



**SOLID  
CARBIDE  
CATALOG  
END MILLS  
DRILLS**



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SOLID  
CARBIDE  
CATALOG  
END MILLS  
DRILLS







Firmamız 2011 yılında, standart ve özel karbür kesici takım üretmek üzere Bursa'da kurulmuştur. Başlıca amacı müşteri memnuniyeti olan firmamızın kurucuları, karbür kesici takım sektöründe uzun yıllar boyunca edindiği deneyim ve bilgi birikimini, yüksek teknoloji ve uzmanlaşmış bir ekip ile birleştirerek firma isminden kısa sürede bahsettirir hale gelmiştir.

2020 yılında kendi binasına geçmesiyle beraber CNC makine parkurunu genişletmiş ve PVD kaplama hattını kendi bünyesinde kurmuştur. Bu yatırımlar sayesinde müşterilerine sunduğu kaliteyi üst seviyeye taşımıştır.



Our company was established in Bursa in 2011 to produce standard and special carbide cutting tools. The founders of our company, whose main aim is customer satisfaction, combined their experience and knowledge gained over many years in the carbide cutting tool industry with high technology and a specialized team, and the company has become popular in a short time.

With the move to its own building in 2020, it expanded its CNC machine park and established the PVD coating line within its own structure. Thanks to these investments, it has brought the quality it offers to its customers to the next level.

# Machine



# Machine



**5 Axis CNC  
Tool Grinding**

# Machine





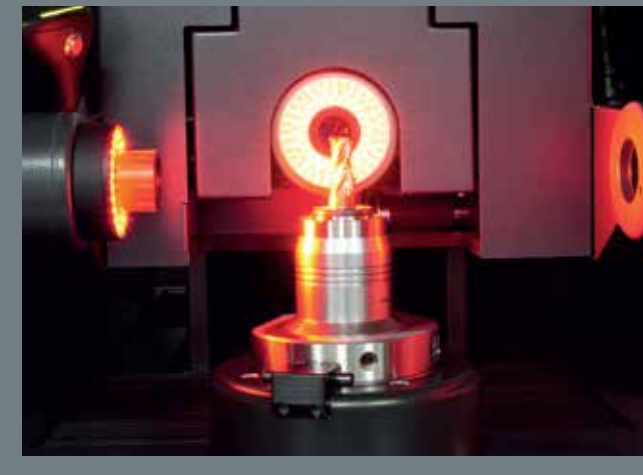
# Machine



# Quality and Measurement



# Quality and Measurement



# PVD Coating



# PVD Coating



# Storage And Shipment



# Storage And Shipment









# End Mills

**HTG**   
HIGH TECHNOLOGY GRINDING




## Information

- K30F** Solid Carbide K30F
- AlTiN** Coating Type
- TiSiN** Coating Type
- AlCrN** Coating Type
- NO COATING** Uncoated
- Z2** Solid Carbide 2 Flute End Mill
- Z3** Solid Carbide 3 Flute End Mill
- Z4** Solid Carbide 4 Flute End Mill
- Z6** Solid Carbide 6 Flute End Mill
- HTG TOOLS Std.** HTG Tools Standart
-  Shank Type
- <56 HRC** Suited for Hardened Steels
- ~30°** Helix Angle
-  Cutting Data Page



Products	Type	Diameter	Z	Coating	Page
	EM5	Ø3 - Ø20	2	●	19
	EM5	Ø3 - Ø20	3	●	20
	EM5	Ø3 - Ø20	4	●	21
	EMT4	Ø1 - Ø5	4	●	22
	EM7	Ø3 - Ø14	4	●	23
	EM9	Ø6 - Ø20	4	●	24
	CRM5	Ø3 - Ø12	4	●	25-26
	CRM7	Ø3 - Ø12	4	●	27
	PM5	Ø3 - Ø20	4	●	29
	PMR5	Ø3 - Ø20	4	●	30
	PMZ5	Ø3 - Ø20	4	●	33
	TM5	Ø3 - Ø20	4	●	35
	RSM5	Ø6 - Ø20	4	●	37
	HM5	Ø6 - Ø20	6	●	39
	HM7	Ø6 - Ø20	6	●	40
	HF5	Ø4 - Ø20	4	●	43
	SF5	Ø4 - Ø12	4	●	44

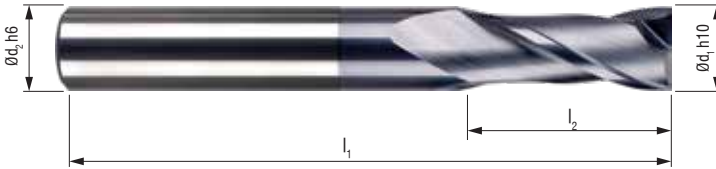


Products	Type	Diameter	Z	Coating	Page
	EMT5	Ø1 - Ø4	2-4	●	47-49
	CMT5	Ø1 - Ø4	2-4	●	50-54
	BMT5	Ø1 - Ø4	2	●	55-57
	CM	Ø6 - Ø16	4	●	58
	AL5	Ø3 - Ø20	3	○	61
	AL7	Ø6 - Ø20	3	○	62
	BM5	Ø3 - Ø20	2	●	65
	BM5	Ø3 - Ø20	4	●	66
	BM7	Ø3 - Ø12	2	●	67
	BM7	Ø3 - Ø12	4	●	68
	BM9	Ø6 - Ø20	4	●	69
	BMH	Ø4 - Ø12	2	●	70
	BMT4	Ø1 - Ø5	2	●	71



## Solid carbide end mill

Smooth-edged, normal version



### Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite

K30F

AITIN

Z2

~30°

<48 HRC

HTG TOOLS Std.

Order Code	d <sub>1</sub> /h <sub>10</sub>	l <sub>1</sub>	l <sub>2</sub>	d <sub>2</sub> /h <sub>6</sub>	Z
EM5-0302C-T10	3	50	8	3	2
EM5-0402C-T10	4	50	10	4	2
EM5-0502C-T10	5	50	13	5	2
EM5-0602C-T10	6	57	14	6	2
EM5-0802C-T10	8	63	19	8	2
EM5-1002C-T10	10	72	22	10	2
EM5-1202C-T10	12	83	26	12	2
EM5-1402C-T10	14	83	26	14	2
EM5-1602C-T10	16	92	32	16	2
EM5-1802C-T10	18	92	32	18	2
EM5-2002C-T10	20	104	38	20	2

EM5-0602C-T10
 
 EM5-0602W-T10



## Solid carbide end mill

Smooth-edged, normal version



### Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	Z
EM5-0303C-T10	3	50	8	3	3
EM5-0403C-T10	4	50	10	4	3
EM5-0503C-T10	5	50	13	5	3
EM5-0603C-T10	6	57	14	6	3
EM5-0803C-T10	8	63	19	8	3
EM5-1003C-T10	10	72	22	10	3
EM5-1203C-T10	12	83	26	12	3
EM5-1403C-T10	14	83	26	14	3
EM5-1603C-T10	16	92	32	16	3
EM5-1803C-T10	18	92	32	18	3
EM5-2003C-T10	20	104	38	20	3



EM5-0603C-T10

EM5-0603W-T10

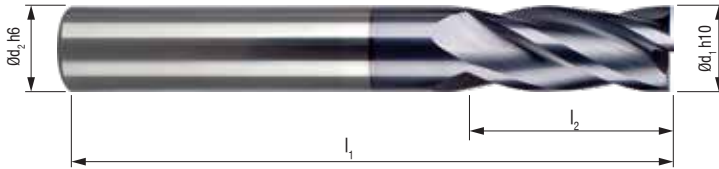


## Solid carbide end mill

Smooth-edged, normal version

### Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	Z
EM5-0304C-T10	3	50	8	3	4
EM5-0404C-T10	4	50	10	4	4
EM5-0504C-T10	5	50	13	5	4
EM5-0604C-T10	6	57	14	6	4
EM5-0804C-T10	8	63	19	8	4
EM5-1004C-T10	10	72	22	10	4
EM5-1204C-T10	12	83	26	12	4
EM5-1404C-T10	14	83	26	14	4
EM5-1604C-T10	16	92	32	16	4
EM5-1804C-T10	18	92	32	18	4
EM5-2004C-T10	20	104	38	20	4



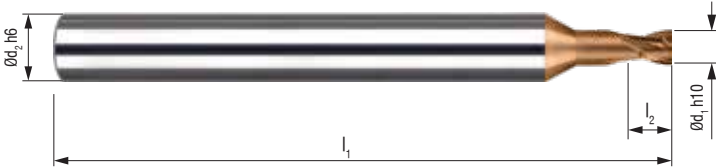


# Solid carbide end mill

Smooth-edged, normal version

## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



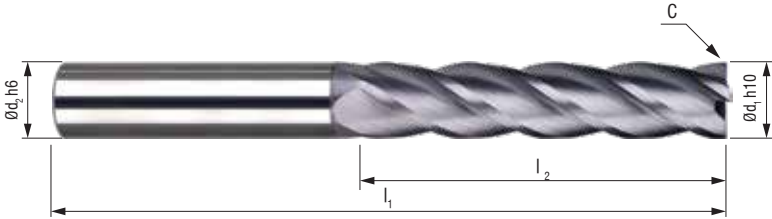
Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	Z
<b>EMT4-0102C-TS10</b>	<b>1</b>	50	3	4	2
<b>EMT4-0154C-TS10</b>	<b>1.5</b>	50	5	4	4
<b>EMT4-0204C-TS10</b>	<b>2</b>	50	6	4	4
<b>EMT4-0254C-TS10</b>	<b>2.5</b>	50	8	4	4
<b>EMT4-0304C-TS10</b>	<b>3</b>	57	8	6	4
<b>EMT4-0404C-TS10</b>	<b>4</b>	57	11	6	4
<b>EMT4-0504C-TS10</b>	<b>5</b>	57	13	6	4





## Solid carbide end mill

Smooth-edged, long version



### Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



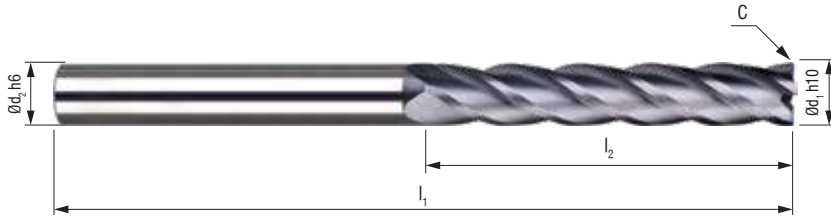
Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	C	Z
EM7-0304C-T10	3	75	15	3	-	4
EM7-0404C-T10	4	75	20	4	-	4
EM7-0504C-T10	5	75	25	5	0.15x45°	4
EM7-0604C-T10	6	100	30	6	0.2x45°	4
EM7-0804C-T10	8	100	40	8	0.25x45°	4
EM7-1004C-T10	10	100	45	10	0.25x45°	4
EM7-1204C-T10	12	100	45	12	0.25x45°	4
EM7-1404C-T10	14	100	45	14	0.25x45°	4





## Solid carbide end mill

Smooth-edged, extra-long version



### Application Range

- ▶ Unalloyed Steels
- ▶ Machining Steels
- ▶ Low Alloy Steels
- ▶ Stainless Steels
- ▶ Heat Resistant Materials
- ▶ Titanium and Titanium Alloys
- ▶ Cast Iron
- ▶ Hardened Materials
- ▶ Aluminium Alloys
- ▶ Copper and Copper Alloys
- ▶ Plastics
- ▶ Graphite



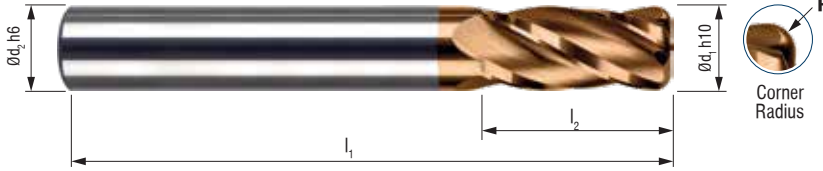
Order Code	d <sub>1</sub> /h <sub>10</sub>	l <sub>1</sub>	l <sub>2</sub>	d <sub>2</sub> /h <sub>6</sub>	C	Z
EM9-0604C-T10	6	150	35	6	0.2x45°	4
EM9-0804C-T10	8	150	45	8	0.25x45°	4
EM9-1004C-T10	10	150	55	10	0.25x45°	4
EM9-1204C-T10	12	150	55	12	0.25x45°	4
EM9-1404C-T10	14	150	60	14	0.25x45°	4
EM9-1604C-T10	16	150	70	16	0.40x45°	4
EM9-1804C-T10	18	150	70	18	0.40x45°	4
EM9-2004C-T10	20	150	70	20	0.40x45°	4





# Solid carbide end mill

Smooth-edged, normal version, corner radius



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	R	Z
CRM5-0304C-R05-TS10	3	50	8	3	0.5	4
CRM5-0304C-R10-TS10	3	50	8	3	1	4
CRM4-0304C-R05-TS10	3	57	8	6	0.5	4
CRM4-0304C-R10-TS10	3	57	8	6	1	4
CRM5-0404C-R05-TS10	4	50	10	4	0.5	4
CRM5-0404C-R10-TS10	4	50	10	4	1	4
CRM4-0404C-R05-TS10	4	57	10	6	0.5	4
CRM4-0404C-R10-TS10	4	57	10	6	1	4
CRM5-0504C-R05-TS10	5	50	13	5	0.5	4
CRM5-0504C-R10-TS10	5	50	13	5	1	4
CRM4-0504C-R05-TS10	5	57	13	6	0.5	4
CRM4-0504C-R10-TS10	5	57	13	6	1	4
CRM5-0604C-R05-TS10	6	57	14	6	0.5	4
CRM5-0604C-R10-TS10	6	57	14	6	1	4
CRM5-0804C-R05-TS10	8	63	19	8	0.5	4
CRM5-0804C-R10-TS10	8	63	19	8	1	4
CRM5-0804C-R15-TS10	8	63	19	8	1,5	4
CRM5-0804C-R20-TS10	8	63	19	8	2	4

CRM5-0604C-TS10 CRM5-0604W-TS10

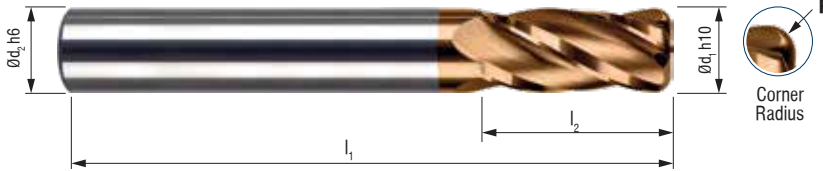


## Solid carbide end mill

Smooth-edged, normal version, corner radius

### Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



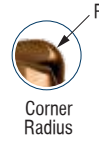
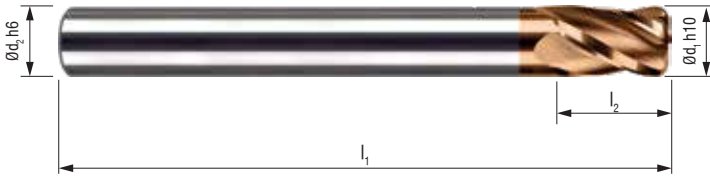
Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	R	Z
CRM5-1004C-R05-TS10	10	72	22	10	0.5	4
CRM5-1004C-R10-TS10	10	72	22	10	1	4
CRM5-1004C-R15-TS10	10	72	22	10	1.5	4
CRM5-1004C-R20-TS10	10	72	22	10	2	4
CRM5-1204C-R05-TS10	12	83	26	12	0.5	4
CRM5-1204C-R10-TS10	12	83	26	12	1	4
CRM5-1204C-R15-TS10	12	83	26	12	1.5	4
CRM5-1204C-R20-TS10	12	83	26	12	2	4





# Solid carbide end mill

Smooth-edged, long version, corner radius



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	R	Z
CRM7-0304C-R05-TS10	3	75	8	3	0.5	4
CRM7-0304C-R10-TS10	3	75	8	3	1	4
CRM7-0404C-R05-TS10	4	75	10	4	0.5	4
CRM7-0404C-R10-TS10	4	75	10	4	1	4
CRM7-0504C-R05-TS10	5	75	13	5	0.5	4
CRM7-0504C-R10-TS10	5	75	13	5	1	4
CRM7-0604C-R05-TS10	6	100	14	6	0.5	4
CRM7-0604C-R10-TS10	6	100	14	6	1	4
CRM7-0804C-R05-TS10	8	100	19	8	0.5	4
CRM7-0804C-R10-TS10	8	100	19	8	1	4
CRM7-0804C-R20-TS10	8	100	19	8	2	4
CRM7-1004C-R05-TS10	10	100	22	10	0.5	4
CRM7-1004C-R10-TS10	10	100	22	10	1	4
CRM7-1004C-R20-TS10	10	100	22	10	2	4
CRM7-1204C-R05-TS10	12	100	26	12	0.5	4
CRM7-1204C-R10-TS10	12	100	26	12	1	4
CRM7-1204C-R20-TS10	12	100	26	12	2	4



# PM5

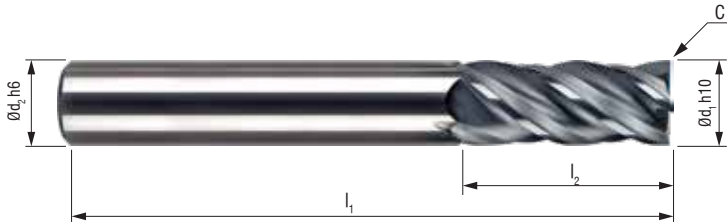
High performance End Mill...





## Solid carbide end mill

Smooth-edged, normal version, variable end mill



### Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite

K30F

AlCrN

Z4

~35/38°

<48 HRC

HTG TOOLS Std.

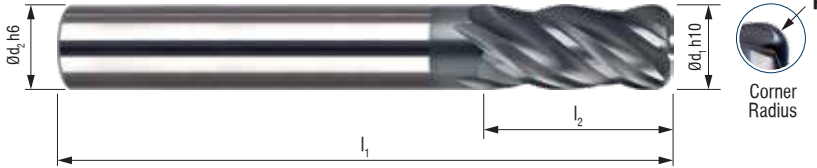
Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	C	Z
PM5-0404C-AC10	4	57	10	6	0.15x45°	4
PM5-0504C-AC10	5	57	13	6	0.15x45°	4
PM5-0604C-AC10	6	57	14	6	0.2x45°	4
PM5-0804C-AC10	8	63	19	8	0.2x45°	4
PM5-1004C-AC10	10	72	22	10	0.25x45°	4
PM5-1204C-AC10	12	83	26	12	0.25x45°	4
PM5-1404C-AC10	14	83	26	14	0.40x45°	4
PM5-1604C-AC10	16	92	32	16	0.40x45°	4
PM5-1804C-AC10	18	92	32	18	0.50x45°	4
PM5-2004C-AC10	20	104	38	20	0.50x45°	4

PM5-0604C-AC10    PM5-0604W-AC10



## Solid carbide end mill

Smooth-edged, normal version, variable end mill, corner radius



### Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	R	Z
PMR5-0604C-R05-AC10	6	57	14	6	0.5	4
PMR5-0604C-R10-AC10	6	57	14	6	1	4
PMR5-0804C-R05-AC10	8	63	19	8	0.5	4
PMR5-0804C-R10-AC10	8	63	19	8	1	4
PMR5-1004C-R05-AC10	10	72	22	10	0.5	4
PMR5-1004C-R10-AC10	10	72	22	10	1	4
PMR5-1004C-R20-AC10	10	72	22	10	2	4
PMR5-1204C-R05-AC10	12	83	26	12	0.5	4
PMR5-1204C-R10-AC10	12	83	26	12	1	4
PMR5-1204C-R20-AC10	12	83	26	12	2	4
PMR5-1604C-R10-AC10	16	92	32	16	1	4
PMR5-1604C-R20-AC10	16	92	32	16	2	4
PMR5-1604C-R30-AC10	16	92	32	16	3	4
PMR5-2004C-R10-AC10	20	104	38	20	1	4
PMR5-2004C-R20-AC10	20	104	38	20	2	4
PMR5-2004C-R30-AC10	20	104	38	20	3	4







Difficult materials, easy manufacturing...

PMZ5



TMS

Quickly performs the assigned task.



# RSM5

Low power consumption, small sawdust section, maximum performance...





# HM5

For processing the  
thermaloperation rigid materials...

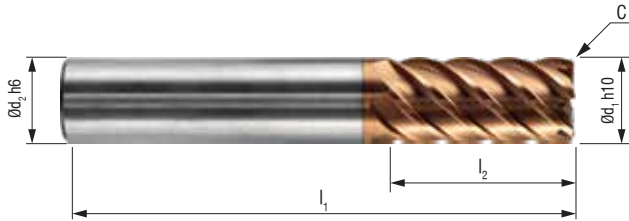






# Solid carbide end mill

Smooth-edged, normal version



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite

K30F
TISIN
Z6
~45°
<56 HRC
[Icon]
[Icon]
[Icon]
HTG TOOLS Std.

Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	C	Z
HM5-0606C-TS10	6	57	14	6	0.2x45°	6
HM5-0806C-TS10	8	63	19	8	0.2x45°	6
HM5-1006C-TS10	10	72	22	10	0.25x45°	6
HM5-1206C-TS10	12	83	26	12	0.25x45°	6
HM5-1406C-TS10	14	83	26	14	0.40x45°	6
HM5-1606C-TS10	16	92	32	16	0.40x45°	6
HM5-1806C-TS10	18	92	32	18	0.50x45°	6
HM5-2006C-TS10	20	104	38	20	0.50x45°	6







# HF5



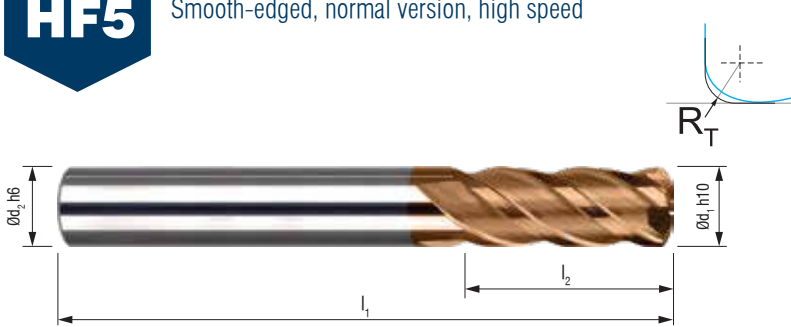
High Feed End Mill...





## Solid carbide end mill

Smooth-edged, normal version, high speed



### Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



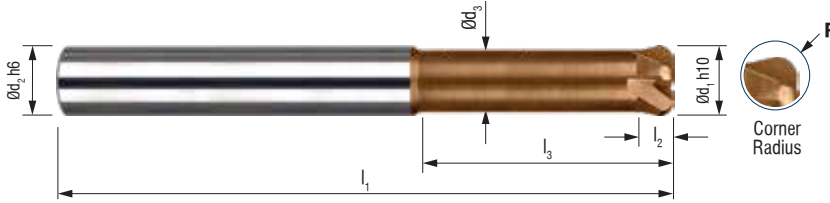
Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	$R_T$	Z
HF5-0404C-TS10	4	57	10	6	0.65	4
HF5-0504C-TS10	5	57	13	6	0.7	4
HF5-0604C-TS10	6	57	14	6	0.75	4
HF7-0604C-TS10	6	100	14	6	0.75	4
HF5-0804C-TS10	8	63	19	8	1.4	4
HF7-0804C-TS10	8	120	19	8	1.4	4
HF5-1004C-TS10	10	72	22	10	2	4
HF7-1004C-TS10	10	150	22	10	2	4
HF5-1204C-TS10	12	83	26	12	2.1	4
HF7-1204C-TS10	12	150	26	12	2.1	4
HF5-1604C-TS10	16	92	32	16	2.75	4
HF5-2004C-TS10	20	104	38	20	3	4





# Solid carbide end mill

Smooth-edged, normal version



## Application Range

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- Machining Steels
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- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$l_3$	$d_2/h_6$	$d_3$	R	Z
SF5-0404C-R05-TS10	4	75	1.6	10	6	3.5	0.5	4
SF5-0404C-R10-TS10	4	75	1.6	10	6	3.5	1	4
SF5-0504C-R10-TS10	5	75	2	12	6	4.5	1	4
SF5-0504C-R12-TS10	5	75	2	12	6	4.5	1.2	4
SF5-0604C-R10-TS10	6	100	2.5	13	6	5.5	1	4
SF5-0604C-R15-TS10	6	100	2.5	13	6	5.5	1.5	4
SF5-0804C-R10-TS10	8	100	3.5	16	8	7.5	1	4
SF5-0804C-R20-TS10	8	100	3.5	16	8	7.5	2	4
SF5-1004C-R10-TS10	10	100	4	20	10	9.5	1	4
SF5-1004C-R20-TS10	10	100	4	20	10	9.5	2	4
SF5-1204C-R10-TS10	12	100	5	24	12	11.5	1	4
SF5-1204C-R20-TS10	12	100	5	24	12	11.5	2	4
SF5-1204C-R30-TS10	12	100	5	24	12	11.5	3	4







Micro End Mills...





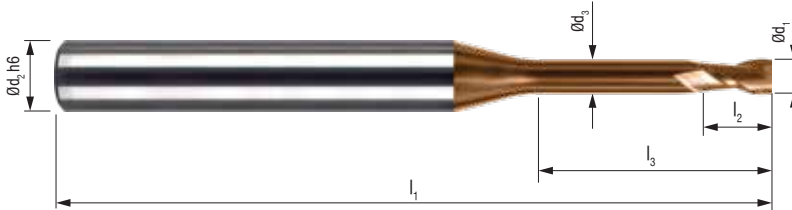


# Solid carbide end mill

Smooth-edged, normal version

## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	d <sub>2</sub> /h <sub>6</sub>	d <sub>3</sub>	Z
EMT5-0102C-L04-TS10	1	50	1.5	4	4	0.94	2
EMT5-0102C-L06-TS10	1	50	1.5	6	4	0.94	2
EMT5-0102C-L08-TS10	1	50	1.5	8	4	0.94	2
EMT5-0102C-L10-TS10	1	50	1.5	10	4	0.94	2
EMT5-0102C-L12-TS10	1	50	1.5	12	4	0.94	2
EMT5-0102C-L14-TS10	1	50	1.5	14	4	0.94	2
EMT5-0102C-L16-TS10	1	50	1.5	16	4	0.94	2
EMT5-0102C-L18-TS10	1	65	1.5	18	4	0.94	2
EMT5-0102C-L20-TS10	1	65	1.5	20	4	0.94	2
EMT5-0152C-L06-TS10	1.5	50	2.25	6	4	1.44	2
EMT5-0152C-L08-TS10	1.5	50	2.25	8	4	1.44	2
EMT5-0152C-L10-TS10	1.5	50	2.25	10	4	1.44	2
EMT5-0152C-L12-TS10	1.5	50	2.25	12	4	1.44	2
EMT5-0152C-L16-TS10	1.5	50	2.25	16	4	1.44	2
EMT5-0152C-L20-TS10	1.5	65	2.25	20	4	1.44	2
EMT5-0202C-L06-TS10	2	50	3	6	4	1.92	2
EMT5-0202C-L08-TS10	2	50	3	8	4	1.92	2
EMT5-0202C-L10-TS10	2	50	3	10	4	1.92	2

**Tolerances**  
d1 0/-0.015

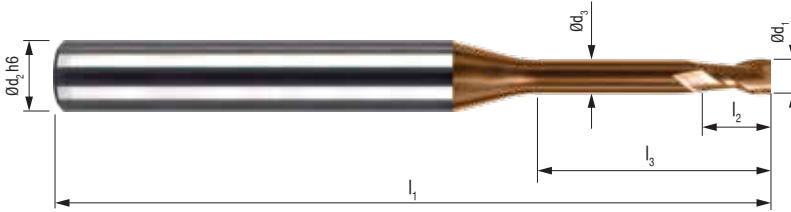


# Solid carbide end mill

Smooth-edged, normal version

## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	d <sub>2</sub> /h <sub>6</sub>	d <sub>3</sub>	Z
EMT5-0202C-L12-TS10	2	50	3	12	4	1.92	2
EMT5-0202C-L16-TS10	2	50	3	16	4	1.92	2
EMT5-0202C-L20-TS10	2	65	3	20	4	1.92	2
EMT5-0202C-L25-TS10	2	65	3	25	4	1.92	2
EMT5-0202C-L30-TS10	2	65	3	30	4	1.92	2
EMT5-0252C-L08-TS10	2.5	50	3.75	8	4	2.40	2
EMT5-0252C-L12-TS10	2.5	50	3.75	12	4	2.40	2
EMT5-0252C-L16-TS10	2.5	50	3.75	16	4	2.40	2
EMT5-0252C-L20-TS10	2.5	65	3.75	20	4	2.40	2
EMT5-0252C-L25-TS10	2.5	65	3.75	25	4	2.40	2
EMT5-0304C-L10-TS10	3	57	4.5	10	6	2.88	4
EMT5-0304C-L12-TS10	3	57	4.5	12	6	2.88	4
EMT5-0304C-L16-TS10	3	57	4.5	16	6	2.88	4
EMT5-0304C-L20-TS10	3	65	4.5	20	6	2.88	4
EMT5-0304C-L25-TS10	3	65	4.5	25	6	2.88	4
EMT5-0304C-L30-TS10	3	80	4.5	30	6	2.88	4
EMT5-0304C-L35-TS10	3	80	4.5	35	6	2.88	4
EMT5-0404C-L12-TS10	4	57	6	12	6	3.85	4

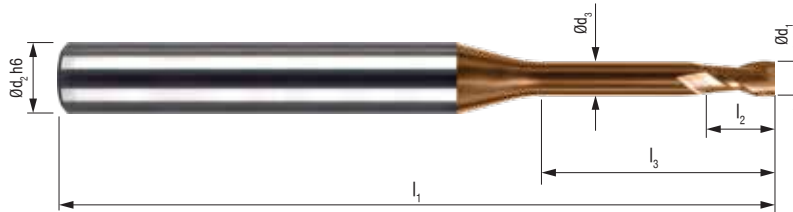
### Tolerances

d1 0/-0.015



## Solid carbide end mill

Smooth-edged, normal version



### Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
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- Plastics
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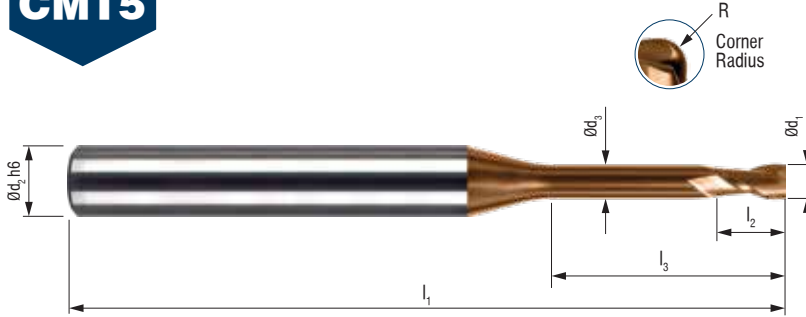
Order Code	$d_1$	$l_1$	$l_2$	$l_3$	$d_2/h_6$	$d_3$	Z
EMT5-0404C-L16-TS10	4	57	6	16	6	3.85	4
EMT5-0404C-L20-TS10	4	65	6	20	6	3.85	4
EMT5-0404C-L25-TS10	4	65	6	25	6	3.85	4
EMT5-0404C-L30-TS10	4	80	6	30	6	3.85	4
EMT5-0404C-L35-TS10	4	80	6	35	6	3.85	4
EMT5-0404C-L40-TS10	4	80	6	40	6	3.85	4

Tolerances	
d1	0/-0.015



# Solid carbide end mill

Smooth-edged, normal version, corner radius



## Application Range

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- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$l_3$	$d_2/h_6$	$d_3$	R	Z
CMT5-0102C-L04-R01-TS10	1	50	0.8	4	4	0.94	0.1	2
CMT5-0102C-L04-R02-TS10	1	50	0.8	4	4	0.94	0.2	2
CMT5-0102C-L06-R01-TS10	1	50	0.8	6	4	0.94	0.1	2
CMT5-0102C-L06-R02-TS10	1	50	0.8	6	4	0.94	0.2	2
CMT5-0102C-L08-R01-TS10	1	50	0.8	8	4	0.94	0.1	2
CMT5-0102C-L08-R02-TS10	1	50	0.8	8	4	0.94	0.2	2
CMT5-0102C-L10-R01-TS10	1	50	0.8	10	4	0.94	0.1	2
CMT5-0102C-L10-R02-TS10	1	50	0.8	10	4	0.94	0.2	2
CMT5-0102C-L12-R01-TS10	1	50	0.8	12	4	0.94	0.1	2
CMT5-0102C-L12-R02-TS10	1	50	0.8	12	4	0.94	0.2	2
CMT5-0102C-L14-R01-TS10	1	50	0.8	14	4	0.94	0.1	2
CMT5-0102C-L14-R02-TS10	1	50	0.8	14	4	0.94	0.2	2
CMT5-0102C-L16-R01-TS10	1	50	0.8	16	4	0.94	0.1	2
CMT5-0102C-L16-R02-TS10	1	50	0.8	16	4	0.94	0.2	2
CMT5-0102C-L18-R01-TS10	1	65	0.8	18	4	0.94	0.1	2
CMT5-0102C-L18-R02-TS10	1	65	0.8	18	4	0.94	0.2	2
CMT5-0102C-L20-R01-TS10	1	65	0.8	20	4	0.94	0.1	2
CMT5-0102C-L20-R02-TS10	1	65	0.8	20	4	0.94	0.2	2

### Tolerances

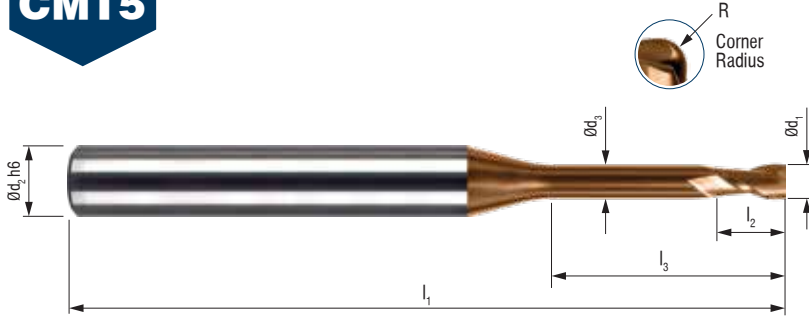
$d_1$  0/-0.015

R ±0.01



# Solid carbide end mill

Smooth-edged, normal version, corner radius



## Application Range

- Unalloyed Steels
- Machining Steels
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- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



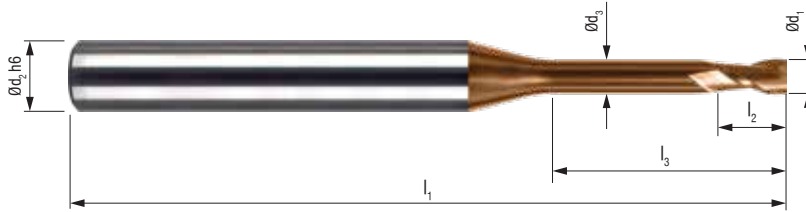
Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$l_3$	$d_2/h_6$	$d_3$	R	Z
CMT5-0152C-L06-R02-TS10	1.5	50	1.35	6	4	1.42	0.2	2
CMT5-0152C-L08-R02-TS10	1.5	50	1.35	8	4	1.42	0.2	2
CMT5-0152C-L10-R02-TS10	1.5	50	1.35	10	4	1.42	0.2	2
CMT5-0152C-L12-R02-TS10	1.5	50	1.35	12	4	1.42	0.2	2
CMT5-0152C-L16-R02-TS10	1.5	50	1.35	16	4	1.42	0.2	2
CMT5-0152C-L20-R02-TS10	1.5	65	1.35	20	4	1.42	0.2	2
CMT5-0202C-L06-R02-TS10	2	50	1.7	6	4	1.92	0.2	2
CMT5-0202C-L06-R05-TS10	2	50	1.7	6	4	1.92	0.5	2
CMT5-0202C-L08-R02-TS10	2	50	1.7	8	4	1.92	0.2	2
CMT5-0202C-L08-R05-TS10	2	50	1.7	8	4	1.92	0.5	2
CMT5-0202C-L10-R02-TS10	2	50	1.7	10	4	1.92	0.2	2
CMT5-0202C-L10-R05-TS10	2	50	1.7	10	4	1.92	0.5	2
CMT5-0202C-L12-R02-TS10	2	50	1.7	12	4	1.92	0.2	2
CMT5-0202C-L12-R05-TS10	2	50	1.7	12	4	1.92	0.5	2
CMT5-0202C-L16-R02-TS10	2	50	1.7	16	4	1.92	0.2	2
CMT5-0202C-L16-R05-TS10	2	50	1.7	16	4	1.92	0.5	2
CMT5-0202C-L20-R02-TS10	2	65	1.7	20	4	1.92	0.2	2
CMT5-0202C-L20-R05-TS10	2	65	1.7	20	4	1.92	0.5	2

Tolerances	
d1	0/-0.015
R	±0.01



# Solid carbide end mill

Smooth-edged, normal version, corner radius



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$l_3$	$d_2/h_6$	$d_3$	R	Z
CMT5-0202C-L25-R02-TS10	2	65	1.7	25	4	1.92	0.2	2
CMT5-0202C-L25-R05-TS10	2	65	1.7	25	4	1.92	0.5	2
CMT5-0202C-L30-R02-TS10	2	65	1.7	30	4	1.92	0.2	2
CMT5-0202C-L30-R05-TS10	2	65	1.7	30	4	1.92	0.5	2
CMT5-0252C-L12-R02-TS10	2.5	50	2.25	12	4	2.4	0.2	2
CMT5-0252C-L12-R05-TS10	2.5	50	2.25	12	4	2.4	0.5	2
CMT5-0252C-L16-R02-TS10	2.5	50	2.25	16	4	2.4	0.2	2
CMT5-0252C-L16-R05-TS10	2.5	50	2.25	16	4	2.4	0.5	2
CMT5-0252C-L20-R02-TS10	2.5	65	2.25	20	4	2.4	0.2	2
CMT5-0252C-L20-R05-TS10	2.5	65	2.25	20	4	2.4	0.5	2
CMT5-0304C-L10-R02-TS10	3	57	2.5	10	6	2.88	0.2	4
CMT5-0304C-L10-R05-TS10	3	57	2.5	10	6	2.88	0.5	4
CMT5-0304C-L12-R02-TS10	3	57	2.5	12	6	2.88	0.2	4
CMT5-0304C-L12-R05-TS10	3	57	2.5	12	6	2.88	0.5	4
CMT5-0304C-L16-R02-TS10	3	57	2.5	16	6	2.88	0.2	4
CMT5-0304C-L16-R05-TS10	3	57	2.5	16	6	2.88	0.5	4
CMT5-0304C-L20-R02-TS10	3	65	2.5	20	6	2.88	0.2	4
CMT5-0304C-L20-R05-TS10	3	65	2.5	20	6	2.88	0.5	4

### Tolerances

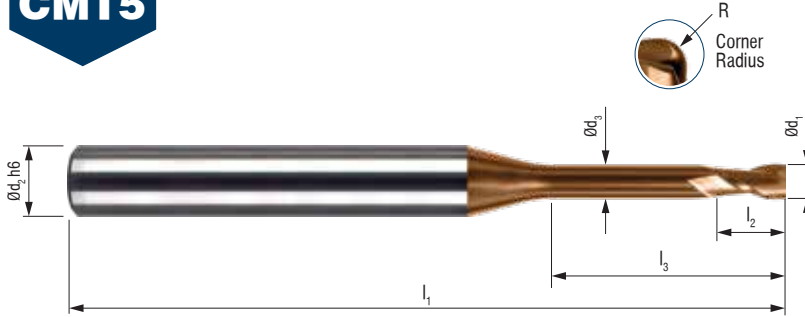
$d_1$  0/-0.015

R ±0.01



# Solid carbide end mill

Smooth-edged, normal version, corner radius



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



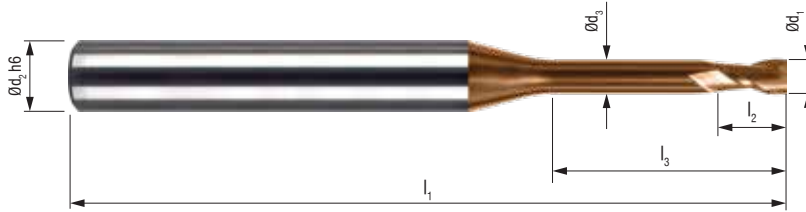
Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$l_3$	$d_2/h_6$	$d_3$	R	Z
CMT5-0304C-L25-R02-TS10	3	65	2.5	25	6	2.88	0.2	4
CMT5-0304C-L25-R05-TS10	3	65	2.5	25	6	2.88	0.5	4
CMT5-0304C-L30-R02-TS10	3	80	2.5	30	6	2.88	0.2	4
CMT5-0304C-L30-R05-TS10	3	80	2.5	30	6	2.88	0.5	4
CMT5-0304C-L35-R02-TS10	3	80	2.5	35	6	2.88	0.2	4
CMT5-0304C-L35-R05-TS10	3	80	2.5	35	6	2.88	0.5	4
CMT5-0404C-L12-R02-TS10	4	57	3.5	12	6	3.85	0.2	4
CMT5-0404C-L12-R05-TS10	4	57	3.5	12	6	3.85	0.5	4
CMT5-0404C-L16-R02-TS10	4	57	3.5	16	6	3.85	0.2	4
CMT5-0404C-L16-R05-TS10	4	57	3.5	16	6	3.85	0.5	4
CMT5-0404C-L20-R02-TS10	4	65	3.5	20	6	3.85	0.2	4
CMT5-0404C-L20-R05-TS10	4	65	3.5	20	6	3.85	0.5	4
CMT5-0404C-L25-R02-TS10	4	65	3.5	25	6	3.85	0.2	4
CMT5-0404C-L25-R05-TS10	4	65	3.5	25	6	3.85	0.5	4
CMT5-0404C-L30-R02-TS10	4	80	3.5	30	6	3.85	0.2	4
CMT5-0404C-L30-R05-TS10	4	80	3.5	30	6	3.85	0.5	4
CMT5-0404C-L35-R02-TS10	4	80	3.5	35	6	3.85	0.2	4
CMT5-0404C-L35-R05-TS10	4	80	3.5	35	6	3.85	0.5	4

Tolerances	
d1	0/-0.015
R	±0.01



# Solid carbide end mill

Smooth-edged, normal version, corner radius



## Application Range

- Unalloyed Steels
- Machining Steels
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- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite

K30F
TISIN
Z2-Z4
~30°
<56 HRC



HTG TOOLS Std.

