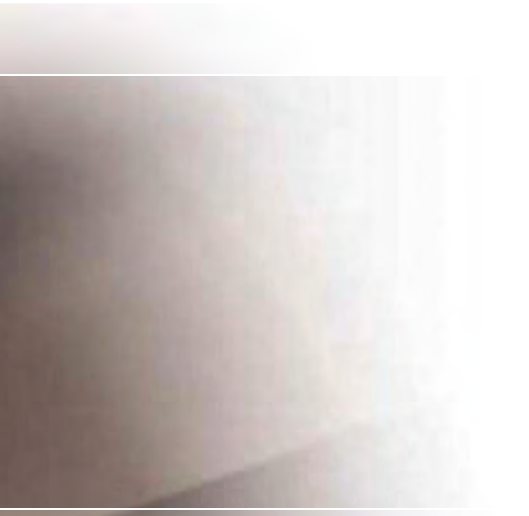
Tolerances

Diameter range	Cutting diameter Ød-g7	Shank Ød1-h5
d ≤ 3	-0,002 -0,012	0 -0,004
3 < d ≤ 6	-0,004 -0,016	0 -0,005
6 < d ≤ 10	-0,005 -0,020	0 -0,006
10 < d ≤ 18	-0,006 -0,024	0 -0,008
18 < d ≤ 30	-0,007 -0,028	0 -0,009

Standard



* For endmills L < 100 mm.



NEW GENERATION

Standard

Article Number	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	z	γ (°)
VHPM 6 030 064 06 40	3	-	6	64	8	15	0,05	6	15
VHPM 6 040 064 06 40	4	-	6	64	10	16	0,10	6	15
VHPM 6 050 064 06 40	5	-	6	64	12	18	0,15	6	15
VHPM 6 060 064 06 40	6	-	6	64	14	20	0,20	6	-
VHPM 6 080 078 08 40	8	-	8	78	18	25	0,20	6	-
VHPM 6 100 078 10 40	10	-	10	78	22	30	0,30	6	-
VHPM 6 120 089 12 40	12	-	12	89	26	35	0,30	6	-
VHPM 6 160 089 16 40	16	-	16	89	34	-	-	6	-
VHPM 8 200 102 20 40	20	-	20	102	42	-	-	8	-

Extra teeth

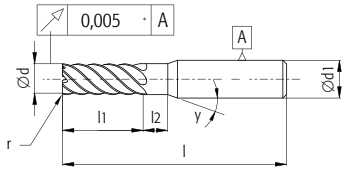
Article Number	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	z	γ (°)
VHPM 8 080 078 08 40	8	-	8	78	18	25	0,20	8	-
VHPM 10 100 078 10 40	10		10	78	22	30	0,30	10	
VHPM 12 120 089 12 40	12		12	89	26	35	0,30	12	
VHPM 16 160 089 16 40	16	-	16	89	34	-	-	16	-

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

Tolerances

Diameter range	Cutting diameter Ød-g7	Shank Ød1-h5
d ≤ 3	-0,002 -0,012	0 -0,004
3 < d ≤ 6	-0,004 -0,016	0 -0,005
6 < d ≤ 10	-0,005 -0,020	0 -0,006
10 < d ≤ 18	-0,006 -0,024	0 -0,008
18 < d ≤ 30	-0,007 -0,028	0 -0,009

Standard



* For endmills L < 100 mm.

NEW GENERATION

Standard

Article Number	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	z	γ (°)
VHPMR 6 030 064 06 40 030	3	0,3	6	64	8	15	0,05	6	15
VHPMR 6 040 064 06 40 030	4	0,3	6	64	10	16	0,10	6	15
VHPMR 6 050 064 06 40 030	5	0,3	6	64	12	18	0,15	6	15
VHPMR 6 050 064 06 40 050	5	0,5	6	64	12	18	0,15	6	15
VHPMR 6 060 064 06 40 050	6	0,5	6	64	14	20	0,20	6	-
VHPMR 6 060 064 06 40 100	6	1,0	6	64	14	20	0,20	6	-
VHPMR 6 080 070 08 40 050	8	0,5	8	70	18	25	0,30	6	-
VHPMR 6 080 070 08 40 100	8	1,0	8	70	18	25	0,30	6	-
VHPMR 6 100 078 10 40 050	10	0,5	10	78	22	30	0,30	6	-
VHPMR 6 100 078 10 40 100	10	1,0	10	78	22	30	0,30	6	
VHPMR 6 100 078 10 40 150	10	1,5	10	78	22	30	0,30	6	
VHPMR 6 120 078 12 40 050	12	0,5	12	78	26	35	0,30	6	-
VHPMR 6 120 078 12 40 100	12	1,0	12	78	26	35	0,30	6	-
VHPMR 6 120 078 12 40 200	12	2,0	12	78	26	35	0,30	6	-
VHPMR 6 160 089 16 40 100	16	1,0	16	89	34	-	-	6	-
VHPMR 6 160 089 16 40 200	16	2,0	16	89	34	-	-	6	-
VHPMR 8 200 102 20 40 100	20	1,0	20	102	42	-	-	8	-
VHPMR 8 200 102 20 40 200	20	2,0	20	102	42	-	-	8	-

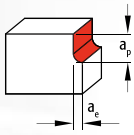
Extra teeth

Article Number	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	z	γ (°)
VHPMR 8 080 078 08 40 050	8	0,5	8	78	18	25	0,20	8	-
VHPMR 10 100 078 10 40 050	10	0,5	10	78	22	30	0,30	10	-
VHPMR 12 120 089 12 40 050	12	0,5	12	89	26	35	0,30	12	-
VHPMR 16 160 089 16 40 050	16	0,5	16	89	34	-	-	16	-