Order Code	d <sub>1</sub> /h <sub>10</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	d <sub>2</sub> /h <sub>6</sub>	d <sub>3</sub>	R	Z
CMT5-0404C-L40-R02-TS10	4	80	3.5	40	6	3.85	0.2	4
CMT5-0404C-L40-R05-TS10	4	80	3.5	40	6	3.85	0.5	4

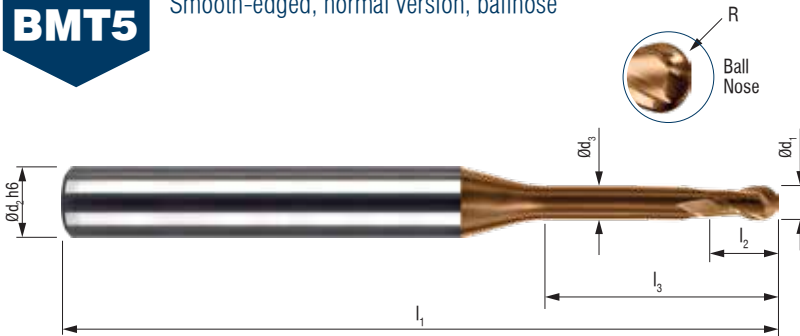
Tolerances	
d1	0/-0.015
R	±0.01





# Solid carbide end mill

Smooth-edged, normal version, ballnose



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



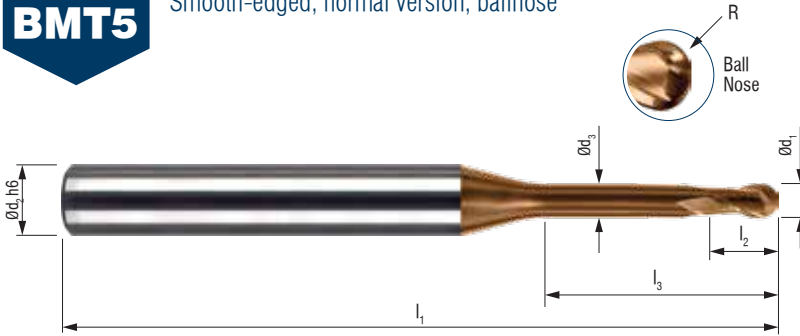
Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$l_3$	$d_2/h_6$	$d_3$	R	Z
BMT5-0102C-L04-TS10	1	50	0.8	4	4	0.94	0.5	2
BMT5-0102C-L06-TS10	1	50	0.8	6	4	0.94	0.5	2
BMT5-0102C-L08-TS10	1	50	0.8	8	4	0.94	0.5	2
BMT5-0102C-L10-TS10	1	50	0.8	10	4	0.94	0.5	2
BMT5-0102C-L12-TS10	1	50	0.8	12	4	0.94	0.5	2
BMT5-0102C-L14-TS10	1	50	0.8	14	4	0.94	0.5	2
BMT5-0102C-L16-TS10	1	50	0.8	16	4	0.94	0.5	2
BMT5-0102C-L18-TS10	1	65	0.8	18	4	0.94	0.5	2
BMT5-0102C-L20-TS10	1	65	0.8	20	4	0.94	0.5	2
BMT5-0152C-L06-TS10	1.5	50	1.35	6	4	1.44	0.75	2
BMT5-0152C-L08-TS10	1.5	50	1.35	8	4	1.44	0.75	2
BMT5-0152C-L10-TS10	1.5	50	1.35	10	4	1.44	0.75	2
BMT5-0152C-L12-TS10	1.5	50	1.35	12	4	1.44	0.75	2
BMT5-0152C-L16-TS10	1.5	50	1.35	16	4	1.44	0.75	2
BMT5-0152C-L20-TS10	1.5	65	1.35	20	4	1.44	0.75	2
BMT5-0202C-L06-TS10	2	50	1.7	6	4	1.92	1	2
BMT5-0202C-L08-TS10	2	50	1.7	8	4	1.92	1	2
BMT5-0202C-L10-TS10	2	50	1.7	10	4	1.92	1	2

Tolerances	
d1	0/-0.015
R	±0.01



# Solid carbide end mill

Smooth-edged, normal version, ballnose



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	d <sub>1</sub> /h <sub>10</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	d <sub>2</sub> /h <sub>6</sub>	d <sub>3</sub>	R	Z
BMT5-0202C-L12-TS10	2	50	1.7	12	4	1.92	1	2
BMT5-0202C-L16-TS10	2	50	1.7	16	4	1.92	1	2
BMT5-0202C-L20-TS10	2	65	1.7	20	4	1.92	1	2
BMT5-0202C-L25-TS10	2	65	1.7	25	4	1.92	1	2
BMT5-0202C-L30-TS10	2	65	1.7	30	4	1.92	1	2
BMT5-0252C-L08-TS10	2.5	50	2.25	8	4	2.4	1.25	2
BMT5-0252C-L12-TS10	2.5	50	2.25	12	4	2.4	1.25	2
BMT5-0252C-L16-TS10	2.5	50	2.25	16	4	2.4	1.25	2
BMT5-0252C-L20-TS10	2.5	65	2.25	20	4	2.4	1.25	2
BMT5-0252C-L25-TS10	2.5	65	2.25	25	4	2.4	1.25	2
BMT5-0302C-L10-TS10	3	57	2.5	10	6	2.88	1.5	2
BMT5-0302C-L12-TS10	3	57	2.5	12	6	2.88	1.5	2
BMT5-0302C-L16-TS10	3	57	2.5	16	6	2.88	1.5	2
BMT5-0302C-L20-TS10	3	65	2.5	20	6	2.88	1.5	2
BMT5-0302C-L25-TS10	3	65	2.5	25	6	2.88	1.5	2
BMT5-0302C-L30-TS10	3	80	2.5	30	6	2.88	1.5	2
BMT5-0302C-L35-TS10	3	80	2.5	35	6	2.88	1.5	2
BMT5-0402C-L12-TS10	4	57	3	12	6	3.85	2	2

### Tolerances

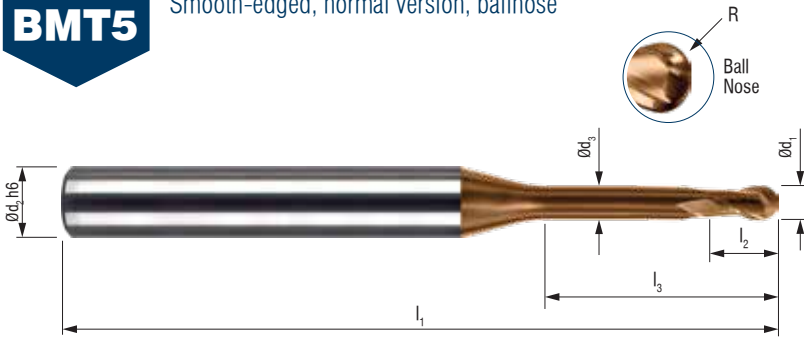
d1 0/-0.015

R ±0.01



# Solid carbide end mill

Smooth-edged, normal version, ballnose



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite

K30F
TISIN
Z2
~30°
<56 HRC



HTG TOOLS Std.

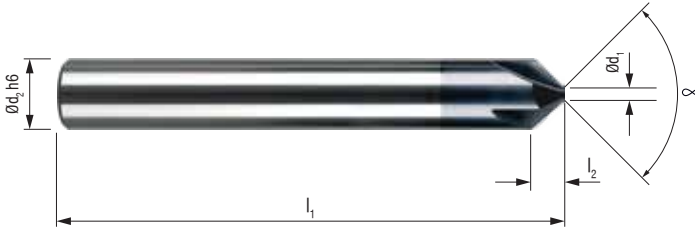
Order Code	d <sub>1</sub> /h <sub>10</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	d <sub>2</sub> /h <sub>6</sub>	d <sub>3</sub>	R	Z
BMT5-0402C-L16-TS10	4	57	3	16	6	3.85	2	2
BMT5-0402C-L20-TS10	4	65	3	20	6	3.85	2	2
BMT5-0402C-L25-TS10	4	65	3	25	6	3.85	2	2
BMT5-0402C-L30-TS10	4	80	3	30	6	3.85	2	2
BMT5-0402C-L35-TS10	4	80	3	35	6	3.85	2	2
BMT5-0402C-L40-TS10	4	80	3	40	6	3.85	2	2

Tolerances	
d1	0/-0.015
R	±0.01



# Solid carbide end mill

Smooth-edged, normal version



## Application Range

- ▶ Unalloyed Steels
- ▶ Machining Steels
- ▶ Low Alloy Steels
- ▶ Stainless Steels
- ▶ Heat Resistant Materials
- ▶ Titanium and Titanium Alloys
- ▶ Cast Iron
- ▶ Hardened Materials
- ▶ Aluminium Alloys
- ▶ Copper and Copper Alloys
- ▶ Plastics
- ▶ Graphite



Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	Z	$\alpha^\circ$
CM90-0604C-T10	1	57	2.5	6	4	90
CM60-0604C-T10	1.4	57	4.5	6	4	60
CM90-0804C-T10	2	63	3	8	4	90
CM60-0804C-T10	2.5	63	4.5	8	4	60
CM90-1004C-T10	2	72	4.25	10	4	90
CM60-1004C-T10	3	72	6	10	4	60
CM90-1204C-T10	3	83	4.5	12	4	90
CM60-1204C-T10	3	83	7.5	12	4	60
CM90-1404C-T10	4	83	5	14	4	90
CM60-1404C-T10	2.4	83	10	14	4	60
CM90-1604C-T10	4	92	6	16	4	90
CM60-1604C-T10	4.5	92	10	16	4	60





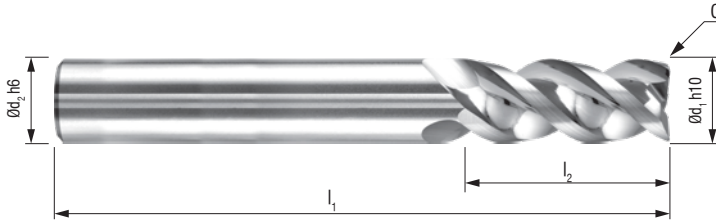
Premium manufacturing for aluminium...





# Solid carbide end mill

Smooth-edged, normal version

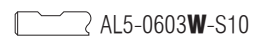


## Application Range

- Non - Ferrous Metals Aluminium
- Aluminium Alloys
- Copper
- Copper Alloys
- Plastics



Order Code	$d_1/h_{10}$	$l_1$	$l_2$	$d_2/h_6$	C	Z
AL5-0303C-S10	3	57	8	6	0.1x45°	3
AL5-0403C-S10	4	57	10	6	0.2x45°	3
AL5-0503C-S10	5	57	13	6	0.2x45°	3
AL5-0603C-S10	6	57	14	6	0.2x45°	3
AL5-0803C-S10	8	63	19	8	0.2x45°	3
AL5-1003C-S10	10	72	22	10	0.2x45°	3
AL6-1003C-S10	10	100	47	10	0.2x45°	3
AL5-1203C-S10	12	83	26	12	0.2x45°	3
AL6-1203C-S10	12	100	47	12	0.2x45°	3
AL5-1403C-S10	14	83	26	14	0.2x45°	3
AL5-1603C-S10	16	92	32	16	0.2x45°	3
AL5-1803C-S10	18	92	32	18	0.2x45°	3
AL5-2003C-S10	20	104	38	20	0.2x45°	3



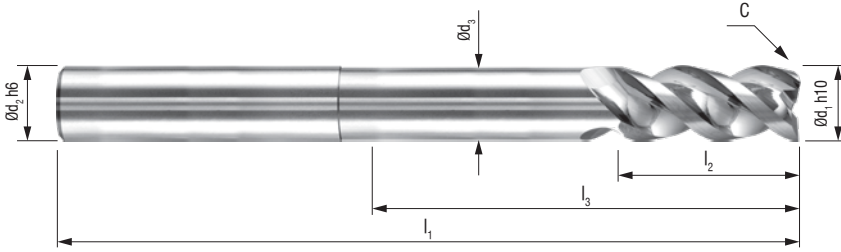


# Solid carbide end mill

Smooth-edged, long version

## Application Range

- Non - Ferrous Metals Aluminium
- Aluminium Alloys
- Copper
- Copper Alloys
- Plastics



K30F

NO COATING

Z3

~45°

AL

M

117

HTG TOOLS Std.

Order Code	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	d <sub>2</sub> /h <sub>6</sub>	d <sub>3</sub>	C	Z
AL7-0603C-S10	6	75	14	35	6	5.8	0.2x45°	3
AL7-0803C-S10	8	100	19	50	8	7.6	0.2x45°	3
AL7-1003C-S10	10	100	22	58	10	9.5	0.2x45°	3
AL7-1203C-S10	12	120	26	73	12	11.5	0.2x45°	3
AL7-1403C-S10	14	120	26	73	14	13.5	0.2x45°	3
AL7-1603C-S10	16	150	32	100	16	15.5	0.2x45°	3
AL7-1803C-S10	18	150	32	100	18	17.5	0.2x45°	3
AL7-2003C-S10	20	150	38	100	20	19.5	0.2x45°	3

AL7-0603**C**-S10      AL7-0603**W**-S10







# BM5

The artistic touching to great geometric...



# Solid carbide end mill

Smooth edged, normal version, ballnose



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite

K30F

AITIN

Z2

~30°

<48 HRC

HTG TOOLS Std.

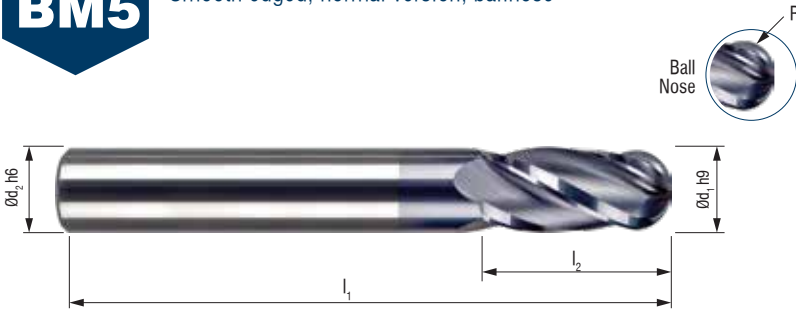
Order Code	d <sub>1</sub> /h <sub>9</sub>	l <sub>1</sub>	l <sub>2</sub>	d <sub>2</sub> /h <sub>6</sub>	R	Z
BM5-0302C-T10	3	50	8	3	1.5	2
BM5-0402C-T10	4	50	10	4	2	2
BM5-0502C-T10	5	50	13	5	2.5	2
BM5-0602C-T10	6	57	14	6	3	2
BM5-0802C-T10	8	63	19	8	4	2
BM5-1002C-T10	10	72	22	10	5	2
BM4-1202C-T10	12	73	26	12	6	2
BM5-1202C-T10	12	83	26	12	6	2
BM5-1402C-T10	14	83	26	14	7	2
BM5-1602C-T10	16	92	32	16	8	2
BM5-1802C-T10	18	92	32	18	9	2
BM5-2002C-T10	20	104	38	20	10	2





# Solid carbide end mill

Smooth edged, normal version, ballnose



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite

K30F
AITIN
Z4
~30°
<48 HRC
HTG
HTG
HTG
HTG
HTG
HTG
HTG
HTG
HTG
HTG
HTG
HTG
HTG
HTG
HTG

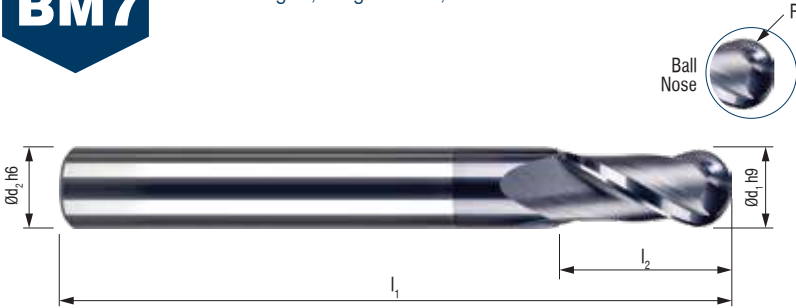
Order Code	d <sub>1</sub> /h <sub>9</sub>	l <sub>1</sub>	l <sub>2</sub>	d <sub>2</sub> /h <sub>6</sub>	R	Z
BM5-0304C-T10	3	50	8	3	1.5	4
BM5-0404C-T10	4	50	10	4	2	4
BM5-0504C-T10	5	50	13	5	2.5	4
BM5-0604C-T10	6	57	14	6	3	4
BM5-0804C-T10	8	63	19	8	4	4
BM5-1004C-T10	10	72	22	10	5	4
BM4-1204C-T10	12	73	26	12	6	4
BM5-1204C-T10	12	83	26	12	6	4
BM5-1404C-T10	14	83	26	14	7	4
BM5-1604C-T10	16	92	32	16	8	4
BM5-1804C-T10	18	92	32	18	9	4
BM5-2004C-T10	20	104	38	20	10	4





# Solid carbide end mill

Smooth-edged, long version, ballnose



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite

K30F

AITIN

Z2

~30°

<48 HRC

HTG TOOLS Std.

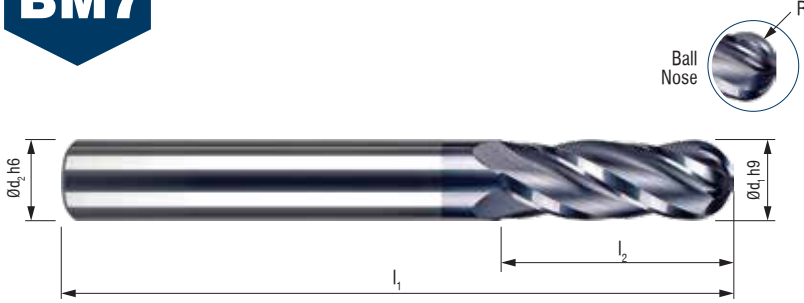
Order Code	$d_1/h_9$	$l_1$	$l_2$	$d_2/h_6$	R	Z
BM7-0302C-T10	3	75	12	3	1.5	2
BM7-0402C-T10	4	75	16	4	2	2
BM7-0502C-T10	5	75	20	5	2.5	2
BM7-0602C-T10	6	100	25	6	3	2
BM7-0802C-T10	8	100	35	8	4	2
BM7-1002C-T10	10	100	40	10	5	2
BM7-1202C-T10	12	100	40	12	6	2

BM7-0602C-T10
 BM7-0602W-T10



# Solid carbide end mill

Smooth-edged, long version, ballnose



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	$d_1/h_9$	$l_1$	$l_2$	$d_2/h_6$	R	Z
BM7-0304C-T10	3	75	12	3	1.5	4
BM7-0404C-T10	4	75	16	4	2	4
BM7-0504C-T10	5	75	20	5	2.5	4
BM7-0604C-T10	6	100	25	6	3	4
BM7-0804C-T10	8	100	35	8	4	4
BM7-1004C-T10	10	100	40	10	5	4
BM7-1204C-T10	12	100	40	12	6	4

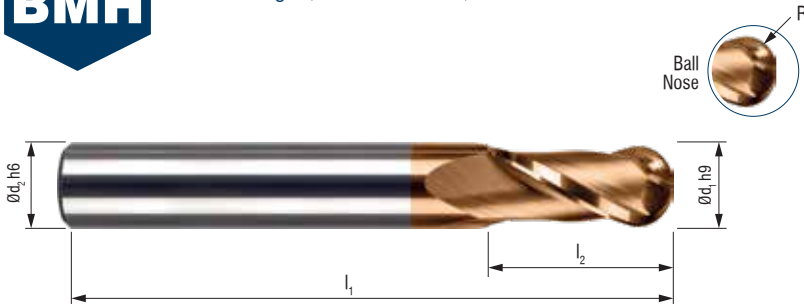






# Solid carbide end mill

Smooth edged, normal version, ballnose



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite



Order Code	$d_1/h_9$	$l_1$	$l_2$	$d_2/h_6$	R	Z
BMH5-0402C-TS10	4	50	6	4	2	2
BMH4-0402C-TS10	4	57	6	6	2	2
BMH7-0402C-TS10	4	75	6	4	2	2
BMH6-0402C-TS10	4	80	6	6	2	2
BMH5-0502C-TS10	5	50	8	5	2.5	2
BMH4-0502C-TS10	5	57	8	6	2.5	2
BMH7-0502C-TS10	5	75	8	5	2.5	2
BMH6-0502C-TS10	5	80	8	6	2.5	2
BMH5-0602C-TS10	6	57	10	6	3	2
BMH7-0602C-TS10	6	80	10	6	3	2
BMH5-0802C-TS10	8	63	12	8	4	2
BMH7-0802C-TS10	8	90	12	8	4	2
BMH5-1002C-TS10	10	72	15	10	5	2
BMH7-1002C-TS10	10	100	15	10	5	2
BMH5-1202C-TS10	12	83	20	12	6	2
BMH7-1202C-TS10	12	100	20	12	6	2

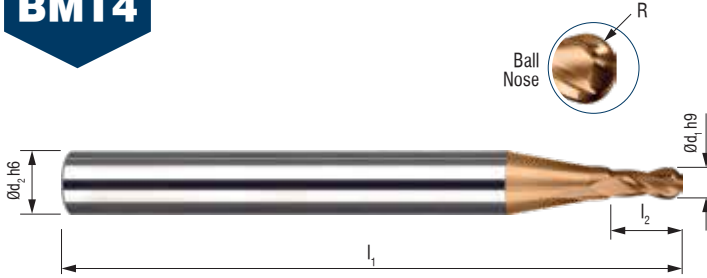






# Solid carbide end mill

Smooth edged, normal version, ballnose



## Application Range

- Unalloyed Steels
- Machining Steels
- Low Alloy Steels
- Stainless Steels
- Heat Resistant Materials
- Titanium and Titanium Alloys
- Cast Iron
- Hardened Materials
- Aluminium Alloys
- Copper and Copper Alloys
- Plastics
- Graphite

K30F
TISIN
Z2
~30°
<56 HRC



HTG TOOLS Std.

Order Code	d <sub>1</sub> /h <sub>9</sub>	l <sub>1</sub>	l <sub>2</sub>	d <sub>2</sub> /h <sub>6</sub>	R	Z
BMT4-0102C-TS10	1	50	2	4	0.5	2
BMT4-0152C-TS10	1.5	50	3	4	0.75	2
BMT4-0202C-TS10	2	50	4	4	1	2
BMT4-0252C-TS10	2.5	50	5	4	1.25	2
BMT4-0302C-TS10	3	57	6	6	1.5	2
BMT4-0402C-TS10	4	57	8	6	2	2
BMT4-0502C-TS10	5	57	10	6	2.5	2



# Drills







## Information

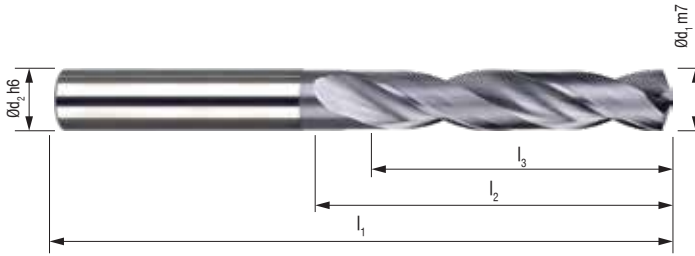
-  Solid Carbide K30F
-  Coating Type
-  Uncoated
-  Depth 3xd
-  Depth 5xd
-  Depth 8xd
-  HTG Tools Standart
-  Right Cutting
-  Shank Type
-  Suited for Hardened Steels up tu 48 HRC
-  Helix Angle
-  Internal Coolant
-  External Coolant
-  Point Angle
-  Cutting Data Page



Products	Type	Diameter	Z	Coating	Page
	DM-502	Ø1 - Ø2.9	2	●	76
	DM-802	Ø1 - Ø2.9	2	●	77
	D302	Ø3 - Ø20	2	●	78-83
	D312	Ø3 - Ø20	2	●	84-89
	D502	Ø3 - Ø20	2	●	90-95
	D512	Ø3 - Ø20	2	●	96-101
	D812	Ø4 - Ø20	2	●	102-106
	NC5	Ø5 - Ø20	2	●	107
	RL5	Ø4 - Ø20	6	●	108



## Solid carbide drills



### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics

K30F

AITIN

5xd

~30°

RH

140°

<48 HRC

HTG TOOLS Std.

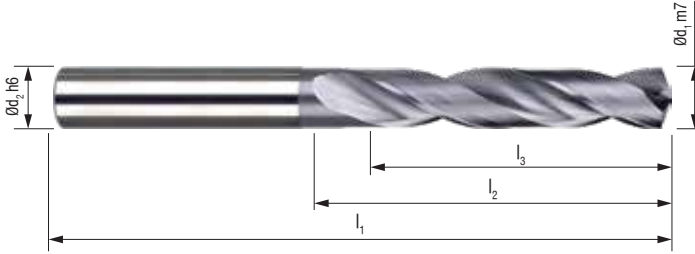
Order Code	d <sub>1</sub> /m7	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	d <sub>2</sub> /h <sub>6</sub>
DM-502-01004-T10	1	50	6.5	5	4
DM-502-01104-T10	1.1	50	7.15	5.5	4
DM-502-01204-T10	1.2	50	7.8	6	4
DM-502-01304-T10	1.3	50	8.45	6.5	4
DM-502-01404-T10	1.4	50	9.1	7	4
DM-502-01504-T10	1.5	50	9.75	7.5	4
DM-502-01604-T10	1.6	50	10.4	8	4
DM-502-01704-T10	1.7	50	11.05	8.5	4
DM-502-01804-T10	1.8	50	11.7	9	4
DM-502-01904-T10	1.9	50	12.35	9.5	4
DM-502-02004-T10	2	50	13	10	4
DM-502-02104-T10	2.1	50	13.65	10.5	4
DM-502-02204-T10	2.2	50	14.3	11	4
DM-502-02304-T10	2.3	50	14.95	11.5	4
DM-502-02404-T10	2.4	50	15.6	12	4
DM-502-02504-T10	2.5	50	16.25	12.5	4
DM-502-02604-T10	2.6	50	16.9	13	4
DM-502-02704-T10	2.7	50	17.55	13.5	4
DM-502-02804-T10	2.8	50	18.2	14	4
DM-502-02904-T10	2.9	50	18.85	14.5	4

**DM-802**

Solid carbide drills

Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



K30F
AITIN
8xd
~30°
RH
140°
< 48 HRC
HTG TOOLS Std.

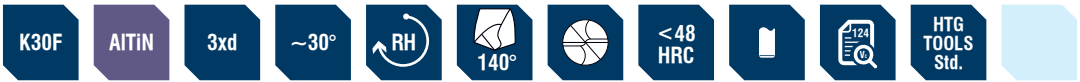
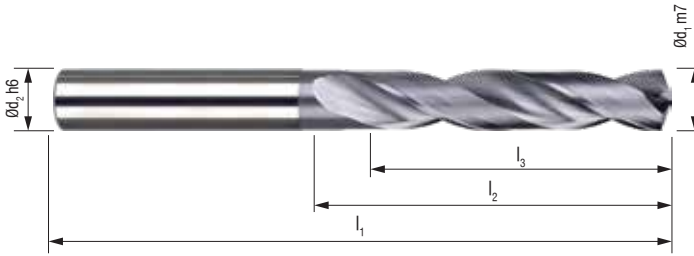
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DM-802-01104-T10	1.1	50	10.45	8.8	4
DM-802-01204-T10	1.2	50	11.4	9.6	4
DM-802-01304-T10	1.3	50	12.35	10.4	4
DM-802-01404-T10	1.4	50	13.3	11.2	4
DM-802-01504-T10	1.5	50	14.25	12	4
DM-802-01604-T10	1.6	50	15.2	12.8	4
DM-802-01704-T10	1.7	50	16.15	13.6	4
DM-802-01804-T10	1.8	50	17.1	14.4	4
DM-802-01904-T10	1.9	50	18.05	15.2	4
DM-802-02004-T10	2	50	19	16	4
DM-802-02104-T10	2.1	50	19.95	16.8	4
DM-802-02204-T10	2.2	65	20.9	17.6	4
DM-802-02304-T10	2.3	65	21.85	18.4	4
DM-802-02404-T10	2.4	65	22.8	19.2	4
DM-802-02504-T10	2.5	65	23.75	20	4
DM-802-02604-T10	2.6	65	24.7	20.8	4
DM-802-02704-T10	2.7	65	25.65	21.6	4
DM-802-02804-T10	2.8	65	26.6	22.4	4
DM-802-02904-T10	2.9	65	27.55	23.2	4



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



Order Code	$d_1/m7$	$l_1$	$l_2$	$l_3$	$d_2/h_6$
D302-0300C-T10	3	62	20	14	6
D302-0310C-T10	3.1	62	20	14	6
D302-0320C-T10	3.2	62	20	14	6
D302-0330C-T10	3.3	62	20	14	6
D302-0340C-T10	3.4	62	20	14	6
D302-0350C-T10	3.5	62	20	14	6
D302-0360C-T10	3.6	62	20	14	6
D302-0365C-T10	3.65	62	20	14	6
D302-0370C-T10	3.7	62	20	14	6
D302-0380C-T10	3.8	66	24	17	6
D302-0390C-T10	3.9	66	24	17	6
D302-0400C-T10	4	66	24	17	6
D302-0410C-T10	4.1	66	24	17	6
D302-0420C-T10	4.2	66	24	17	6
D302-0430C-T10	4.3	66	24	17	6
D302-0440C-T10	4.4	66	24	17	6
D302-0450C-T10	4.5	66	24	17	6
D302-0460C-T10	4.6	66	24	17	6
D302-0470C-T10	4.7	66	24	17	6
D302-0480C-T10	4.8	66	28	20	6
D302-0490C-T10	4.9	66	28	20	6
D302-0500C-T10	5	66	28	20	6
D302-0510C-T10	5.1	66	28	20	6
D302-0520C-T10	5.2	66	28	20	6
D302-0530C-T10	5.3	66	28	20	6

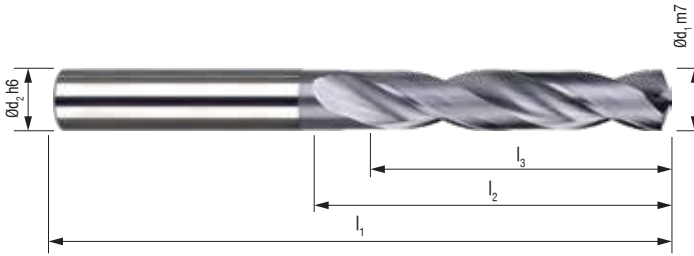




## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



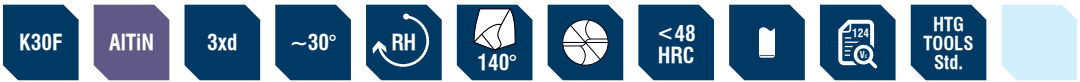
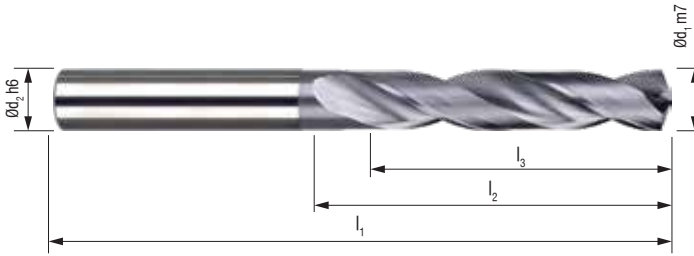
Order Code	$d_1 / m7$	$l_1$	$l_2$	$l_3$	$d_2 / h_6$
D302-0540C-T10	5.4	66	28	20	6
D302-0550C-T10	5.5	66	28	20	6
D302-0555C-T10	5.55	66	28	20	6
D302-0560C-T10	5.6	66	28	20	6
D302-0565C-T10	5.65	66	28	20	6
D302-0570C-T10	5.7	66	28	20	6
D302-0580C-T10	5.8	66	28	20	6
D302-0590C-T10	5.9	66	28	20	6
D302-0600C-T10	6	66	28	20	6
D302-0610C-T10	6.1	79	34	24	8
D302-0620C-T10	6.2	79	34	24	8
D302-0630C-T10	6.3	79	34	24	8
D302-0640C-T10	6.4	79	34	24	8
D302-0650C-T10	6.5	79	34	24	8
D302-0660C-T10	6.6	79	34	24	8
D302-0670C-T10	6.7	79	34	24	8
D302-0680C-T10	6.8	79	34	24	8
D302-0690C-T10	6.9	79	34	24	8
D302-0700C-T10	7	79	34	24	8
D302-0710C-T10	7.1	79	41	29	8
D302-0720C-T10	7.2	79	41	29	8
D302-0730C-T10	7.3	79	41	29	8
D302-0740C-T10	7.4	79	41	29	8
D302-0750C-T10	7.5	79	41	29	8
D302-0755C-T10	7.55	79	41	29	8



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



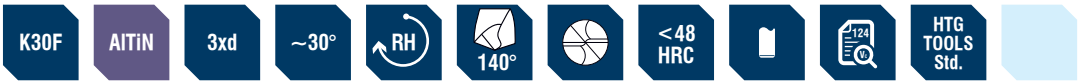
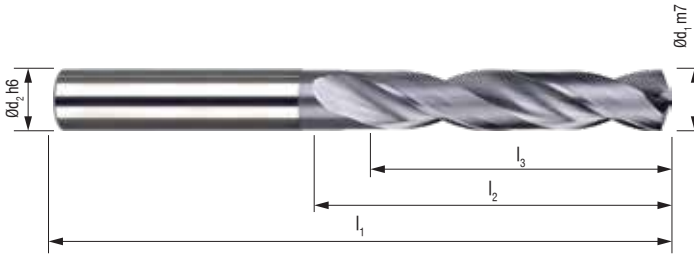
Order Code	$d_1 / m7$	$l_1$	$l_2$	$l_3$	$d_2 / h_6$
D302-0760C-T10	7.6	79	41	29	8
D302-0770C-T10	7.7	79	41	29	8
D302-0780C-T10	7.8	79	41	29	8
D302-0790C-T10	7.9	79	41	29	8
D302-0800C-T10	8	79	41	29	8
D302-0810C-T10	8.1	89	47	35	10
D302-0820C-T10	8.2	89	47	35	10
D302-0830C-T10	8.3	89	47	35	10
D302-0840C-T10	8.4	89	47	35	10
D302-0850C-T10	8.5	89	47	35	10
D302-0860C-T10	8.6	89	47	35	10
D302-0870C-T10	8.7	89	47	35	10
D302-0880C-T10	8.8	89	47	35	10
D302-0890C-T10	8.9	89	47	35	10
D302-0900C-T10	9	89	47	35	10
D302-0910C-T10	9.1	89	47	35	10
D302-0920C-T10	9.2	89	47	35	10
D302-0930C-T10	9.3	89	47	35	10
D302-0940C-T10	9.4	89	47	35	10
D302-0950C-T10	9.5	89	47	35	10
D302-0955C-T10	9.55	89	47	35	10
D302-0960C-T10	9.6	89	47	35	10
D302-0970C-T10	9.7	89	47	35	10
D302-0980C-T10	9.8	89	47	35	10
D302-0990C-T10	9.9	89	47	35	10



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



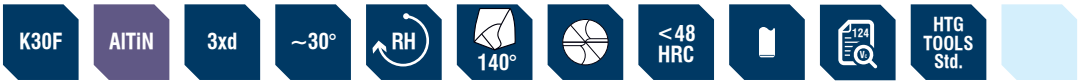
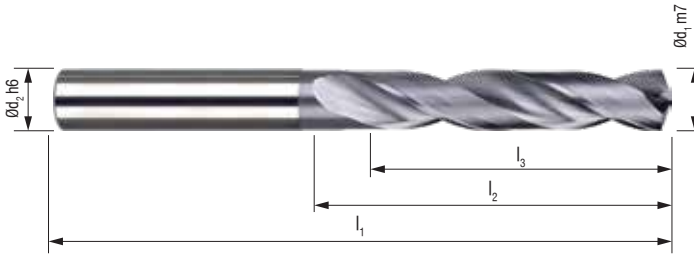
Order Code	$d_1 / m7$	$l_1$	$l_2$	$l_3$	$d_2 / h_6$
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D302-1010C-T10	10.1	102	55	40	12
D302-1020C-T10	10.2	102	55	40	12
D302-1030C-T10	10.3	102	55	40	12
D302-1040C-T10	10.4	102	55	40	12
D302-1050C-T10	10.5	102	55	40	12
D302-1060C-T10	10.6	102	55	40	12
D302-1070C-T10	10.7	102	55	40	12
D302-1080C-T10	10.8	102	55	40	12
D302-1090C-T10	10.9	102	55	40	12
D302-1100C-T10	11	102	55	40	12
D302-1110C-T10	11.1	102	55	40	12
D302-1120C-T10	11.2	102	55	40	12
D302-1130C-T10	11.3	102	55	40	12
D302-1140C-T10	11.4	102	55	40	12
D302-1150C-T10	11.5	102	55	40	12
D302-1155C-T10	11.55	102	55	40	12
D302-1160C-T10	11.6	102	55	40	12
D302-1170C-T10	11.7	102	55	40	12
D302-1180C-T10	11.8	102	55	40	12
D302-1190C-T10	11.9	102	55	40	12
D302-1200C-T10	12	102	55	40	12
D302-1210C-T10	12.1	107	60	43	14
D302-1220C-T10	12.2	107	60	43	14
D302-1230C-T10	12.3	107	60	43	14



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



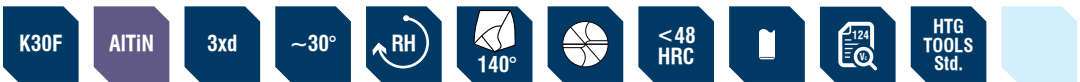
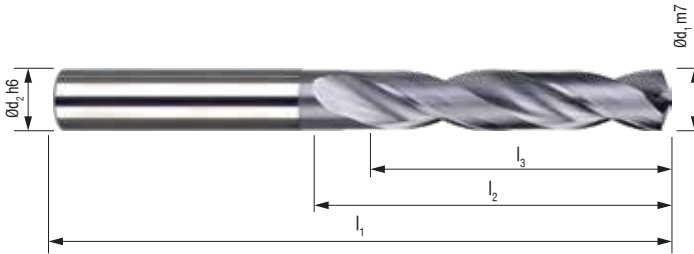
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D302-1240C-T10	12.4	107	60	43	14
D302-1250C-T10	12.5	107	60	43	14
D302-1260C-T10	12.6	107	60	43	14
D302-1270C-T10	12.7	107	60	43	14
D302-1280C-T10	12.8	107	60	43	14
D302-1290C-T10	12.9	107	60	43	14
D302-1300C-T10	13	107	60	43	14
D302-1310C-T10	13.1	107	60	43	14
D302-1320C-T10	13.2	107	60	43	14
D302-1330C-T10	13.3	107	60	43	14
D302-1340C-T10	13.4	107	60	43	14
D302-1350C-T10	13.5	107	60	43	14
D302-1360C-T10	13.6	107	60	43	14
D302-1370C-T10	13.7	107	60	43	14
D302-1380C-T10	13.8	107	60	43	14
D302-1390C-T10	13.9	107	60	43	14
D302-1400C-T10	14	107	60	43	14
D302-1410C-T10	14.1	115	65	45	16
D302-1420C-T10	14.2	115	65	45	16
D302-1430C-T10	14.3	115	65	45	16
D302-1440C-T10	14.4	115	65	45	16
D302-1450C-T10	14.5	115	65	45	16
D302-1460C-T10	14.6	115	65	45	16
D302-1470C-T10	14.7	115	65	45	16
D302-1480C-T10	14.8	115	65	45	16



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



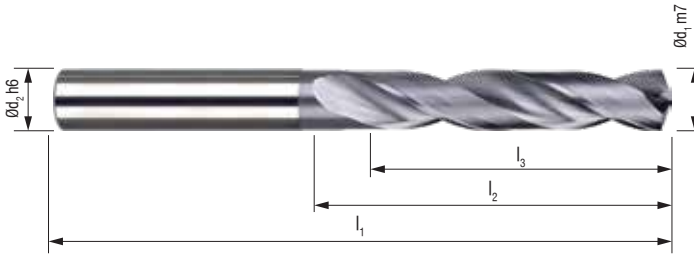
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D302-1490C-T10	14.9	115	65	45	16
D302-1500C-T10	15	115	65	45	16
D302-1510C-T10	15.1	115	65	45	16
D302-1520C-T10	15.2	115	65	45	16
D302-1530C-T10	15.3	115	65	45	16
D302-1540C-T10	15.4	115	65	45	16
D302-1550C-T10	15.5	115	65	45	16
D302-1560C-T10	15.6	115	65	45	16
D302-1570C-T10	15.7	115	65	45	16
D302-1580C-T10	15.8	115	65	45	16
D302-1590C-T10	15.9	115	65	45	16
D302-1600C-T10	16	115	65	45	16
D302-1650C-T10	16.5	123	73	51	18
D302-1700C-T10	17	123	73	51	18
D302-1750C-T10	17.5	123	73	51	18
D302-1800C-T10	18	123	73	51	18
D302-1850C-T10	18.5	131	79	55	20
D302-1880C-T10	18.8	131	79	55	20
D302-1900C-T10	19	131	79	55	20
D302-1950C-T10	19.5	131	79	55	20
D302-2000C-T10	20	131	79	55	20