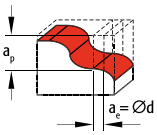
For an extra charge we offer an inspection report of the tool geometry

Material group	TSR (N/mm²)	Hardness HB	Cutting speed Vc m/min
Carbon steel	< 750	< 250	
Alloy steel	< 1000	< 300	
Tool steel	> 850	> 250	
	> 1000	> 300	
Stainless steel	< 600	< 200	
	< 850	< 250	
High temp. alloys	< 900	< 300	
Titanium alloys	< 900	< 300	
Hardened steel		45-52 HRc	
		52-60 HRc	120 - 200
		58-70 HRc	80 - 150
Cast iron		< 260	
Aluminium	< 350	< 100	
Aluminium < 5% Si	< 500	< 150	
Aluminium > 5% Si	< 400	< 120	
Copper	< 350	< 100	
Brass, bronze	< 700	< 200	
Graphite			
Synthetics			

For further material specifications see material cross reference list

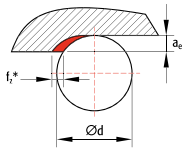


Hardened material
a_p up to 2,00 x d
a_e up to 0,02 x d



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

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



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

- At shoulder milling, feed per tooth f_z* for lower a_e values should be converted according formula.

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

VHDRS-VHDRH, double radius tool

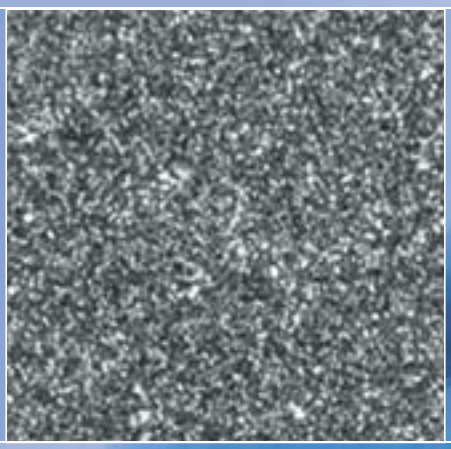
Features

- Suited for non hardened and hardened materials up to 45 HRc (VHDRS) and hardened materials 45 HRc ≤ 60 (VHDRH) HRc.
- Specified geometry for low cutting forces.
- Due to the double radius geometry of this endmill, the machine has to be programmed with a theoretical radius which can be found in the catalogue.
- h5 Shank tolerance for optimized clamping.

Van Hoorn vs competitor

Workpiece Material: 1.2379 (Sverker21) 52HRc
DIN: X155CrVMo12-1
Endmill: VHDRH41000781003

	Van Hoorn	Competitor
v_c	150 m/min	150 m/min
n	4.775 rpm	4.775 rpm
F_z	0,200 mm/t	0,200 mm/t
v_f	3.820 mm/min	1.910 mm/min
a_p	0,2 mm	0,2 mm
a_e	5 mm	5 mm
Coolant	emulsion	emulsion
Q	**3,82 cm³/min**	**1,91 cm³/min**



Carbide

- Carbide with ultra fine grain structure of 0,3 - 0,5 micron.
- High tensile rupture strength.

Coating

- TiAlN coated.
- High heat and chemical resistance.
- High hardness 3500 HV.
- Machining temperature up to 800° C.
- Suitable for dry and wet machining.

Application Area

- Multifunctional usage, such as carbon steel, alloy steel, cast iron, cast steel, tool steel up to 45 HRc and 45 HRc ≤ 60 HRc.
- 4 Flute endmill for wide range of roughing applications.
- Large chip removal rate due to High Feed Rate (Fz 0,5 - 1,0 mm/t).
- Dimensions specially designed for milling deep pockets.

Market Segment

- Moulds and dies for the plastic moulding industry.
- General roughing applications in the engineering industry.

VHDT-VHDB, the diamond tool

Materials to cut: application area

- Graphite
- Fibre reinforced plastics
- Composites (e.g. aerospace materials)
- Ceramics
- Ancoloy
- Tungsten carbide
- All materials which are currently cut by PCD-Tools

Diamond tipped tools vs PCD

- **Improved tool life**
- Because of homogene diamond (smaller diamond grains), smoother surface
- **Improved surface finish and form accuracy**
- Because of sharper cutting edge
- **Higher machining efficiency**
- Because of reduction of production time (cycle time)

- 2 to 5 times better toollife than PCD

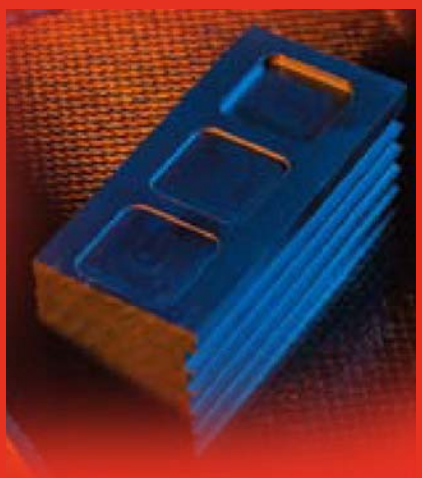
- 10 to 20 times better than diamond coated tools

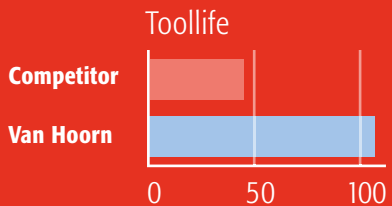
Special sizes and dimensions available

Van Hoorn vs competitor

Workpiece Material: Aerospace **Endmill:** VHDT2060078R05

	Van Hoorn	Competitor
v_c	283 m/min	283 m/min
n	15.000 rpm	15.000 rpm
F_z	0,100 mm/t	0,100 mm/t
v_f	3.000 mm/min	3.000 mm/min
a_p	4 mm	4 mm
a_e	0,1 mm	0,1 mm
Coolant	emulsion	emulsion
Q	1,2 cm^3/min	1,2 cm^3/min





Knowledge is the key!