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



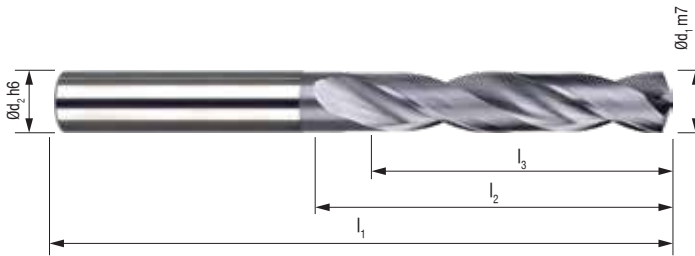
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D312-0300C-T10	3	62	20	14	6
D312-0310C-T10	3.1	62	20	14	6
D312-0320C-T10	3.2	62	20	14	6
D312-0330C-T10	3.3	62	20	14	6
D312-0340C-T10	3.4	62	20	14	6
D312-0350C-T10	3.5	62	20	14	6
D312-0360C-T10	3.6	62	20	14	6
D312-0365C-T10	3.65	62	20	14	6
D312-0370C-T10	3.7	62	20	14	6
D312-0380C-T10	3.8	66	24	17	6
D312-0390C-T10	3.9	66	24	17	6
D312-0400C-T10	4	66	24	17	6
D312-0410C-T10	4.1	66	24	17	6
D312-0420C-T10	4.2	66	24	17	6
D312-0430C-T10	4.3	66	24	17	6
D312-0440C-T10	4.4	66	24	17	6
D312-0450C-T10	4.5	66	24	17	6
D312-0460C-T10	4.6	66	24	17	6
D312-0470C-T10	4.7	66	24	17	6
D312-0480C-T10	4.8	66	28	20	6
D312-0490C-T10	4.9	66	28	20	6
D312-0500C-T10	5	66	28	20	6
D312-0510C-T10	5.1	66	28	20	6
D312-0520C-T10	5.2	66	28	20	6
D312-0530C-T10	5.3	66	28	20	6



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



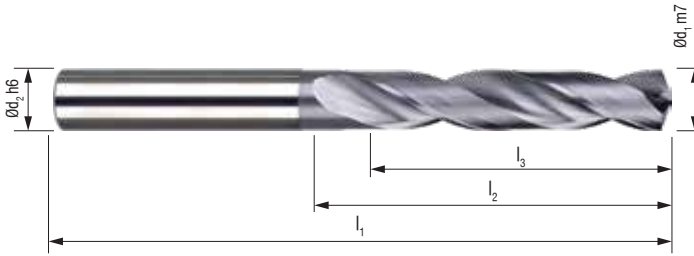
Order Code	$d_1/m7$	$l_1$	$l_2$	$l_3$	$d_2/h_6$
D312-0540C-T10	5.4	66	28	20	6
D312-0550C-T10	5.5	66	28	20	6
D312-0555C-T10	5.55	66	28	20	6
D312-0560C-T10	5.6	66	28	20	6
D312-0565C-T10	5.65	66	28	20	6
D312-0570C-T10	5.7	66	28	20	6
D312-0580C-T10	5.8	66	28	20	6
D312-0590C-T10	5.9	66	28	20	6
D312-0600C-T10	6	66	28	20	6
D312-0610C-T10	6.1	79	34	24	8
D312-0620C-T10	6.2	79	34	24	8
D312-0630C-T10	6.3	79	34	24	8
D312-0640C-T10	6.4	79	34	24	8
D312-0650C-T10	6.5	79	34	24	8
D312-0660C-T10	6.6	79	34	24	8
D312-0670C-T10	6.7	79	34	24	8
D312-0680C-T10	6.8	79	34	24	8
D312-0690C-T10	6.9	79	34	24	8
D312-0700C-T10	7	79	34	24	8
D312-0710C-T10	7.1	79	41	29	8
D312-0720C-T10	7.2	79	41	29	8
D312-0730C-T10	7.3	79	41	29	8
D312-0740C-T10	7.4	79	41	29	8
D312-0750C-T10	7.5	79	41	29	8
D312-0755C-T10	7.55	79	41	29	8



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



Order Code	$d_1 / m7$	$l_1$	$l_2$	$l_3$	$d_2 / h_6$
D312-0760C-T10	7.6	79	41	29	8
D312-0770C-T10	7.7	79	41	29	8
D312-0780C-T10	7.8	79	41	29	8
D312-0790C-T10	7.9	79	41	29	8
D312-0800C-T10	8	79	41	29	8
D312-0810C-T10	8.1	89	47	35	10
D312-0820C-T10	8.2	89	47	35	10
D312-0830C-T10	8.3	89	47	35	10
D312-0840C-T10	8.4	89	47	35	10
D312-0850C-T10	8.5	89	47	35	10
D312-0860C-T10	8.6	89	47	35	10
D312-0870C-T10	8.7	89	47	35	10
D312-0880C-T10	8.8	89	47	35	10
D312-0890C-T10	8.9	89	47	35	10
D312-0900C-T10	9	89	47	35	10
D312-0910C-T10	9.1	89	47	35	10
D312-0920C-T10	9.2	89	47	35	10
D312-0930C-T10	9.3	89	47	35	10
D312-0940C-T10	9.4	89	47	35	10
D312-0950C-T10	9.5	89	47	35	10
D312-0955C-T10	9.55	89	47	35	10
D312-0960C-T10	9.6	89	47	35	10
D312-0970C-T10	9.7	89	47	35	10
D312-0980C-T10	9.8	89	47	35	10
D312-0990C-T10	9.9	89	47	35	10

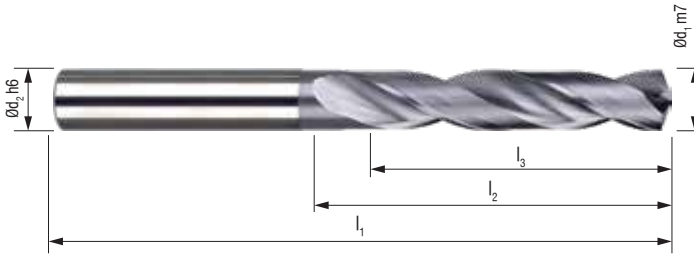




## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



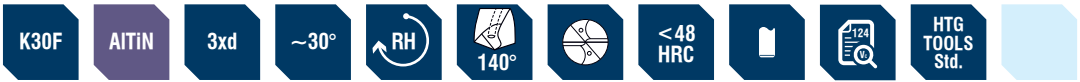
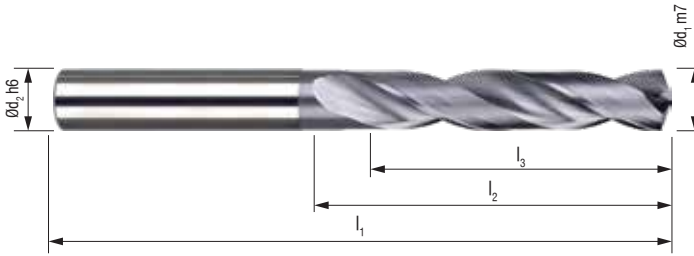
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D312-1000C-T10	10	89	47	35	10
D312-1010C-T10	10.1	102	55	40	12
D312-1020C-T10	10.2	102	55	40	12
D312-1030C-T10	10.3	102	55	40	12
D312-1040C-T10	10.4	102	55	40	12
D312-1050C-T10	10.5	102	55	40	12
D312-1060C-T10	10.6	102	55	40	12
D312-1070C-T10	10.7	102	55	40	12
D312-1080C-T10	10.8	102	55	40	12
D312-1090C-T10	10.9	102	55	40	12
D312-1100C-T10	11	102	55	40	12
D312-1110C-T10	11.1	102	55	40	12
D312-1120C-T10	11.2	102	55	40	12
D312-1130C-T10	11.3	102	55	40	12
D312-1140C-T10	11.4	102	55	40	12
D312-1150C-T10	11.5	102	55	40	12
D312-1155C-T10	11.55	102	55	40	12
D312-1160C-T10	11.6	102	55	40	12
D312-1170C-T10	11.7	102	55	40	12
D312-1180C-T10	11.8	102	55	40	12
D312-1190C-T10	11.9	102	55	40	12
D312-1200C-T10	12	102	55	40	12
D312-1210C-T10	12.1	107	60	43	14
D312-1220C-T10	12.2	107	60	43	14
D312-1230C-T10	12.3	107	60	43	14



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



Order Code	d <sub>1</sub> /m7	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	d <sub>2</sub> /h <sub>6</sub>
D312-1240C-T10	12.4	107	60	43	14
D312-1250C-T10	12.5	107	60	43	14
D312-1260C-T10	12.6	107	60	43	14
D312-1270C-T10	12.7	107	60	43	14
D312-1280C-T10	12.8	107	60	43	14
D312-1290C-T10	12.9	107	60	43	14
D312-1300C-T10	13	107	60	43	14
D312-1310C-T10	13.1	107	60	43	14
D312-1320C-T10	13.2	107	60	43	14
D312-1330C-T10	13.3	107	60	43	14
D312-1340C-T10	13.4	107	60	43	14
D312-1350C-T10	13.5	107	60	43	14
D312-1360C-T10	13.6	107	60	43	14
D312-1370C-T10	13.7	107	60	43	14
D312-1380C-T10	13.8	107	60	43	14
D312-1390C-T10	13.9	107	60	43	14
D312-1400C-T10	14	107	60	43	14
D312-1410C-T10	14.1	115	60	45	16
D312-1420C-T10	14.2	115	65	45	16
D312-1430C-T10	14.3	115	65	45	16
D312-1440C-T10	14.4	115	65	45	16
D312-1450C-T10	14.5	115	65	45	16
D312-1460C-T10	14.6	115	65	45	16
D312-1470C-T10	14.7	115	65	45	16
D312-1480C-T10	14.8	115	65	45	16

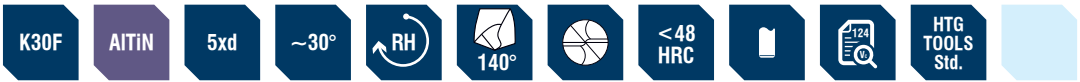
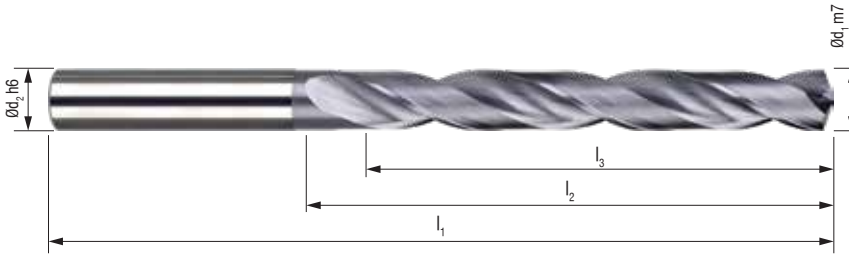




## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



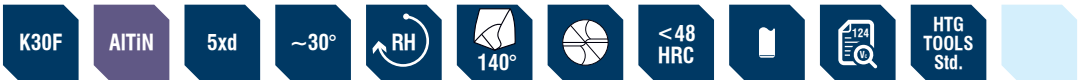
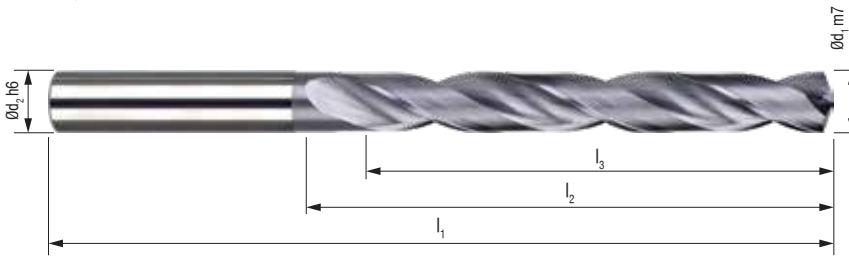
Order Code	$d_1/m7$	$l_1$	$l_2$	$l_3$	$d_2/h_6$
D502-0300C-T10	3	66	28	23	6
D502-0310C-T10	3.1	66	28	23	6
D502-0320C-T10	3.2	66	28	23	6
D502-0330C-T10	3.3	66	28	23	6
D502-0340C-T10	3.4	66	28	23	6
D502-0350C-T10	3.5	66	28	23	6
D502-0360C-T10	3.6	66	28	23	6
D502-0365C-T10	3.65	66	28	23	6
D502-0370C-T10	3.7	66	28	23	6
D502-0380C-T10	3.8	74	36	29	6
D502-0390C-T10	3.9	74	36	29	6
D502-0400C-T10	4	74	36	29	6
D502-0410C-T10	4.1	74	36	29	6
D502-0420C-T10	4.2	74	36	29	6
D502-0430C-T10	4.3	74	36	29	6
D502-0440C-T10	4.4	74	36	29	6
D502-0450C-T10	4.5	74	36	29	6
D502-0460C-T10	4.6	74	36	29	6
D502-0470C-T10	4.7	74	36	29	6
D502-0480C-T10	4.8	82	44	35	6
D502-0490C-T10	4.9	82	44	35	6
D502-0500C-T10	5	82	44	35	6
D502-0510C-T10	5.1	82	44	35	6
D502-0520C-T10	5.2	82	44	35	6
D502-0530C-T10	5.3	82	44	35	6



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



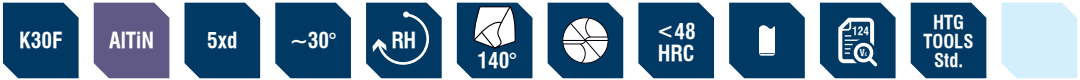
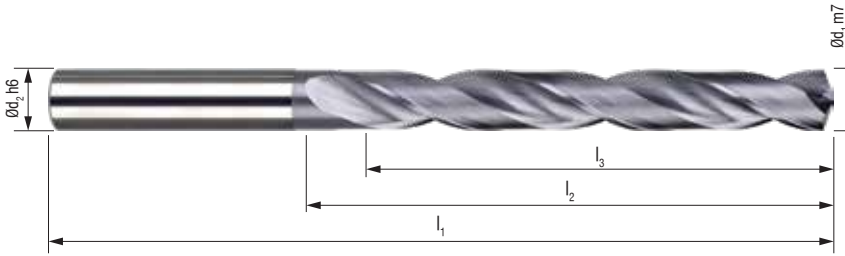
Order Code	$d_1 / m7$	$l_1$	$l_2$	$l_3$	$d_2 / h_6$
D502-0540C-T10	5.4	82	44	35	6
D502-0550C-T10	5.5	82	44	35	6
D502-0555C-T10	5.55	82	44	35	6
D502-0560C-T10	5.6	82	44	35	6
D502-0565C-T10	5.65	82	44	35	6
D502-0570C-T10	5.7	82	44	35	6
D502-0580C-T10	5.8	82	44	35	6
D502-0590C-T10	5.9	82	44	35	6
D502-0600C-T10	6	82	44	35	6
D502-0610C-T10	6.1	91	53	43	8
D502-0620C-T10	6.2	91	53	43	8
D502-0630C-T10	6.3	91	53	43	8
D502-0640C-T10	6.4	91	53	43	8
D502-0650C-T10	6.5	91	53	43	8
D502-0660C-T10	6.6	91	53	43	8
D502-0670C-T10	6.7	91	53	43	8
D502-0680C-T10	6.8	91	53	43	8
D502-0690C-T10	6.9	91	53	43	8
D502-0700C-T10	7	91	53	43	8
D502-0710C-T10	7.1	91	53	43	8
D502-0720C-T10	7.2	91	53	43	8
D502-0730C-T10	7.3	91	53	43	8
D502-0740C-T10	7.4	91	53	43	8
D502-0750C-T10	7.5	91	53	43	8
D502-0755C-T10	7.55	91	53	43	8



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



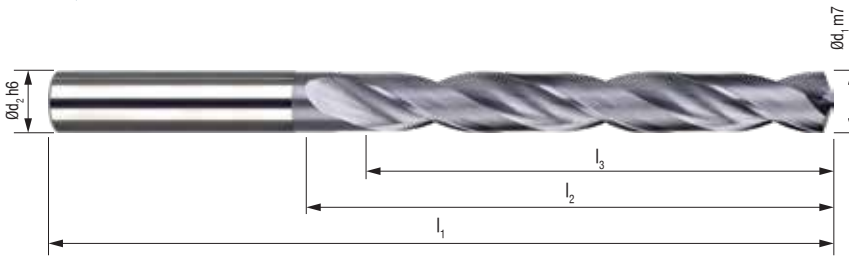
Order Code	$d_1/m7$	$l_1$	$l_2$	$l_3$	$d_2/h_6$
D502-0760C-T10	7.6	91	53	43	8
D502-0770C-T10	7.7	91	53	43	8
D502-0780C-T10	7.8	91	53	43	8
D502-0790C-T10	7.9	91	53	43	8
D502-0800C-T10	8	91	53	43	8
D502-0810C-T10	8.1	103	61	49	10
D502-0820C-T10	8.2	103	61	49	10
D502-0830C-T10	8.3	103	61	49	10
D502-0840C-T10	8.4	103	61	49	10
D502-0850C-T10	8.5	103	61	49	10
D502-0860C-T10	8.6	103	61	49	10
D502-0870C-T10	8.7	103	61	49	10
D502-0880C-T10	8.8	103	61	49	10
D502-0890C-T10	8.9	103	61	49	10
D502-0900C-T10	9	103	61	49	10
D502-0910C-T10	9.1	103	61	49	10
D502-0920C-T10	9.2	103	61	49	10
D502-0930C-T10	9.3	103	61	49	10
D502-0940C-T10	9.4	103	61	49	10
D502-0950C-T10	9.5	103	61	49	10
D502-0955C-T10	9.55	103	61	49	10
D502-0960C-T10	9.6	103	61	49	10
D502-0970C-T10	9.7	103	61	49	10
D502-0980C-T10	9.8	103	61	49	10
D502-0990C-T10	9.9	103	61	49	10



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



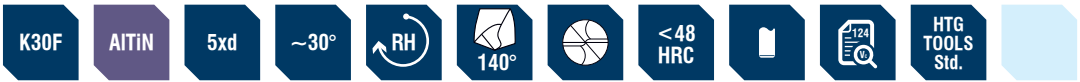
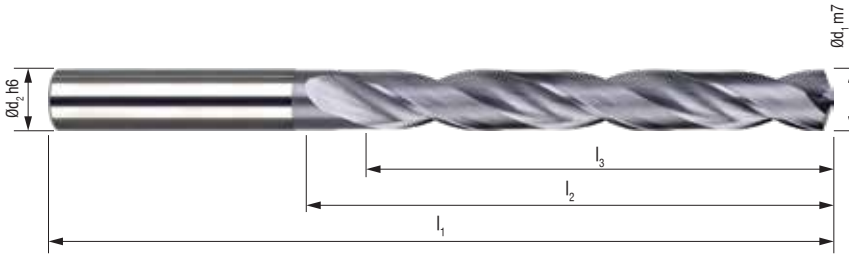
Order Code	$d_1 / m7$	$l_1$	$l_2$	$l_3$	$d_2 / h_6$
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D502-1010C-T10	10.1	118	71	56	12
D502-1020C-T10	10.2	118	71	56	12
D502-1030C-T10	10.3	118	71	56	12
D502-1040C-T10	10.4	118	71	56	12
D502-1050C-T10	10.5	118	71	56	12
D502-1060C-T10	10.6	118	71	56	12
D502-1070C-T10	10.7	118	71	56	12
D502-1080C-T10	10.8	118	71	56	12
D502-1090C-T10	10.9	118	71	56	12
D502-1100C-T10	11	118	71	56	12
D502-1110C-T10	11.1	118	71	56	12
D502-1120C-T10	11.2	118	71	56	12
D502-1130C-T10	11.3	118	71	56	12
D502-1140C-T10	11.4	118	71	56	12
D502-1150C-T10	11.5	118	71	56	12
D502-1155C-T10	11.55	118	71	56	12
D502-1160C-T10	11.6	118	71	56	12
D502-1170C-T10	11.7	118	71	56	12
D502-1180C-T10	11.8	118	71	56	12
D502-1190C-T10	11.9	118	71	56	12
D502-1200C-T10	12	118	71	56	12
D502-1210C-T10	12.1	124	77	60	14
D502-1220C-T10	12.2	124	77	60	14
D502-1230C-T10	12.3	124	77	60	14



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



Order Code	$d_1/m7$	$l_1$	$l_2$	$l_3$	$d_2/h_6$
D502-1240C-T10	12.4	124	77	60	14
D502-1250C-T10	12.5	124	77	60	14
D502-1260C-T10	12.6	124	77	60	14
D502-1270C-T10	12.7	124	77	60	14
D502-1280C-T10	12.8	124	77	60	14
D502-1290C-T10	12.9	124	77	60	14
D502-1300C-T10	13	124	77	60	14
D502-1310C-T10	13.1	124	77	60	14
D502-1320C-T10	13.2	124	77	60	14
D502-1330C-T10	13.3	124	77	60	14
D502-1340C-T10	13.4	124	77	60	14
D502-1350C-T10	13.5	124	77	60	14
D502-1360C-T10	13.6	124	77	60	14
D502-1370C-T10	13.7	124	77	60	14
D502-1380C-T10	13.8	124	77	60	14
D502-1390C-T10	13.9	124	77	60	14
D502-1400C-T10	14	124	77	60	14
D502-1410C-T10	14.1	133	83	63	16
D502-1420C-T10	14.2	133	83	63	16
D502-1430C-T10	14.3	133	83	63	16
D502-1440C-T10	14.4	133	83	63	16
D502-1450C-T10	14.5	133	83	63	16
D502-1460C-T10	14.6	133	83	63	16
D502-1470C-T10	14.7	133	83	63	16
D502-1480C-T10	14.8	133	83	63	16



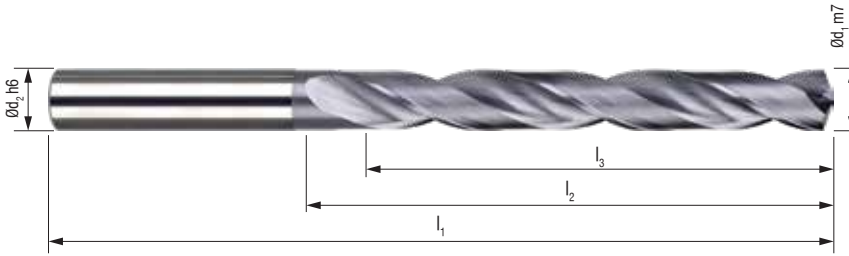




## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



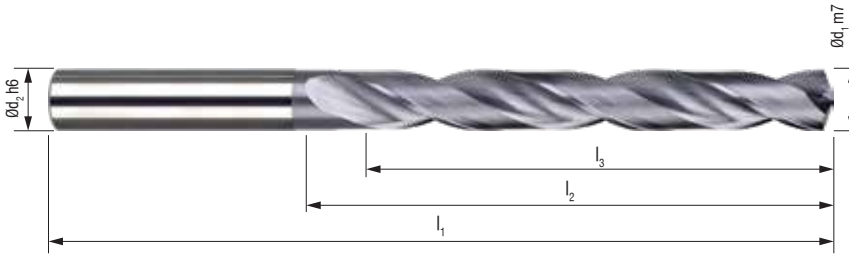
Order Code	$d_1/m7$	$l_1$	$l_2$	$l_3$	$d_2/h_6$
D512-0300C-T10	3	66	28	23	6
D512-0310C-T10	3.1	66	28	23	6
D512-0320C-T10	3.2	66	28	23	6
D512-0330C-T10	3.3	66	28	23	6
D512-0340C-T10	3.4	66	28	23	6
D512-0350C-T10	3.5	66	28	23	6
D512-0360C-T10	3.6	66	28	23	6
D512-0365C-T10	3.65	66	28	23	6
D512-0370C-T10	3.7	66	28	23	6
D512-0380C-T10	3.8	74	36	29	6
D512-0390C-T10	3.9	74	36	29	6
D512-0400C-T10	4	74	36	29	6
D512-0410C-T10	4.1	74	36	29	6
D512-0420C-T10	4.2	74	36	29	6
D512-0430C-T10	4.3	74	36	29	6
D512-0440C-T10	4.4	74	36	29	6
D512-0450C-T10	4.5	74	36	29	6
D512-0460C-T10	4.6	74	36	29	6
D512-0470C-T10	4.7	74	36	29	6
D512-0480C-T10	4.8	82	44	35	6
D512-0490C-T10	4.9	82	44	35	6
D512-0500C-T10	5	82	44	35	6
D512-0510C-T10	5.1	82	44	35	6
D512-0520C-T10	5.2	82	44	35	6
D512-0530C-T10	5.3	82	44	35	6



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



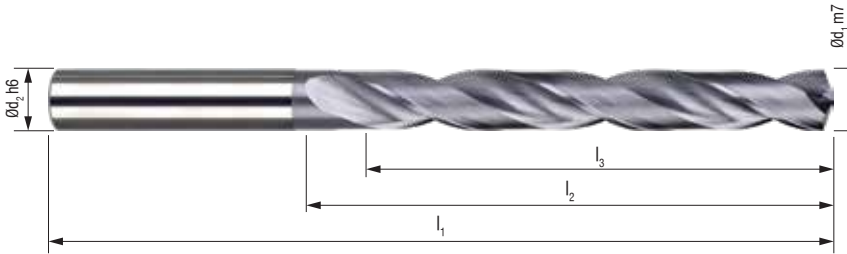
Order Code	$d_1 / m7$	$l_1$	$l_2$	$l_3$	$d_2 / h_6$
D512-0540C-T10	5.4	82	44	35	6
D512-0550C-T10	5.5	82	44	35	6
D512-0555C-T10	5.55	82	44	35	6
D512-0560C-T10	5.6	82	44	35	6
D512-0565C-T10	5.65	82	44	35	6
D512-0570C-T10	5.7	82	44	35	6
D512-0580C-T10	5.8	82	44	35	6
D512-0590C-T10	5.9	82	44	35	6
D512-0600C-T10	6	82	44	35	6
D512-0610C-T10	6.1	91	53	43	8
D512-0620C-T10	6.2	91	53	43	8
D512-0630C-T10	6.3	91	53	43	8
D512-0640C-T10	6.4	91	53	43	8
D512-0650C-T10	6.5	91	53	43	8
D512-0660C-T10	6.6	91	53	43	8
D512-0670C-T10	6.7	91	53	43	8
D512-0680C-T10	6.8	91	53	43	8
D512-0690C-T10	6.9	91	53	43	8
D512-0700C-T10	7	91	53	43	8
D512-0710C-T10	7.1	91	53	43	8
D512-0720C-T10	7.2	91	53	43	8
D512-0730C-T10	7.3	91	53	43	8
D512-0740C-T10	7.4	91	53	43	8
D512-0750C-T10	7.5	91	53	43	8
D512-0755C-T10	7.55	91	53	43	8



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



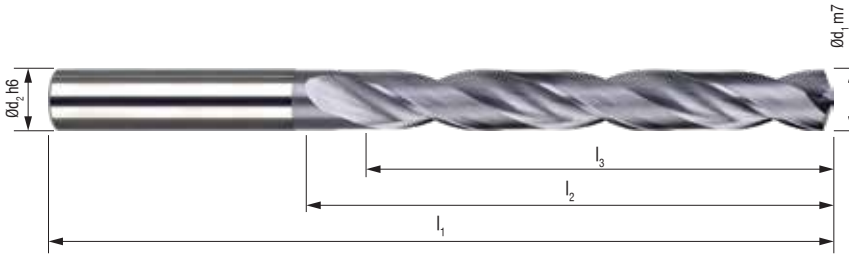
Order Code	$d_1/m7$	$l_1$	$l_2$	$l_3$	$d_2/h_6$
D512-0760C-T10	7.6	91	53	43	8
D512-0770C-T10	7.7	91	53	43	8
D512-0780C-T10	7.8	91	53	43	8
D512-0790C-T10	7.9	91	53	43	8
D512-0800C-T10	8	91	53	43	8
D512-0810C-T10	8.1	103	61	49	10
D512-0820C-T10	8.2	103	61	49	10
D512-0830C-T10	8.3	103	61	49	10
D512-0840C-T10	8.4	103	61	49	10
D512-0850C-T10	8.5	103	61	49	10
D512-0860C-T10	8.6	103	61	49	10
D512-0870C-T10	8.7	103	61	49	10
D512-0880C-T10	8.8	103	61	49	10
D512-0890C-T10	8.9	103	61	49	10
D512-0900C-T10	9	103	61	49	10
D512-0910C-T10	9.1	103	61	49	10
D512-0920C-T10	9.2	103	61	49	10
D512-0930C-T10	9.3	103	61	49	10
D512-0940C-T10	9.4	103	61	49	10
D512-0950C-T10	9.5	103	61	49	10
D512-0955C-T10	9.55	103	61	49	10
D512-0960C-T10	9.6	103	61	49	10
D512-0970C-T10	9.7	103	61	49	10
D512-0980C-T10	9.8	103	61	49	10
D512-0990C-T10	9.9	103	61	49	10



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



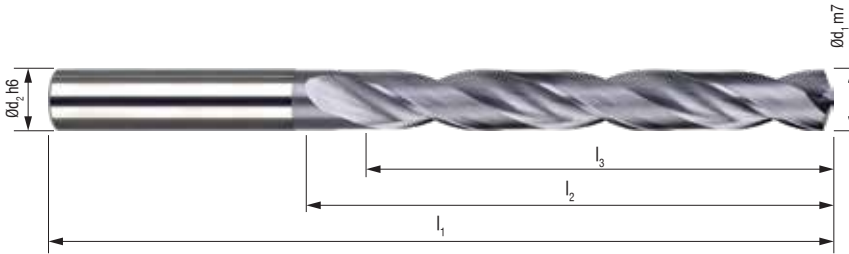
Order Code	$d_1/m7$	$l_1$	$l_2$	$l_3$	$d_2/h_6$
D512-1000C-T10	10	103	61	49	10
D512-1010C-T10	10.1	118	71	56	12
D512-1020C-T10	10.2	118	71	56	12
D512-1030C-T10	10.3	118	71	56	12
D512-1040C-T10	10.4	118	71	56	12
D512-1050C-T10	10.5	118	71	56	12
D512-1060C-T10	10.6	118	71	56	12
D512-1070C-T10	10.7	118	71	56	12
D512-1080C-T10	10.8	118	71	56	12
D512-1090C-T10	10.9	118	71	56	12
D512-1100C-T10	11	118	71	56	12
D512-1110C-T10	11.1	118	71	56	12
D512-1120C-T10	11.2	118	71	56	12
D512-1130C-T10	11.3	118	71	56	12
D512-1140C-T10	11.4	118	71	56	12
D512-1150C-T10	11.5	118	71	56	12
D512-1155C-T10	11.55	118	71	56	12
D512-1160C-T10	11.6	118	71	56	12
D512-1170C-T10	11.7	118	71	56	12
D512-1180C-T10	11.8	118	71	56	12
D512-1190C-T10	11.9	118	71	56	12
D512-1200C-T10	12	118	71	56	12
D512-1210C-T10	12.1	124	77	60	14
D512-1220C-T10	12.2	124	77	60	14
D512-1230C-T10	12.3	124	77	60	14



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



Order Code	$d_1/h_6$	$l_1$	$l_2$	$l_3$	$d_2/h_6$
D512-1240C-T10	12.4	124	77	60	14
D512-1250C-T10	12.5	124	77	60	14
D512-1260C-T10	12.6	124	77	60	14
D512-1270C-T10	12.7	124	77	60	14
D512-1280C-T10	12.8	124	77	60	14
D512-1290C-T10	12.9	124	77	60	14
D512-1300C-T10	13	124	77	60	14
D512-1310C-T10	13.1	124	77	60	14
D512-1320C-T10	13.2	124	77	60	14
D512-1330C-T10	13.3	124	77	60	14
D512-1340C-T10	13.4	124	77	60	14
D512-1350C-T10	13.5	124	77	60	14
D512-1360C-T10	13.6	124	77	60	14
D512-1370C-T10	13.7	124	77	60	14
D512-1380C-T10	13.8	124	77	60	14
D512-1390C-T10	13.9	124	77	60	14
D512-1400C-T10	14	124	77	60	14
D512-1410C-T10	14.1	133	83	63	16
D512-1420C-T10	14.2	133	83	63	16
D512-1430C-T10	14.3	133	83	63	16
D512-1440C-T10	14.4	133	83	63	16
D512-1450C-T10	14.5	133	83	63	16
D512-1460C-T10	14.6	133	83	63	16
D512-1470C-T10	14.7	133	83	63	16
D512-1480C-T10	14.8	133	83	63	16

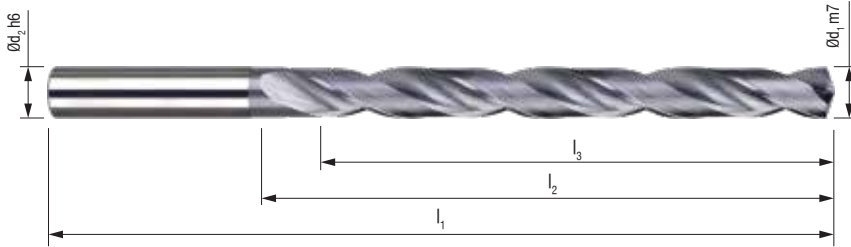




## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



Order Code	$d_1 / m7$	$l_1$	$l_2$	$l_3$	$d_2 / h_6$
D812-0400C-T10	4	85	45	38	6
D812-0410C-T10	4.1	85	45	38	6
D812-0420C-T10	4.2	85	45	38	6
D812-0430C-T10	4.3	85	45	38	6
D812-0440C-T10	4.4	85	45	38	6
D812-0450C-T10	4.5	85	45	38	6
D812-0460C-T10	4.6	85	45	38	6
D812-0470C-T10	4.7	85	45	38	6
D812-0480C-T10	4.8	97	57	49	6
D812-0490C-T10	4.9	97	57	49	6
D812-0500C-T10	5	97	57	49	6
D812-0510C-T10	5.1	97	57	49	6
D812-0520C-T10	5.2	97	57	49	6
D812-0530C-T10	5.3	97	57	49	6
D812-0540C-T10	5.4	97	57	49	6
D812-0550C-T10	5.5	97	57	49	6
D812-0560C-T10	5.6	97	57	49	6
D812-0570C-T10	5.7	97	57	49	6
D812-0580C-T10	5.8	97	57	49	6
D812-0590C-T10	5.9	97	57	49	6
D812-0600C-T10	6	97	57	49	6
D812-0610C-T10	6.1	106	66	57	8
D812-0620C-T10	6.2	106	66	57	8
D812-0630C-T10	6.3	106	66	57	8
D812-0640C-T10	6.4	106	66	57	8

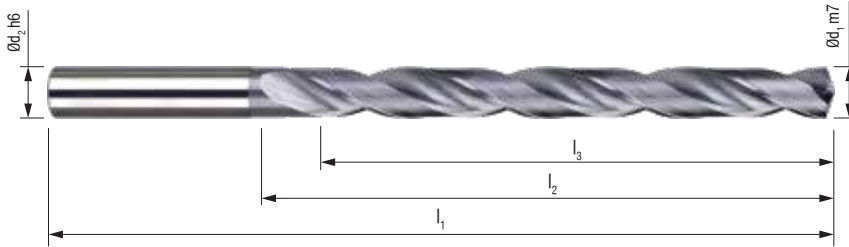




## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



Order Code	$d_1 / m7$	$l_1$	$l_2$	$l_3$	$d_2 / h_6$
D812-0650C-T10	6.5	106	66	57	8
D812-0660C-T10	6.6	106	66	57	8
D812-0670C-T10	6.7	106	66	57	8
D812-0680C-T10	6.8	106	66	57	8
D812-0690C-T10	6.9	106	66	57	8
D812-0700C-T10	7	106	66	57	8
D812-0710C-T10	7.1	116	76	66	8
D812-0720C-T10	7.2	116	76	66	8
D812-0730C-T10	7.3	116	76	66	8
D812-0740C-T10	7.4	116	76	66	8
D812-0750C-T10	7.5	116	76	66	8
D812-0760C-T10	7.6	116	76	66	8
D812-0770C-T10	7.7	116	76	66	8
D812-0780C-T10	7.8	116	76	66	8
D812-0790C-T10	7.9	116	76	66	8
D812-0800C-T10	8	116	76	66	8
D812-0810C-T10	8.1	139	95	85	10
D812-0820C-T10	8.2	139	95	85	10
D812-0830C-T10	8.3	139	95	85	10
D812-0840C-T10	8.4	139	95	85	10
D812-0850C-T10	8.5	139	95	85	10
D812-0860C-T10	8.6	139	95	85	10
D812-0870C-T10	8.7	139	95	85	10
D812-0880C-T10	8.8	139	95	85	10
D812-0890C-T10	8.9	139	95	85	10



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



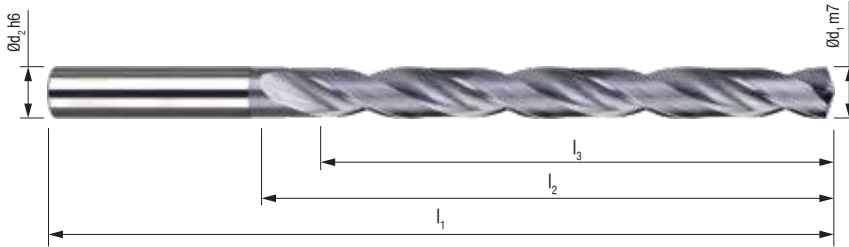
Order Code	$d_1/m7$	$l_1$	$l_2$	$l_3$	$d_2/h_6$
D812-0900C-T10	9	139	95	85	10
D812-0910C-T10	9.1	139	95	85	10
D812-0920C-T10	9.2	139	95	85	10
D812-0930C-T10	9.3	139	95	85	10
D812-0940C-T10	9.4	139	95	85	10
D812-0950C-T10	9.5	139	95	85	10
D812-0960C-T10	9.6	139	95	85	10
D812-0970C-T10	9.7	139	95	85	10
D812-0980C-T10	9.8	139	95	85	10
D812-0990C-T10	9.9	139	95	85	10
D812-1000C-T10	10	139	95	85	10
D812-1010C-T10	10.1	163	114	96	12
D812-1020C-T10	10.2	163	114	96	12
D812-1030C-T10	10.3	163	114	96	12
D812-1040C-T10	10.4	163	114	96	12
D812-1050C-T10	10.5	163	114	96	12
D812-1060C-T10	10.6	163	114	96	12
D812-1070C-T10	10.7	163	114	96	12
D812-1080C-T10	10.8	163	114	96	12
D812-1090C-T10	10.9	163	114	96	12
D812-1100C-T10	11	163	114	96	12
D812-1110C-T10	11.1	163	114	96	12
D812-1120C-T10	11.2	163	114	96	12
D812-1130C-T10	11.3	163	114	96	12
D812-1140C-T10	11.4	163	114	96	12



## Solid carbide drills

### Application Range

- General Steel
- Cast Steel
- Soft Structural Steel
- Stainless Steel
- Tool Steel
- High-alloy Steel
- High Temperature Alloys
- Cast Materials
- Non-ferrous Metals
- Titanium Alloys
- Plastics



Order Code	$d_1/m7$	$l_1$	$l_2$	$l_3$	$d_2/h_6$
D812-1150C-T10	11.5	163	114	96	12
D812-1160C-T10	11.6	163	114	96	12
D812-1170C-T10	11.7	163	114	96	12
D812-1180C-T10	11.8	163	114	96	12
D812-1190C-T10	11.9	163	114	96	12
D812-1200C-T10	12	163	114	96	12
D812-1210C-T10	12.1	182	133	115	14
D812-1230C-T10	12.3	182	133	115	14
D812-1250C-T10	12.5	182	133	115	14
D812-1270C-T10	12.7	182	133	115	14
D812-1290C-T10	12.9	182	133	115	14
D812-1300C-T10	13	182	133	115	14
D812-1310C-T10	13.1	182	133	115	14
D812-1330C-T10	13.3	182	133	115	14
D812-1350C-T10	13.5	182	133	115	14
D812-1370C-T10	13.7	182	133	115	14
D812-1390C-T10	13.9	182	133	115	14
D812-1400C-T10	14	182	133	115	14
D812-1410C-T10	14.1	204	152	130	16
D812-1430C-T10	14.3	204	152	130	16
D812-1450C-T10	14.5	204	152	130	16
D812-1470C-T10	14.7	204	152	130	16
D812-1490C-T10	14.9	204	152	130	16
D812-1500C-T10	15	204	152	130	16
D812-1510C-T10	15.1	204	152	130	16











## Calculation of cutting speed and feed rate for ball nose end mills

Cutting Speed

$$V_c = \frac{\pi \times d_1 \times n}{1000}$$

Feed Rate For End Mills

$$V_f = n \times f_z \times f_n$$

$$n = \frac{1000 \times V_c}{\pi \times d_1}$$

$V_c$  : Cutting speed (m / min)

$d_1$  : End Mill diameter (mm)

$n$  : Revolution (rpm)

$V_f$  : Feed speed (mm / min)

$f_z$  : Feed per tooth (mm / tooth)

$f_n$  : Number of teeth

### General recommendations for solid carbide end mills

- In case of vibration, reduce feed and speed.
- When slotting Stainless Steel it may be necessary to reduce spindle and feed per tooth.
- For side milling, modify feed to obtain required finish quality.
- Use high precision machine set up for rigidity.
- For Ball Nose End Mills with 4 cutting edge use following recommendation is useful if surface have over 30 degree, increase feedrate up to 30%.