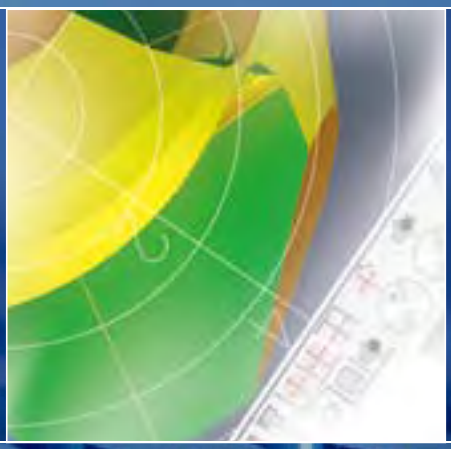
The Van Hoorn Carbide products need knowledge and support. For each endmill on each material other conditions are required. We gladly share this knowledge with you. We are experienced in cutting difficult materials, cutting with high precision, series production, but also in standard applications we have the required knowledge. Others only supply an endmill we supply a solution.

Highest level of production

- Fully automated process
- New CNC grinding machines
- 24-7 production
- Climate controlled production
- Know-how

Quality

- Climatized measuring
- CNC measuring equipment
- 100% tool inspection
- Master tools
- Measuring protocols
- Tolerances of ± 0.001 mm possible



Research & Development

- In-house development of cutting tools
- 3-D simulation
- Manufacturing of test tools
- Continuous optimization of program

Demonstration & Test centre

- Mikron VCP 600
- 20.000 RPM 130 N/m
- Emulsion, minimal lubrication and air coolant
- Shrink fit holders, collet chuck, weldon holders
- Highly skilled application engineers

Technical support

- Testing on our Mikron milling machine
- Remote support by phone
- Support on site
- Large database of test reports

To machine materials like: stainless steel, titanium, hastelloy, inconel, monel, maraging, waspalloy, nickel-based materials, etc.

Most common problems to face:

- Abrasiveness of the material
- Resonance of the machine and/or workpiece
- Vibrations of the workpiece and/or tool

How to handle:

- Stable clamping of tool and material

- Coolant

- Try to have as much coolant on the tool as possible (see page 21).
- For materials as mentioned above; recommended oil percentage of the emulsion coolant if possible between 8 - 12% (grease).

- Chip flow

- Try to have a smooth chip-flow so the chip can leave the flute easily.

Solutions:

- Very sharp geometry of endmill

- Prevention of Vibrations due to geometry

- Unequal helix
- Unequal tooth-spacing

- Special flute polish grinding

- New coating design with very low friction coefficient

Van Hoorn vs competitor

Workpiece Material: 1.4462 (Duplex)

DIN: X2CrNiMoN22-5-3

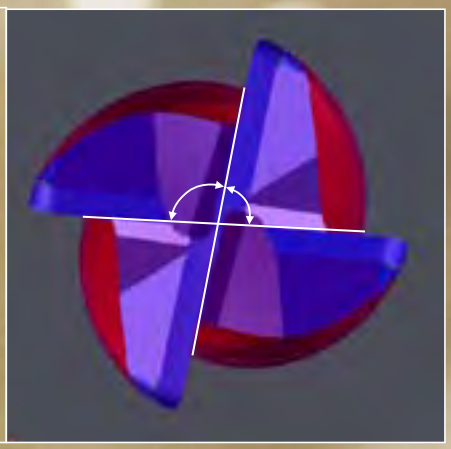
Endmill: VHVTRW52501202503

	Van Hoorn	Competitor
v_c	60 m/min	25 m/min
n	765 rpm	318 rpm
F_z	0,07 mm/t	0,03 mm/t
v_f	265 mm/min	40 mm/min
a_p	42 mm	2 mm
a_e	2 mm	28 mm
Coolant	emulsion	emulsion
Q	**22260 mm³/min**	**2240 mm³/min**

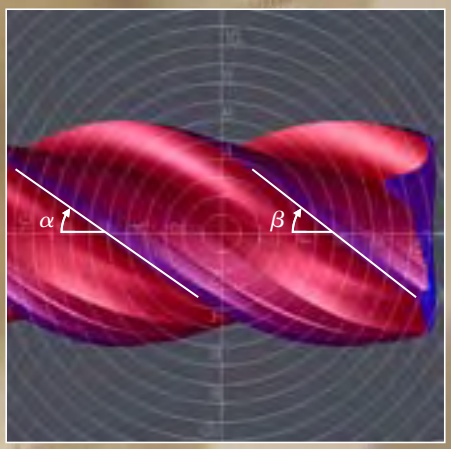
New generation roughing endmill for milling exotic materials

The VHVTR is able to perform roughing operations in exotic materials, due to the combination of carbide, coating and geometry. Due to the sharp geometry, variable helix and coating with a low friction coefficient, slotting up to 2xD is possible. Due to a special flute design, the chipflow is optimized. This chipflow is essential for roughing applications. Numerous tests on a large variety of materials has proven that the VHVTR is a perfect solution for roughing applications.

- Sharp geometry
- Polish flutes
- Coating with low friction coefficient



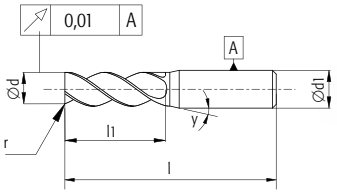
Unequal tooth spacing



Variable helix

Tolerances

Diameter range	Cutting diameter Ød-h9	Shank Ød1-h5
d ≤ 3	0 -0,025	0 -0,004
3 < d ≤ 6	0 -0,030	0 -0,005
6 < d ≤ 10	0 -0,036	0 -0,006
10 < d ≤ 18	0 -0,043	0 -0,008
18 < d ≤ 30	0 -0,052	0 -0,009



NEW GENERATION

Short

Article Number	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	z	
VHVTR 4030 039 03 03 S	3	0,2	3	39	5	7	-	4	new
VHVTR 4040 051 04 03 S	4	0,2	4	51	6	9		4	new
VHVTR 4050 051 05 03 S	5	0,2	5	51	7	11		4	new
VHVTR 4060 064 06 03 S	6	0,3	6	64	8	13		4	new
VHVTR 4080 064 08 03 S	8	0,5	8	64	11	18		4	new
VHVTR 4100 070 10 03 S	10	0,5	10	70	13	22		4	new
VHVTR 4120 078 12 03 S	12	1,0	12	78	15	25		4	new
VHVTR 4160 089 16 03 S	16	1,0	16	89	19	35		4	new
VHVTR 4200 102 20 03 S	20	1,0	20	102	23	42		4	new
VHVTR 4250 120 25 03 S	25	1,0	25	120	28	45		4	new

Also available with weldon shank

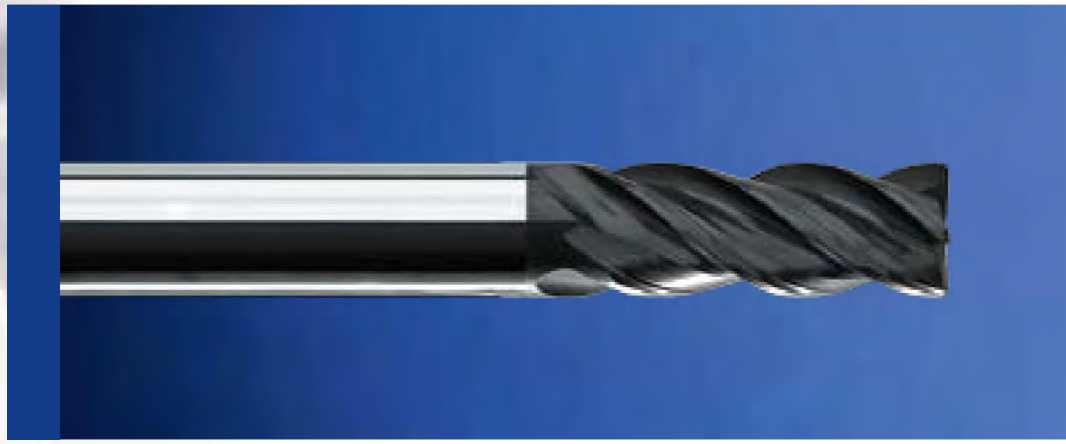
Standard

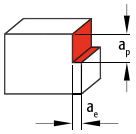
VHVTR 4 030 039 03 03	3	0,2	3	39	7	-	-	4	-
VHVTR 4 040 051 04 03	4	0,2	4	51	9	-	-	4	-
VHVTR 4 050 051 05 03	5	0,2	5	51	11			4	
VHVTR 4 060 064 06 03	6	0,3	6	64	13	-	-	4	-
VHVTR 4 080 064 08 03	8	0,5	8	64	18			4	
VHVTR 4 100 070 10 03	10	0,5	10	70	22	-	-	4	-
VHVTR 4 120 078 12 03	12	1,0	12	78	25	-	-	4	-
VHVTR 5 160 089 16 03	16	1,0	16	89	35	-	-	5	-
VHVTR 5 200 102 20 03	20	1,0	20	102	42	-	-	5	-
VHVTR 5 250 120 25 03	25	1,0	25	120	45			5	

with Weldon

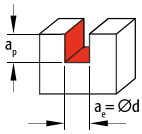
VHVTRW 4 060 064 06 03	6	0,3	6	64	13			4	
VHVTRW 4 080 064 08 03	8	0,5	8	64	18	-	-	4	-
VHVTRW 4 100 070 10 03	10	0,5	10	70	22	-	-	4	-
VHVTRW 4 120 078 12 03	12	1,0	12	78	25	-	-	4	-
VHVTRW 5 160 089 16 03	16	1,0	16	89	35	-	-	5	-
VHVTRW 5 200 102 20 03	20	1,0	20	102	42	-	-	5	-
VHVTRW 5 250 120 25 03	25	1,0	25	120	45	-	-	5	-

Material group	TSR (N/mm²)	Hardness HB	Cutting speed Vc m/min
Carbon steel	< 750	< 250	150 - 200
Alloy steel	< 1000	< 300	100 - 150
Tool steel	> 850	> 250	100 - 150
	> 1000	> 300	90 - 130
Stainless steel	< 600	< 200	80 - 150
	< 850	< 250	60 - 120
High temp. alloys	< 900	< 300	30 - 50
Titanium alloys	< 900	< 300	70 - 100
Hardened steel		45-52 HRc	100 - 180
		52-60 HRc	
		58-70 HRc	
Cast iron		< 260	100 - 150
Aluminium	< 350	< 100	
Aluminium < 5% Si	< 500	< 150	
Aluminium > 5% Si	< 400	< 120	
Copper	< 350	< 100	
Brass, bronze	< 700	< 200	
Graphite			
Synthetics			