# Solid Carbide End Mills

## Recommended Cutting Data

ISO		P										
Material		Non-alloy steel and cast steel, free cutting steel					Low alloy steel and cast steel (less than)		High alloy steel and cast steel			
		< 0.25 %C	< 0.25 %C	< 0.55 %C	< 0.55 %C	≥ 0.55 %C	Annealed	Quenched and tempered	Annealed	Quenched and tempered		
Condition		Annealed	Annealed	Quenched and tempered	Annealed	Quenched and tempered	Annealed	Quenched and tempered	Annealed	Quenched and tempered		
Tensile Strength [N/mm <sup>2</sup> ]		420	650	850	750	1000	600	930	1000	1200	680	1100
Hardness HB		125	190	250	220	300	200	275	300	350	200	325
Speed (m/min)	V min.	210	160	140	140	120	130	100	110	120	110	65
	V max.	230	190	150	150	130	150	110	120	130	130	70

ISO		M			ISO		K					
Material		Stainless steel and Cast Steel			Material		Cast Iron Nodular (GGG)		Grey Cast Iron (GG)		Malleable Cast Iron	
		Ferritic / Martensitic	Martensitic	Austenitic			Ferritic Pearlitic	Pearlitic	Ferritic	Pearlitic	Ferritic	Pearlitic
Condition		Ferritic / Martensitic	Martensitic	Austenitic	Condition		Ferritic Pearlitic	Pearlitic	Ferritic	Pearlitic	Ferritic	Pearlitic
Tensile Strength [N/mm <sup>2</sup> ]		680	820	600	Tensile Strength [N/mm <sup>2</sup> ]							
Hardness HB		200	240	180	Hardness HB		180	260	160	250	130	230
Speed (m/min)	V min.	100	60	70	Speed (m/min)	V min.	70	110	130	70	130	110
	V max.	170	150	100		V max.	220	200	230	230	230	200

ISO		N							
Material		Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper Alloys		
		Not cureable	Cured	≤ 12% Si	> 12% Si	Quenched and tempered	High Temperature	Brass	Electrolytic copper
Condition		Not cureable	Cured	Not cureable	Cured	Quenched and tempered	High Temperature	Brass	Electrolytic copper
Tensile Strength [N/mm <sup>2</sup> ]									
Hardness HB		60	100	75	90	130	110	90	100
Speed (m/min)	V min.	650	600	650	600	250	310	310	220
	V max.	700	690	700	690	280	350	350	250

ISO		S						
Material		High Temp. Alloys					Titanium an Ti Alloys	
		Fe Based		Fe Based				Alpha + beta alloys cured
Condition		Annealed	Cured	Annealed	Cured	Cast		Alpha + beta alloys cured
Tensile Strength [N/mm <sup>2</sup> ]							RM400	RM1050
Hardness HB		200	280	250	350	320		
Speed (m/min)	V min.	20	20	20	20	30	30	30
	V max.	30	20	20	20	60	60	60

ISO		H			
Material		Hardened Steel		Chilled cast iron	Cast iron
		Hardened		Cast	Hardened
Condition		Annealed	Cured	Annealed	Cured
Tensile Strength [N/mm <sup>2</sup> ]					
Hardness HB		55 HRC	60 HRC	400	55 HRC
Speed (m/min)	V min.	30	30	50	30
	V max.	40	30	60	40

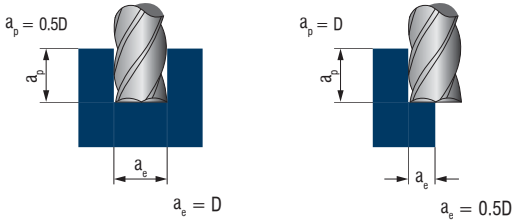


# Solid Carbide End Mills

## Recommended Cutting Data

### EM Series

D (mm)	Slotting		Shouldering	
	Fz (min)	Fz (max)	Fz (min)	Fz (max)
1	0.003	0.005	0.003	0.007
2	0.005	0.030	0.005	0.033
3	0.010	0.040	0.010	0.044
4	0.015	0.045	0.015	0.049
5	0.025	0.050	0.020	0.055
6	0.030	0.060	0.025	0.066
8	0.030	0.080	0.030	0.088
10	0.035	0.090	0.030	0.098
12	0.040	0.100	0.035	0.108
14	0.050	0.110	0.040	0.119
16	0.050	0.120	0.050	0.130
18	0.050	0.130	0.050	0.140
20	0.050	0.150	0.050	0.170
25	0.060	0.150	0.060	0.180



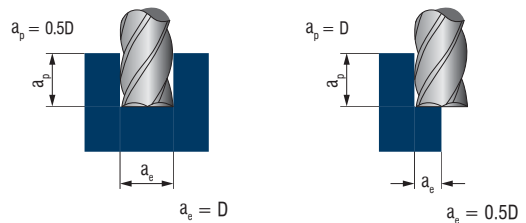
- For Slotting **M** type materials —  $a_{p,max} = 0.5D$
- For Slotting **S** type materials —  $a_{p,max} = 0.25D$
- For Finishing **P** type materials —  $a_{p,max} = 1.5D$

# Solid Carbide Roughing End Mills,

## Recommended Cutting Data

### RSM Series

D (mm)	Slotting		Shouldering	
	Fz (min)	Fz (max)	Fz (min)	Fz (max)
1	0.006	0.01	0.006	0.014
2	0.01	0.06	0.01	0.066
3	0.02	0.08	0.02	0.088
4	0.03	0.09	0.03	0.098
5	0.04	0.10	0.04	0.110
6	0.05	0.12	0.05	0.132
8	0.06	0.16	0.06	0.176
10	0.06	0.18	0.06	0.196
12	0.07	0.20	0.07	0.216
14	0.08	0.22	0.08	0.238
16	0.10	0.24	0.10	0.260
18	0.10	0.26	0.10	0.280
20	0.10	0.30	0.10	0.340
25	0.12	0.30	0.12	0.360



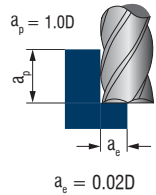
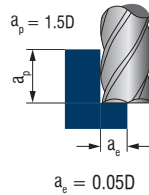
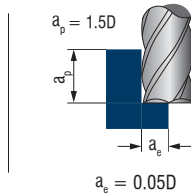
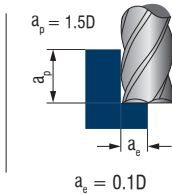


# Solid Carbide End Mills

## Recommended Cutting Data

### HM Series

Material	Alloy Steels, Cast Iron		Alloy Steels Tempered Steels		Hardened Steels		High Hardened Steels	
Hardness	- HRC30		HRC30 - HRC45		HRC50 - HRC60		HRC50 - HRC65	
Strength	-850 N/mm <sup>2</sup>		850-1600 N/mm <sup>2</sup>		1600-2000 N/mm <sup>2</sup>		2000 N/mm <sup>2</sup> -	
Diameter	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)
6	5600	1900	3900	1250	1600	200	1100	130
8	4200	1900	3000	1250	1200	200	900	130
10	3400	1900	2400	1250	1000	200	700	130
12	2800	1600	2000	1000	900	200	600	110
14	2450	1400	1750	900	900	175	525	90
16	2100	1200	1500	800	900	150	450	70
18	1900	1100	1350	750	700	135	375	65
20	1700	1000	1200	700	500	120	300	60

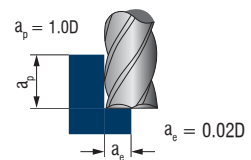
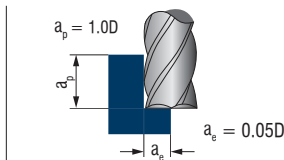
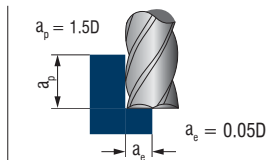


## Solid Carbide Roughing End Mills, Short

### Recommended Cutting Data

### HM Series For High Speed

Material	Hardened Steels Tempered Steels		Hardened Steels		High Hardened Steels	
Hardness	- HRC50		HRC50 - HRC60		HRC60 - HRC65	
Strength	-1600 N/mm <sup>2</sup>		1600-2000 N/mm <sup>2</sup>		2000 N/mm <sup>2</sup> -	
Diameter	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)
6	17000	6100	8400	3000	4200	1500
8	13000	6100	6300	3000	3200	1500
10	10000	6000	5000	3000	2500	1500
12	8400	5000	4200	2500	2100	1300
14	7350	4500	3700	2200	1850	1150
16	6300	4000	3200	1900	1600	1000
18	5650	3550	2850	1685	1450	900
20	5000	3100	2500	1470	1300	800



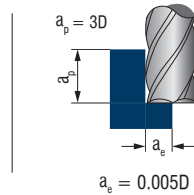
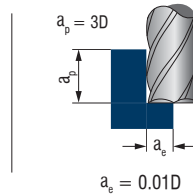
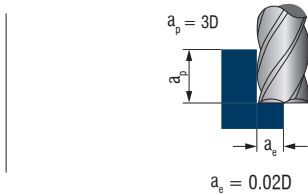


# Solid Carbide End Mills

## Recommended Cutting Data

### HM Series For Long Version

Material	Alloy Steels, Cast Iron		Alloy Steels Tempered Steels		Hardened Steels		High Hardened Steels	
Hardness	- HRC30		HRC30 - HRC45		HRC50 - HRC60		HRC50 - HRC65	
Strength	-850 N/mm <sup>2</sup>		850-1600 N/mm <sup>2</sup>		1600-2000 N/mm <sup>2</sup>		2000 N/mm <sup>2</sup> -	
Diameter	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)
6	2400	500	1700	360	1400	250	1110	200
8	1800	460	1300	340	1100	240	850	180
10	1400	430	1000	300	900	230	680	160
12	1150	400	900	280	700	210	580	150
14	1025	375	775	260	625	190	515	140
16	900	350	650	240	550	170	450	130
18	800	325	557	220	500	160	390	125
20	700	300	500	200	450	150	330	120



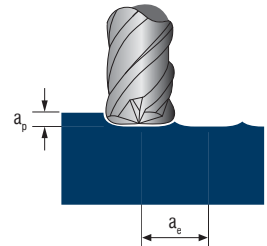


# Solid Carbide End Mills

## Recommended Cutting Data

### HF Series

ISO	Materials	$V_c$ (m/min)	$f_z$ max. (mm)	$a_p$ max. (mm)	$a_e$ max. (mm)	
P	Cold-extrusion steels, Magnetic soft iron	$\leq 400 \text{ N/mm}^2$	280 - 300	$0.04 \times d_i$	$0.06 \times d_i$	$0.6 \times d_i$
	Free-cutting steels, General construction steels	$\leq 600 \text{ N/mm}^2$	260 - 280	$0.04 \times d_i$	$0.05 \times d_i$	$0.6 \times d_i$
	Free-cutting steels, Construction steels, Alloyed steels, Steel casting	$\leq 850 \text{ N/mm}^2$	240 - 260	$0.025 \times d_i$	$0.04 \times d_i$	$0.6 \times d_i$
	Cementation steels, Heat-treatable steels, Nitriding steels, Cold work steels	$\leq 1100 \text{ N/mm}^2$	220 - 240	$0.025 \times d_i$	$0.04 \times d_i$	$0.6 \times d_i$
	Heat-treatable steels, Hot work steels, Nitriding steels, Hardened Steels up to 44 HRC, Cold work steels	$\leq 1400 \text{ N/mm}^2$	180 - 200	$0.02 \times d_i$	$0.035 \times d_i$	$0.6 \times d_i$
	Hardened Steels > 44 - 45		120 - 160	$0.015 \times d_i$	$0.03 \times d_i$	$0.6 \times d_i$
	Hardened Steels > 55 - 60		100 - 120	$0.01 \times d_i$	$0.025 \times d_i$	$0.6 \times d_i$
	Hardened Steels > 60 - 63		80 - 100	$0.01 \times d_i$	$0.02 \times d_i$	$0.6 \times d_i$
Hardened Steels > 63 - 66		60 - 80	$0.007 \times d_i$	$0.015 \times d_i$	$0.6 \times d_i$	
K	Cast iron	GG20-GG30	180 - 200	$0.05 \times d_i$	$0.07 \times d_i$	$0.6 \times d_i$
	Cast iron with nodular graphite	GGG40-GGG70	180 - 200	$0.05 \times d_i$	$0.07 \times d_i$	$0.6 \times d_i$
	Cast iron with vermicular graphite	GGV(80%Perfit)	160 - 180	$0.04 \times d_i$	$0.07 \times d_i$	$0.6 \times d_i$
	Malleable cast iron		160 - 180	$0.04 \times d_i$	$0.07 \times d_i$	$0.6 \times d_i$
N	Copper-zinc alloys (brass, long-chipping)		180 - 200	$0.04 \times d_i$	$0.07 \times d_i$	$0.6 \times d_i$
	Copper-zinc alloys (brass, short-chipping)		180 - 200	$0.04 \times d_i$	$0.07 \times d_i$	$0.6 \times d_i$
	Copper-aluminium alloys (alubronze, long chipping),		160 - 180	$0.04 \times d_i$	$0.06 \times d_i$	$0.6 \times d_i$
	Copper-tin alloys (bronze, long chipping)		160 - 180	$0.04 \times d_i$	$0.06 \times d_i$	$0.6 \times d_i$
	Duroplastics (Short chipping)		200 - 220	$0.05 \times d_i$	$0.07 \times d_i$	$0.6 \times d_i$
	Tungsten-copper alloys		100 - 140	$0.035 \times d_i$	$0.07 \times d_i$	$0.6 \times d_i$



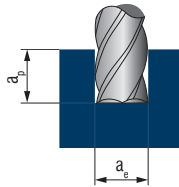


# Solid Carbide End Mills

## Recommended Cutting Data

### PM Series

Material	VC (mm/min)	Slotting	Ø3		Ø4		Ø5		Ø6		Ø8		Ø10		Ø12		Ø16		Ø20	
			Medium	Heavy	Medium	Heavy	Medium	Heavy	Medium	Heavy	Medium	Heavy	Medium	Heavy	Medium	Heavy	Medium	Heavy	Medium	Heavy
Non-alloy steel and cast steel, free cutting steel $\geq 0.25\%C$ .	200	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Non-alloy steel and cast steel, free cutting steel $< 0.55\%C$ .	160	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Low alloy & cast steel (less than 5% of alloying elements).	130	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
High alloyed steel, cast steel and tool steel.	80	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Stainless steel and cast steel.	150	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Stainless steel and cast steel.	120	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Stainless steel and cast steel.	80	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Cast iron nodular (GGG).	180	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Grey cast iron (GG).	170	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Aluminum-cast, alloyed $< 12\% Si$ .	770	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Aluminum-cast, alloyed $> 12\% Si$ .	310	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Copper alloys.	270	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Titanium Ti alloys.	50	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Hardened steel.	40	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40
Hardened steel.	30	$f_z$ (mm/tooth)	0.02	0.012	0.024	0.014	0.028	0.017	0.034	0.021	0.044	0.026	0.048	0.029	0.054	0.033	0.068	0.041	0.08	0.048
		$a_p$ (mm)	3.20	6.40	5.00	7.00	6.00	8.40	7.00	9.80	9.00	12.60	11.00	15.40	13.00	18.20	17.00	23.80	21.00	29.40



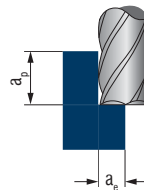
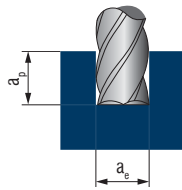


# Solid Carbide End Mills

## Recommended Cutting Data

### AL Series

Material		Aluminium si < %10			Aluminium si > %10		
Vc (m / min)		700			300		
Slotting / Shouldering Processing		fz (mm/tooth)	ap (mm)	ae (mm)	fz (mm/tooth)	ap (mm)	ae (mm)
Ø4	Shouldering	0.040	4.0	2.0	0.032	4.0	2.0
	Slotting	0.032	4.0	-	0.026	4.0	-
Ø5	Shouldering	0.050	5.0	2.5	0.040	5.0	2.5
	Slotting	0.040	5.0	-	0.032	5.0	-
Ø6	Shouldering	0.060	6.0	3.0	0.048	6.0	3.0
	Slotting	0.048	6.0	-	0.038	6.0	-
Ø8	Shouldering	0.080	8.0	4.0	0.064	8.0	4.0
	Slotting	0.064	8.0	-	0.051	8.0	-
Ø10	Shouldering	0.100	10.0	5.0	0.080	10.0	5.0
	Slotting	0.080	10.0	-	0.064	10.0	-
Ø12	Shouldering	0.120	12.0	6.0	0.096	12.0	6.0
	Slotting	0.096	12.0	-	0.077	12.0	-
Ø14	Shouldering	0.140	14.0	7.0	0.112	14.0	7.0
	Slotting	0.112	14.0	-	0.090	14.0	-
Ø16	Shouldering	0.160	16.0	8.0	0.128	16.0	8.0
	Slotting	0.128	16.0	-	0.102	16.0	-
Ø20	Shouldering	0.200	20.0	10.0	0.160	20.0	10.0
	Slotting	0.160	20.0	-	0.128	20.0	-





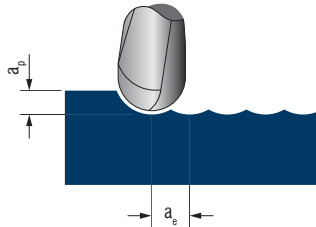
# Solid Carbide End Mills

## Recommended Cutting Data

### BM Series

Shoulder Processing		$a_p = 0,3 \times \varnothing d_1$ (Below R1,0 ; $0,2 \times \varnothing d_1$ )		$a_e = 0,7 \times \varnothing d_1$ (Below R1,0 ; $0,6 \times \varnothing d_1$ )			
R	Vc / fz	Carbon Steel , Alloy Steel		Hardened Steel (Below HRC48)	Cast Iron	Stainless Steel, Ti-alloy etc.	
		(Below HRC25)	(Below HRC48)				
R0,5 ~ R1,4	Vc	160 - 200 - 240	80 - 120 - 160	80 - 100 - 120	80 - 100 - 120	50 - 60 - 75	
	fz	0,005 ~ 0,010	0,003 ~ 0,005	0,002 ~ 0,003	0,008 ~ 0,015	0,003 ~ 0,005	
R1,5 ~ R2,9	Vc	160 - 200 - 240	80 - 120 - 160	80 - 100 - 120	80 - 100 - 120	50 - 60 - 75	
	fz	0,013 ~ 0,025	0,007 ~ 0,013	0,005 ~ 0,008	0,017 ~ 0,042	0,007 ~ 0,013	
R3,0 ~ R6,4	Vc	160 - 200 - 240	80 - 120 - 160	80 - 100 - 120	80 - 100 - 120	50 - 60 - 75	
	fz	0,030 ~ 0,050	0,017 ~ 0,033	0,010 ~ 0,020	0,056 ~ 0,136	0,017 ~ 0,033	
R6,5 ~ R9,9	Vc	160 - 200 - 240	80 - 120 - 160	80 - 100 - 120	80 - 100 - 120	50 - 60 - 75	
	fz	0,070 ~ 0,100	0,040 ~ 0,057	0,020 ~ 0,040	0,167 ~ 0,238	0,040 ~ 0,057	
R10,0 ~ R20,0	Vc	160 - 200 - 240	80 - 120 - 160	80 - 100 - 120	80 - 100 - 120	50 - 60 - 75	
	fz	0,118 ~ 0,167	0,085 ~ 0,095	0,045 ~ 0,080	0,250 ~ 0,350	0,085 ~ 0,095	

Vc = m / min      fz = mm/tooth



### BM Series For High Speed

Corner Radius (mm)	Material										
	Carbon steel, Cast iron (HB150 ~ 250)		Alloy steel, Prehardened steel (HRC 25 ~ 35)		Heat resistant alloys, titanium alloy (HRC 35 - 45)		Hardened steel (HRC 45 ~ 55)		Stainless steel		
	Speed (rpm)	Feed (mm/min)	Speed (rpm)	Feed (mm/min)	Speed (rpm)	Feed (mm/min)	Speed (rpm)	Feed (mm/min)	Speed (rpm)	Feed (mm/min)	
r = 1	51000	2100	39800	1300	35700	960	35700	960	23700	640	
r = 2	25500	2700	19900	1700	17900	1300	17900	1300	11900	830	
r = 3	17000	3000	13300	1900	11900	1400	11900	1400	7900	920	
r = 4	12800	3100	10000	2000	9000	1500	9000	1500	6000	960	
r = 5	10200	3100	8000	2000	7200	1500	7200	1500	4800	960	
r = 6	8500	3100	6700	2000	6000	1500	6000	1500	4000	960	
Depth and width of cut	$a_p$	$0,05 \times \varnothing d_1$				$0,02 \times \varnothing d_1$		$0,05 \times \varnothing d_1$		$0,05 \times \varnothing d_1$	
	$a_e$	$0,1 \times \varnothing d_1$						$0,05 \times \varnothing d_1$		$0,1 \times \varnothing d_1$	