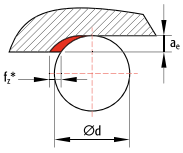




a_p up to 2,00 x d
a_e up to 0,50 x d



Ød (mm)	Shoulder milling ap max. (mm)	ae max. (mm)	fz (mm/tooth)	Slot milling ap max. (mm)	ae max. (mm)	fz (mm/tooth)
3,0	< 4,0	< 0,5	0,01 - 0,02	< 2,0	< 3,0	0,01 - 0,02
4,0	< 7,0	< 0,8	0,02 - 0,03	< 3,0	< 4,0	0,02 - 0,03
5,0	< 9,0	< 1,2	0,02 - 0,03	< 4,0	< 5,0	0,02 - 0,03
6,0	< 12,0	< 2,0	0,02 - 0,04	< 5,0	< 6,0	0,02 - 0,04
8,0	< 16,0	< 3,0	0,03 - 0,05	< 6,0	< 8,0	0,03 - 0,05
10,0	< 20,0	< 4,0	0,04 - 0,07	< 8,0	< 10,0	0,04 - 0,07
12,0	< 24,0	< 6,0	0,05 - 0,08	< 10,0	< 12,0	0,05 - 0,08
16,0	< 32,0	< 8,0	0,06 - 0,10	< 12,0	<16,0	0,06 - 0,10
20,0	< 38,0	< 10,0	0,08 - 0,12	< 16,0	< 20,0	0,08 - 0,12
25,0	< 42,0	< 12,5	0,10 - 0,15	< 20,0	< 25,0	0,10 - 0,15



- At shoulder milling, feed per tooth f_z* for lower a_e values should be converted according table.

The Real Tool

For semi finishing and finishing applications in exotic materials we highly recommend our Predator line. Due to the positive cutting angles and adjusted coating, the Predator line is the best choice. You can find information about our Predator line in our main catalogue.

Predator

Workpiece Material: 1.4462 (Duplex), **Endmill:** HABM20801000803

	Van Hoorn Carbide	Van Hoorn Carbide
v_c	120 m/min	120 m/min
n	4.775 rpm	9.550 rpm
F_z	0,040 mm/t	0,020 mm/t
v_f	385 mm/min	385 mm/min
a_p	0,1 mm	0,05 mm
a_e	0,1 mm	0,05 mm
Coolant	emulsion	emulsion
Q	**0,0039 cm³/min**	**0,0010 cm³/min**

Workpiece Material: 1.4462 (Duplex) **Endmill:** HAMM40600780603050

	Van Hoorn Carbide
v_c	70 m/min
n	3.715 rpm
F_z	0,040 mm/t
v_f	595 mm/min
a_p	10 mm
a_e	1,5 mm
Coolant	emulsion
Q	8,93 cm³/min

Workpiece Material: 14Cr17Ni2 **Endmill:** HAMF82001022003050

	Van Hoorn Carbide	Competitor
v_c	157 m/min	157 m/min
n	2.500 rpm	2.500 rpm
F_z	0,035 mm/t	0,035 mm/t
v_f	700 mm/min	525 mm/min
a_p	50 mm	50 mm
a_e	0,2 mm	0,2 mm
Coolant	emulsion	emulsion
Q	**7,00 cm³/min**	**5,25 cm³/min**

Keep the tool cool!

We recommend always to use coolant to remove the chips and keep them away from the endmill (emulsion, minimum lubrication or air).

By reducing the temperature of the tool, the toollife will be increased. The coolant must be at the right place on the endmill all time. One coolant jet pointed from the front in a flute for immediate coolant❶. Another coolant jet pointed from the right hand side in a flute to prevent chips to come along❷. Of course the coolant pressure must be sufficient to flush the chips away.

When to use, what kind of coolant:

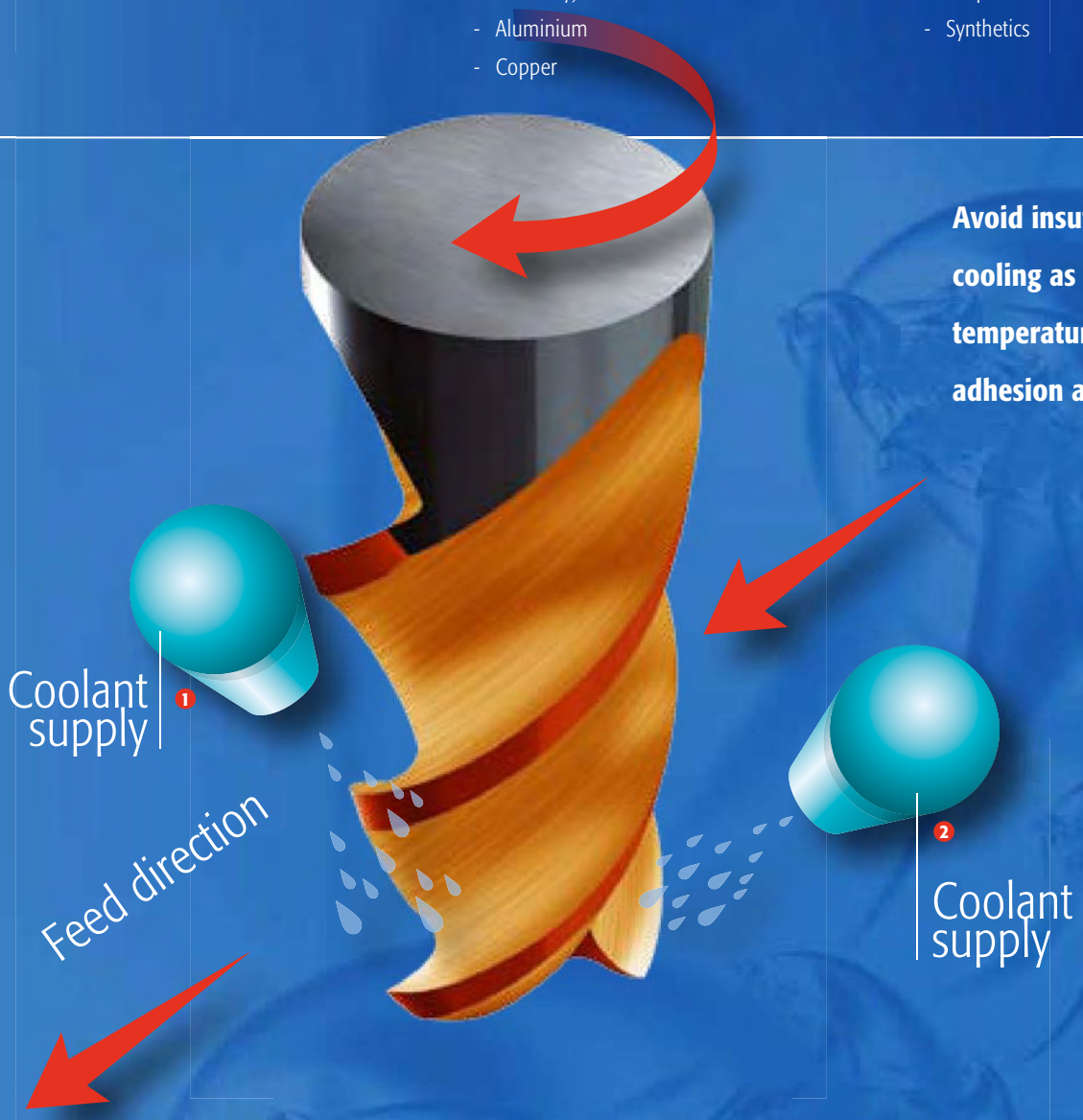
Emulsion

- Hardness less than 50 HRc
- Vc < 200 m/min
- Exotic materials (Stainless Steel, Titanium, Hastelloy)
- Aluminium
- Copper

Minimum Lubrication (Preference) Or Air

- Hardness over 50 HRc
- Vc > 200 m/min
- Graphite
- Synthetics

Avoid insufficient lubrication / cooling as it may cause temperature shocks, chip adhesion and tool breakage.



Milling synthetic material with our single flute endmill VHKE

All kinds of plastic and synthetic materials can be machined with our special developed single flute endmill VHKE. The VHKE is currently used in the graphic industry, food industry, packaging industry and in the production of synthetic components.
The smoothness and surface finish of the workpiece are the most important factors in these industries. Because our tools are special designed for synthetics we can meet these requirements.

- Polish finish in chiproom
- Small helix for low radial forces
- Sharp geometry for smooth cutting
- Standard shank Ø3 or Ø6mm
- Pre-balanced cutting geometry

The workpiece is often clamped on a vacuum-bed on the machine. Advantage is that the workpiece will not disfigure. Disadvantage is vibration in the workpiece. This is minimized due to sharp geometry of the endmill.

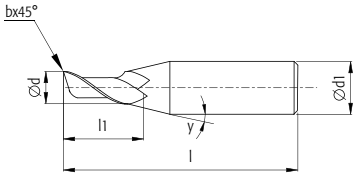
The machines where the endmill is often used on, usually has a lot of RPM available; between 20.000 and 60.000 rpm. Because there is no coolant available all the heat should be transferred into the chips. Therefore these RPM are required.

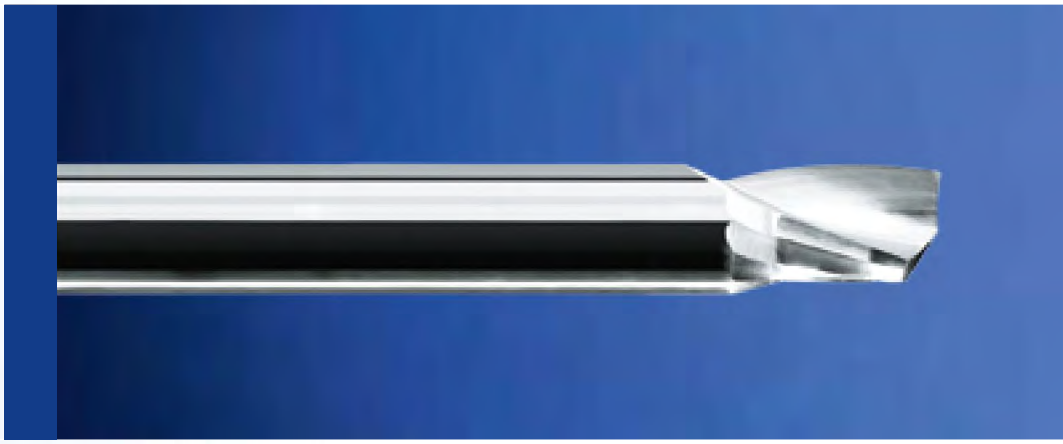
Mostly, coolant is not allowed or not available on the machine. The chips(dust) removal is being done by an industrial vacuum cleaner.

Tolerances

Diameter range	Cutting diameter Ød-h9	Shank Ød1-h5
d ≤ 3	0 -0,025	0 -0,004
3 < d ≤ 6	0 -0,030	0 -0,005
6 < d ≤ 10	0 -0,036	0 -0,006
10 < d ≤ 18	0 -0,043	0 -0,008

Standard





Van Hoorn vs competitor

Workpiece Material: Glass Fibre Synthetic

Endmill: VHKE10200390310L030
Cilindrical Shank, Ø2, Z=1

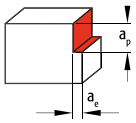
	Van Hoorn	Competitor
v_c	94 m/min	94 m/min
n	15.000 -/min	15.000 -/min
F_z	0,06 mm/t	0,05 mm/t
v_f	900 mm/min	750 mm/min
a_p	2 mm	1 mm
a_e	2 mm	2 mm
Coolant	air	air
Q	**3600 mm³/min**	**1500 mm³/min**

Standard

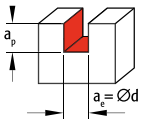
Article Number	Ød (mm)	r (mm)	Ød1 (mm)	L (mm)	L1 (mm)	L2 (mm)	a (mm)	z	γ (°)	
VHKE10100390310L020	1,0	-	3	39	2	-	-	1	15	New
VHKE10100390310L040	1,0	-	3	39	4	-	-	1	15	New
VHKE10150390310L025	1,5	-	3	39	2,5	-	-	1	15	New
VHKE10150390310L050	1,5	-	3	39	5	-	-	1	15	New
VHKE10200390310L030	2,0	-	3	39	3	-	-	1	15	New
VHKE10200390310L060	2,0	-	3	39	6	-	-	1	15	New
VHKE10250390310L040	2,5	-	3	39	4	-	-	1	15	New
VHKE10250390310L060	2,5	-	3	39	6	-	-	1	15	New
VHKE10300510610L040	3,0	0,05	6	51	4	-	-	1	15	New
VHKE10300510610L060	3,0	0,05	6	51	6			1	15	New
VHKE10400510610L050	4,0	0,05	6	51	5			1	15	New
VHKE10400510610L080	4,0	0,05	6	51	8	-	-	1	15	New
VHKE10500510610L060	5,0	0,08	6	51	6	-	-	1	15	New
VHKE10500510610L100	5,0	0,08	6	51	10	-	-	1	15	New
VHKE10600510610L080	6,0	0,10	6	51	8	-	-	1	-	New
VHKE10600510610L120	6,0	0,10	6	51	12	-	-	1	-	New
VHKE10800600810L100	8,0	0,12	8	60	10	-	-	1	-	New
VHKE10800600810L160	8,0	0,12	8	60	16	-	-	1	-	New
VHKE11000701010L120	10,0	0,15	10	70	12	-	-	1	-	New
VHKE11000701010L220	10,0	0,15	10	70	22	-	-	1	-	New
VHKE11200781210L150	12,0	0,20	12	78	15	-	-	1	-	New

Material group	TSR (N/mm²)	Hardness HB	Cutting speed Vc m/min
Carbon steel	< 750	< 250	
Alloy steel	< 1000	< 300	
Tool steel	> 850	> 250	
	> 1000	> 300	
Stainless steel	< 600	< 200	
	< 850	< 250	
High temp. alloys	< 900	< 300	
Titanium alloys	< 900	< 300	
Hardened steel		48-52 HRc	
		52-60 HRc	
		58-70 HRc	
Cast iron		< 260	
Aluminium	< 350	< 100	< 600
Aluminium < 5% Si	< 500	< 150	< 400
Aluminium > 5% Si	< 400	< 120	< 300
Copper	< 350	< 100	< 350
Brass, bronze	< 700	< 200	< 250
Graphite			
Synthetics			< 700

For further material specifications see material cross reference list.



a_p up to 2,00 x d
a_e up to 0,50 x d



a_p up to 1,00 x d

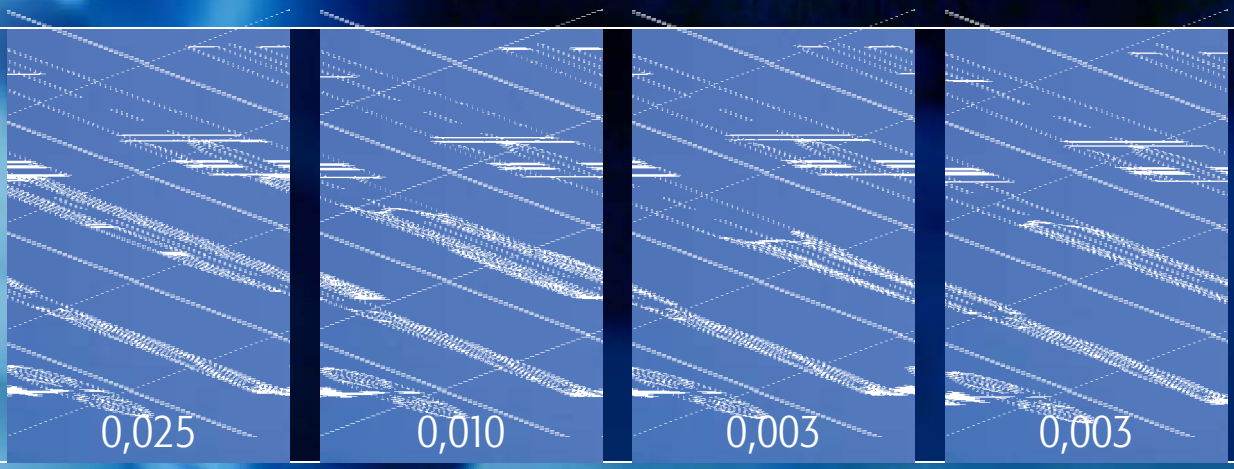
- Cutting speed Vc is based on max. 50.000 rpm.
- Endmills can be used also for drilling with reduced cutting conditions.

	Shoulder milling			Slot milling		
Ød (mm)	ap max. (mm)	ae max. (mm)	fz (mm/tooth)	ap max. (mm)	ae max. (mm)	fz (mm/tooth)
1,0	< 0,8	< 0,25	0,015 - 0,020	< 0,8	1,0	0,015 - 0,020
1,5	< 1,1	< 0,38	0,023 - 0,027	< 1,1	1,5	0,023 - 0,027
2,0	< 1,5	< 0,50	0,030 - 0,043	< 1,5	2,0	0,030 - 0,043
2,5	< 1,9	< 0,63	0,034 - 0,060	< 1,9	2,5	0,034 - 0,060
3,0	< 2,3	< 0,75	0,045 - 0,070	< 2,3	3,0	0,045 - 0,070
4,0	< 4,0	< 2,0	0,050 - 0,080	< 4,0	4,0	0,050 - 0,080
5,0	< 5,0	< 2,5	0,060 - 0,100	< 5,0	5,0	0,060 - 0,100
6,0	< 6,0	< 3,0	0,075 - 0,120	< 6,0	6,0	0,075 - 0,120
8,0	< 8,0	< 4,0	0,095 - 0,150	< 8,0	8,0	0,095 - 0,150
10,0	< 10,0	< 5,0	0,115 - 0,185	< 10,0	10,0	0,115 - 0,185
12,0	< 12,0	< 6,0	0,140 - 0,230	< 12,0	12,0	0,140 - 0,230

Radial runout vs toolholding system

When high speed milling, the radial runout of the tool has a big influence on the results. When the radial runout of the endmill is to large, the tool will get unbalanced and will start vibrating. Resulting in: shorter toollife due to unequal edge wear, bad surface finish and the risk of breaking the tool.

The shrink holder, is the most accurate system and therefore recommended by our application engineers.

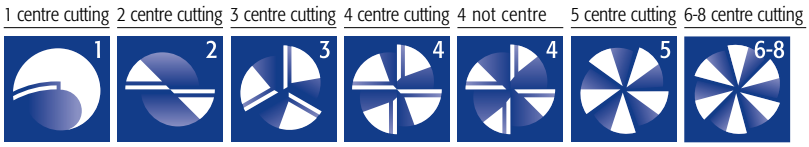
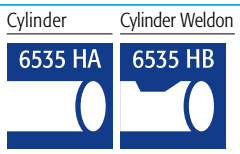
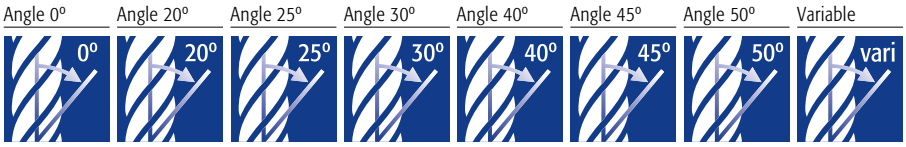
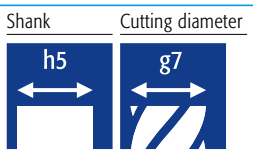
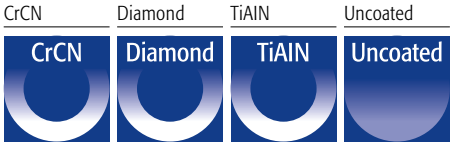
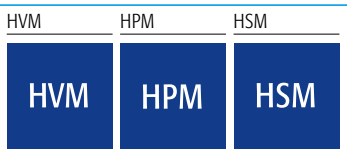


Weldon/Whistle notch | Collet chuck | Hydrolic holder | Shrink holder

Advantages shrinking system

- Shrinking gives a 2-3 times higher clamping force than the collet and hydrolic holder.
- Higher rigidity.
- Balanced design, no obstacles around the endmill.

Symbols

Number of Flutes	
Shank design	
Helix angle	
Diameter Tolerances	
End face design	
Coating	
Strategy	
Cutting conditions on page ...	

Test report

Application Details

VAN HOORN CARBIDE

Machine Tool & Material	
Machine	
Spindle type	
Max RPM	
Power Kw	
Cutter holder	
Workpiece material	
Hardness	

Application		
Side milling		Up-milling	
Slotting		Down-milling	
Profiling		Ramping	
Plunging		Circular	

Tool Details		
Cutter supplier		
Cutter description		
Cutter diameter	Ød	mm
Number of teeth	z	
Carbide grade		

Cutting Conditions & Parameters		
Cutting speed	V_c	m/min
Revolution	n	rpm
Feed per tooth	f_z	mm
Table feed	V_f	mm/min
Depth of cut	a_p	mm
Width of cut	a_e	mm
Length of cut	L	mm
Chip removal rate	Q	cm^3/min
Chip thickness	Hm	mm
Coolant type		
Coolant pressure		Bar
Cutting time / comp	$T_{comp.}$ min	
Toollife	T_{total} min	min
Power consumption	P Kw	Kw
Edge wear	V_b mm	mm

Sketch

Tests

dry / air / minimum lub / emulsion	dry / air / minimum lub / emulsion
Internal: External:	Internal: External:

Also visit us at www.hoorn-carbide.com

For more information about our products we gladly invite you to visit our website. On our website you will find a product overview and the possibility to download the Van Hoorn catalogue. If you require additional information or technical support, you can always contact our head office by phone or by email:

- Tel: +31 (0)495 - 58 40 99
- Email: info@hoorn-carbide.com

Mentioned values in this brochure should be regarded as guidelines.

General precautions
- Be careful when removing the tools from the cases, the cutting edges are very sharp
- The cutting edge of the tool may chip or fragment during use
- The cutting tool may break or shatter if improperly used
- Use holders that match the tool and nature of the processing operations
- Use balanced toolholders when machining over 10,000 rpm
- Van Hoorn Carbide will not assume responsibility for any products which have been modified, misused, subjected to an accident or used beyond their normal useful life

Safety precautions
- Ensure that you take proper fire-prevention measures
- Grinding or other use of the tools may produce hazardous dust and fumes which may endanger health.
- Use safety covers and eye protection as tools may break when machining

All our quotations, all orders placed with us and all contracts concluded with us are subject to the Metaalunieconditions. A copy will be sent to you upon request.

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