# Solid Carbide End Mills

## Recommended Cutting Data

### EMT Series

Material		Carbon Steels, Alloy Steels (180–250HB)			Stainless Steels, Tool Steels (25–35HRC)			Pre-harden Steels, Tool Steels (35–45HRC)			Hardened Steels, (45–55HRC)			Hardened Steels, (55–65HRC)			Copper		
d <sub>1</sub> (mm)	l <sub>2</sub> (mm)	a <sub>e</sub> (mm)	RPM (rev/min)	Feed (mm/min)	a <sub>e</sub> (mm)	RPM (rev/min)	Feed (mm/min)	a <sub>e</sub> (mm)	RPM (rev/min)	Feed (mm/min)	a <sub>e</sub> (mm)	RPM (rev/min)	Feed (mm/min)	a <sub>e</sub> (mm)	RPM (rev/min)	Feed (mm/min)	a <sub>e</sub> (mm)	RPM (rev/min)	Feed (mm/min)
1.0	2	0.100	28750	1350	0.090	26000	1250	0.070	24500	930	0.050	21600	700	0.055	20150	560	0.120	34550	1630
	4	0.070	28750	1350	0.063	26000	1250	0.049	24500	930	0.035	21600	700	0.039	20150	560	0.084	34550	1630
	6	0.040	25900	1120	0.036	23350	1000	0.028	22000	770	0.020	19450	575	0.022	18150	465	0.048	31100	1345
	8	0.040	25900	1120	0.036	23350	1000	0.028	22000	770	0.020	19450	575	0.022	18150	465	0.048	31100	1345
	10	0.025	25900	1120	0.023	23350	1000	0.018	22000	770	0.013	19450	575	0.014	18150	465	0.030	31100	1345
	12	0.025	23000	870	0.023	20750	785	0.018	19600	500	0.013	17300	445	0.014	16150	350	0.030	27650	1045
	14	0.025	23000	870	0.023	20750	785	0.018	19600	500	0.013	17300	445	0.014	16150	350	0.030	27650	1045
	16	0.015	23000	750	0.014	20750	670	0.011	19600	475	0.008	17300	375	0.008	16150	280	0.018	27650	895
1.2	6	0.084	25500	1200	0.076	23000	1100	0.059	21750	760	0.042	19200	570	0.046	17900	460	0.101	30700	1450
	12	0.030	23000	1000	0.027	20750	900	0.021	19600	685	0.015	17300	515	0.017	16150	415	0.036	27650	1200
1.4	6	0.100	22500	1060	0.090	20200	950	0.070	19000	670	0.050	16800	500	0.055	15700	400	0.120	26900	1270
	10	0.056	20000	870	0.050	18200	785	0.039	17150	600	0.028	15100	450	0.031	14100	360	0.067	24200	1045
	16	0.035	18000	680	0.032	16150	600	0.025	15250	390	0.018	13450	345	0.019	12550	270	0.042	21500	810
1.5	4	0.110	22500	1060	0.099	20200	950	0.077	19000	670	0.055	16800	500	0.061	15700	400	0.132	26900	1270
	6	0.110	22500	1060	0.099	20200	950	0.077	19000	670	0.055	16800	500	0.061	15700	400	0.132	26900	1270
	10	0.060	20000	870	0.054	18150	785	0.042	17150	600	0.030	15100	450	0.033	14100	360	0.072	24200	1045
	12	0.060	20000	870	0.054	18150	785	0.042	17150	600	0.030	15100	450	0.033	14100	360	0.072	24200	1045
	16	0.038	18000	680	0.034	16150	610	0.027	15250	390	0.019	13450	345	0.021	12550	270	0.046	21500	810
	18	0.038	18000	680	0.034	16150	610	0.027	15250	390	0.019	13450	345	0.021	12550	270	0.046	21500	810
	25	0.023	13500	440	0.021	12100	390	0.016	11450	380	0.012	10100	220	0.013	9400	165	0.028	16150	525
1.6	6	0.110	20800	1100	0.099	18750	985	0.077	17700	690	0.055	15600	515	0.061	14550	415	0.132	25000	1310
	12	0.064	18700	900	0.058	16850	810	0.045	16000	620	0.032	14000	465	0.035	13100	370	0.077	22500	1080
	20	0.040	16650	700	0.036	15000	630	0.028	14150	400	0.020	12500	355	0.022	11700	280	0.048	20000	840
1.8	8	0.130	20800	1100	0.117	18750	985	0.091	17700	690	0.065	15600	515	0.072	14600	415	0.156	25000	1310
	14	0.072	18700	900	0.065	16850	810	0.050	16000	620	0.036	14000	465	0.040	13100	370	0.086	22500	1080
	20	0.045	16650	700	0.041	15000	630	0.032	14150	400	0.023	12500	355	0.025	11700	280	0.054	20000	840
2.0	4	0.200	16800	1060	0.180	15100	950	0.140	14300	670	0.100	12600	500	0.110	11750	400	0.240	20150	1270
	6	0.200	16800	1060	0.180	15100	950	0.140	14300	670	0.100	12600	500	0.110	11750	400	0.240	20150	1270
	8	0.140	16800	1060	0.126	15100	950	0.098	14300	670	0.070	12600	500	0.077	11750	400	0.168	20150	1270
	10	0.140	16800	1060	0.126	15100	950	0.098	14300	670	0.070	12600	500	0.077	11750	400	0.168	20150	1270
	12	0.080	15100	870	0.072	13600	785	0.056	12850	600	0.040	11350	450	0.044	10600	360	0.096	18150	1045
	16	0.080	15100	870	0.072	13600	785	0.056	12850	600	0.040	11350	450	0.044	10600	360	0.096	18150	1045
	20	0.050	15100	870	0.045	13600	785	0.035	12850	600	0.025	11350	450	0.028	10600	360	0.060	18150	1045
	25	0.050	13450	680	0.045	12100	610	0.035	11450	390	0.025	10100	345	0.028	9400	270	0.060	16150	810
	30	0.030	13450	680	0.027	12100	610	0.021	11450	390	0.015	10100	345	0.017	9400	270	0.036	16150	810
2.5	12	0.180	14400	1140	0.162	13000	1000	0.126	12250	715	0.090	10800	535	0.099	10000	430	0.216	17300	1360
	20	0.100	12950	940	0.090	11700	850	0.070	11000	640	0.050	9700	480	0.055	9080	390	0.120	15550	1120
	8	0.300	12800	1010	0.270	11500	910	0.210	10900	635	0.150	9600	475	0.165	8950	380	0.360	15360	1210
3.0	12	0.210	12800	1010	0.189	11500	910	0.147	10900	635	0.105	9600	475	0.116	8950	380	0.252	15360	1210
	20	0.120	11500	830	0.108	10400	750	0.084	9800	570	0.060	8650	430	0.066	8070	345	0.144	13825	995
	30	0.080	11500	830	0.072	10400	750	0.056	9800	570	0.040	8650	430	0.044	8070	345	0.096	13825	995
	40	0.040	9400	1900	0.360	8500	1500	0.280	8000	1360	0.200	7050	900	0.220	6600	730	0.480	11500	2300
4.0	20	0.280	8450	1700	0.252	7600	1370	0.196	7200	1220	0.140	6350	810	0.154	5920	655	0.336	10350	2070
	30	0.160	8450	1530	0.144	7600	1250	0.112	7200	1100	0.080	6350	810	0.088	5920	655	0.192	10350	1863
	40	0.100	7600	1370	0.090	6850	1110	0.070	6480	990	0.050	5710	730	0.055	5330	590	0.120	9140	1645



# Solid Carbide End Mills

## Recommended Cutting Data

### CMT Series

Material			Carbon Steels, Alloy Steels (180–250HB)			Stainless Steels, Tool Steels (25–35HRC)			Pre-hardened Steels, Tool Steels (35–45HRC)			Hardened Steels, (45–55HRC)			Hardened Steels, (55–65HRC)			Copper			
$d_c$ (mm)	R (mm)	$l_c$ (mm)	$a_p$ (mm)	RPM (rev/min)	Feed (mm/min)	$a_p$ (mm)	RPM (rev/min)	Feed (mm/min)	$a_p$ (mm)	RPM (rev/min)	Feed (mm/min)	$a_p$ (mm)	RPM (rev/min)	Feed (mm/min)	$a_p$ (mm)	RPM (rev/min)	Feed (mm/min)	$a_p$ (mm)	RPM (rev/min)	Feed (mm/min)	
1.0	0.2	4	0.070	32400	1360	0.063	29150	1220	0.056	27540	1040	0.046	24300	815	0.042	22700	670	0.084	39000	1630	
		6	0.040	26250	990	0.036	23600	890	0.032	22300	840	0.026	19680	660	0.024	18370	540	0.048	31500	1190	
		8	0.040	23330	880	0.036	21000	790	0.032	19830	750	0.026	17500	590	0.024	16330	480	0.048	28000	1060	
		10	0.025	20400	770	0.023	18370	690	0.020	17350	655	0.016	15310	515	0.015	14300	420	0.030	25000	925	
		12	0.025	18150	610	0.023	16300	550	0.020	15420	450	0.016	13600	400	0.015	12700	320	0.030	21800	730	
		16	0.015	18150	530	0.014	16300	480	0.012	15420	420	0.010	13600	345	0.009	12700	270	0.018	21800	640	
		18																			
20	0.010	13600	400	0.009	12250	360	0.008	11570	315	0.007	10200	260	0.006	9530	200	0.012	16350	480			
1.5	0.2	4	0.070	24950	1130	0.063	22450	1020	0.056	20960	870	0.046	18710	680	0.042	17370	560	0.084	30000	1360	
		8	0.060	22700	1030	0.054	20400	925	0.048	19280	875	0.039	17010	685	0.036	15880	560	0.072	27250	1230	
		12	0.060	18150	820	0.054	16330	740	0.048	15400	700	0.039	13610	550	0.036	12700	450	0.072	21800	990	
		15	0.038	14100	570	0.034	12700	510	0.030	12000	425	0.025	10585	375	0.023	9880	300	0.046	17000	680	
		20	0.030	14100	570	0.027	12700	510	0.024	12000	425	0.020	10585	375	0.018	9880	300	0.036	17000	680	
2.0	0.2	4																			
		8	0.070	18900	1490	0.063	17000	1340	0.056	16070	1265	0.046	14175	890	0.042	13230	800	0.084	22700	1780	
		12	0.040	15300	1085	0.036	13780	975	0.032	13000	920	0.026	11480	720	0.024	10715	730	0.048	18400	1300	
		16	0.040	13600	970	0.036	12250	870	0.032	11570	820	0.026	10200	640	0.024	9530	590	0.048	16350	1160	
		20	0.035	11900	845	0.032	10700	760	0.028	10120	715	0.023	8930	560	0.021	8335	525	0.042	14300	1010	
	25	0.025	11900	845	0.023	10700	760	0.020	10120	715	0.016	8930	560	0.015	8335	460	0.030	14300	1010		
	30	0.017	11300	800	0.015	10180	720	0.014	9615	680	0.011	8485	535	0.010	7920	460	0.020	13600	960		
	0.5	4																			
		8	0.140	18900	1650	0.126	17000	1490	0.112	16065	1400	0.091	14175	990	0.084	13230	801	0.168	22700	1980	
		12	0.080	15300	1204	0.072	13780	1080	0.064	13000	1025	0.052	11480	800	0.048	10715	810	0.096	18400	1450	
16		0.080	13600	1070	0.072	12250	965	0.064	11570	910	0.052	10200	710	0.048	9530	655	0.096	16350	1280		
20		0.050	11900	940	0.045	10700	845	0.040	10120	800	0.033	8930	625	0.030	8335	585	0.060	14300	1120		
3.0	0.2	25	0.050	11900	940	0.045	10700	845	0.040	10120	800	0.033	8930	625	0.030	8335	510	0.060	14300	1120	
		30	0.030	11300	890	0.027	10180	800	0.024	9615	760	0.020	8485	595	0.018	7920	510	0.036	13600	1070	
		8	0.090	14400	1415	0.081	12960	1275	0.072	12240	1205	0.059	10800	850	0.054	10080	695	0.108	17300	1700	
		12	0.070	14400	1415	0.063	12960	1275	0.056	12240	1205	0.046	10800	850	0.042	10080	695	0.084	17300	1700	
		16	0.050	14400	1415	0.045	12960	1275	0.040	12240	1205	0.033	10800	850	0.030	10080	695	0.060	17300	1700	
	0.5	20	0.050	11670	1150	0.045	10500	1030	0.040	9915	975	0.033	8750	765	0.030	8165	625	0.060	14000	1380	
		30	0.040	9070	1150	0.036	8170	1030	0.032	7710	975	0.026	6800	765	0.024	6350	625	0.048	10900	1380	
		8	0.180	14400	1570	0.162	12960	1415	0.144	12240	1340	0.117	10800	945	0.108	10080	770	0.216	17300	1890	
		12	0.130	14400	1570	0.117	12960	1415	0.104	12240	1340	0.085	10800	945	0.078	10080	770	0.156	17300	1890	
		16	0.100	14400	1570	0.090	12960	1415	0.080	12240	1340	0.065	10800	945	0.060	10080	770	0.120	17300	1890	
20	0.100	11670	1275	0.090	10500	1150	0.080	9915	1085	0.065	8750	850	0.060	8165	695	0.120	14000	1530			
30	0.080	9070	1275	0.072	8170	1150	0.064	7710	1085	0.052	6800	850	0.048	6350	695	0.096	10900	1530			



# Solid Carbide End Mills

## Recommended Cutting Data

### BMT Series

Material			Carbon Steels, Alloy Steels (180~250HB)			Stainless Steels, Tool Steels (25~35HRC)			Pre-hardened Steels, Tool Steels (35~45HRC)			Hardened Steels, (45~55HRC)			Hardened Steels, (55~65HRC)			Copper			
d <sub>t</sub> (mm)	R (mm)	L (mm)	a <sub>p</sub> (mm)	RPM (rev/min)	Feed (mm/min)	a <sub>p</sub> (mm)	RPM (rev/min)	Feed (mm/min)	a <sub>p</sub> (mm)	RPM (rev/min)	Feed (mm/min)	a <sub>p</sub> (mm)	RPM (rev/min)	Feed (mm/min)	a <sub>p</sub> (mm)	RPM (rev/min)	Feed (mm/min)	a <sub>p</sub> (mm)	RPM (rev/min)	Feed (mm/min)	
1.0	0.5	2	0.100	36000	1800	0.090	32400	1620	0.080	30600	1380	0.065	27000	1135	0.060	25200	1008	0.120	43200	2160	
		3	0.100	36000	1800	0.090	32400	1620	0.080	30600	1380	0.065	27000	1135	0.060	25200	1008	0.120	43200	2160	
		4	0.070	36000	1800	0.063	32400	1620	0.056	30600	1380	0.046	27000	1135	0.042	25200	1008	0.084	43200	2160	
		7	0.040	32400	1460	0.036	29160	1310	0.032	27540	1115	0.026	24300	920	0.024	22700	815	0.048	39000	1750	
		8	0.040	32400	1460	0.036	29160	1310	0.032	27540	1115	0.026	24300	920	0.024	22700	815	0.048	39000	1750	
	1.2	0.6	10	0.025	32400	1460	0.023	29160	1310	0.020	27540	1115	0.016	24300	920	0.015	22700	815	0.030	39000	1750
			12	0.025	28800	1225	0.023	25920	1100	0.020	24480	940	0.016	21600	770	0.015	20160	685	0.030	34560	1470
			14	0.020	28800	1225	0.018	25920	1100	0.016	24480	940	0.013	21600	770	0.012	20160	685	0.024	34560	1470
			16	0.015	28800	1225	0.014	25920	1100	0.012	24480	940	0.010	21600	770	0.009	20160	685	0.018	34560	1470
			18	0.012	25200	1010	0.011	22680	910	0.010	21420	770	0.008	18900	635	0.007	17650	565	0.014	30240	1210
1.4	0.7	20	0.010	21600	865	0.009	19450	780	0.008	18360	660	0.007	16200	545	0.006	15120	485	0.012	25900	1040	
		8	0.040	28800	1500	0.036	25920	1350	0.032	24480	1225	0.026	21600	950	0.024	20160	805	0.048	34560	1800	
		12	0.030	28800	1350	0.027	25920	1215	0.024	24480	1100	0.020	21600	855	0.018	20160	725	0.036	34560	1620	
1.5	0.75	8	0.055	25200	1510	0.050	22680	1360	0.044	21420	1160	0.036	18900	985	0.033	17650	880	0.066	30240	1815	
		12	0.035	25200	1360	0.032	22680	1225	0.028	21420	1040	0.023	18900	885	0.021	17650	795	0.042	30240	1635	
		16	0.035	22400	1140	0.032	20150	1030	0.028	19040	875	0.023	16800	745	0.021	15680	665	0.042	27000	1370	
1.6	0.8	4	0.100	28000	1850	0.090	25200	1665	0.080	23800	1430	0.065	21000	1135	0.060	19600	980	0.120	33600	2220	
		8	0.060	25200	1500	0.054	22680	1350	0.048	21420	1160	0.039	18900	920	0.036	17640	795	0.072	30240	1800	
		12	0.060	25200	1500	0.054	22680	1350	0.048	21420	1160	0.039	18900	920	0.036	17640	795	0.072	30240	1800	
		16	0.038	22400	1260	0.034	20150	1130	0.030	19040	970	0.025	16800	770	0.023	15680	665	0.046	27000	1510	
1.8	0.9	20	0.038	22400	1260	0.034	20150	1130	0.030	19040	970	0.025	16800	770	0.023	15680	665	0.046	27000	1510	
		8	0.110	26000	1820	0.099	23400	1640	0.088	22100	1370	0.072	19500	1170	0.066	18200	1020	0.132	31200	2185	
		12	0.065	23400	1475	0.059	21060	1330	0.052	19900	1110	0.042	17550	950	0.039	16380	825	0.078	28000	1770	
		16	0.040	23400	1475	0.036	21060	1330	0.032	19900	1110	0.026	17550	950	0.024	16380	825	0.048	28000	1770	
		20	0.040	20800	1240	0.036	18750	1115	0.032	17680	930	0.026	15600	780	0.024	14560	695	0.048	25000	1485	
		8	0.130	26000	2080	0.117	23400	1870	0.104	22100	1550	0.085	19500	1290	0.078	18200	1090	0.156	31200	2500	
2.0	1.0	12	0.070	23400	1685	0.063	21060	1520	0.056	19900	1255	0.046	17550	1045	0.042	16380	885	0.084	28000	2020	
		16	0.045	23400	1685	0.041	21060	1520	0.036	19900	1255	0.029	17550	1045	0.027	16380	885	0.054	28000	2020	
		20	0.045	20800	1415	0.041	18750	1280	0.036	17680	1050	0.029	15600	875	0.027	14560	745	0.054	25000	1700	
		3	0.200	21000	2100	0.180	18900	1890	0.160	17850	1610	0.130	15750	1355	0.120	14700	1175	0.240	25200	2520	
		4	0.200	21000	2100	0.180	18900	1890	0.160	17850	1610	0.130	15750	1355	0.120	14700	1175	0.240	25200	2520	
		6	0.200	21000	1890	0.180	18900	1700	0.160	17850	1430	0.130	15750	1200	0.120	14700	1060	0.240	25200	2270	
		8	0.140	21000	1890	0.126	18900	1700	0.112	17850	1430	0.091	15750	1200	0.084	14700	1060	0.168	25200	2270	
		10	0.140	21000	1680	0.126	18900	1510	0.112	17850	1285	0.091	15750	1070	0.084	14700	940	0.168	25200	2020	
		12	0.080	18900	1510	0.072	17000	1360	0.064	16065	1160	0.052	14175	965	0.048	13230	850	0.096	22700	1815	
		16	0.080	18900	1360	0.072	17000	1225	0.064	16065	1041	0.052	14175	868	0.048	13230	760	0.096	22700	1635	
		20	0.050	18900	1360	0.045	17000	1225	0.040	16065	1041	0.033	14175	868	0.030	13230	760	0.060	22700	1635	
		25	0.050	16800	1140	0.045	15150	1030	0.040	14280	875	0.033	12600	730	0.030	11760	640	0.060	20200	1370	
		30	0.030	16800	1140	0.027	15150	1030	0.024	14280	875	0.020	12600	730	0.018	11760	640	0.036	20200	1370	
		35	0.025	14700	940	0.023	13250	850	0.020	12500	720	0.016	11025	600	0.015	10300	530	0.030	17650	1130	
40	0.022	12600	805	0.020	11350	730	0.018	10700	620	0.014	9450	515	0.013	8800	450	0.026	15150	970			
3.0	1.5	8	0.300	16000	2400	0.270	14400	2160	0.240	13600	1820	0.195	12000	1512	0.180	11200	1345	0.360	19200	2900	
		10	0.210	16000	2400	0.189	14400	2160	0.168	13600	1820	0.137	12000	1512	0.126	11200	1345	0.252	19200	2900	
		16	0.210	16000	2160	0.189	14400	1945	0.168	13600	1640	0.137	12000	1360	0.126	11200	1210	0.252	19200	2600	
		25	0.080	14400	1945	0.072	13000	1750	0.064	12250	1480	0.052	10800	1225	0.048	10100	1090	0.096	17300	2335	
		30	0.080	14400	1945	0.072	13000	1750	0.064	12250	1480	0.052	10800	1225	0.048	10100	1090	0.096	17300	2335	
		35	0.080	12800	1630	0.072	11500	1470	0.064	10900	1240	0.052	9600	1030	0.048	8950	915	0.096	15350	1960	
		40	0.040	11500	2300	0.360	10350	2070	0.320	9800	1760	0.260	8625	1465	0.240	8050	1290	0.480	13800	2760	
4.0	2.0	16	0.280	11500	2300	0.252	10350	2070	0.224	9800	1760	0.182	8625	1465	0.168	8050	1290	0.336	13800	2760	
		25	0.160	10350	1865	0.144	9300	1680	0.128	8800	1425	0.104	7765	1200	0.096	7250	1045	0.192	12400	2240	
		35	0.100	10350	1865	0.090	9300	1680	0.080	8800	1425	0.065	7765	1200	0.060	7250	1045	0.120	12400	2240	
		40	0.100	10350	1865	0.090	9300	1680	0.080	8800	1425	0.065	7765	1200	0.060	7250	1045	0.120	12400	2240	
		50	0.100	9200	1565	0.090	8300	1410	0.080	7800	1200	0.065	6900	1000	0.060	6440	875	0.120	11000	1880	



# Solid Carbide End Mills

## Recommended Cutting Data

### PMZ / TM Series

Material	Carbon Steel, Alloy Steel (<30 HRC) Ck55, 070M55, Cast iron GG25				Alloy Steel, Tool Steel (30-45 HRC) W.Nr. 1.2344 (H13)				Austenitic Stainless Steel X5CrNi18-10 X5CrNiMo17-12-2 Titanium alloy				Hardened Steel (45-55 HRC) W.Nr. 1.2344 (H13)				Heat Resistant Alloys Inconel			
	Shoulder Milling		Slotting		Shoulder Milling		Slotting		Shoulder Milling		Slotting		Shoulder Milling		Slotting		Shoulder Milling		Slotting	
Operation	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)	RPM (rev/min)	Feed (mm/min)
2	21000	1100	17000	680	21000	1100	10000	400	14000	560	9600	310	9600	310	4800	130	4800	130	3200	80
3	15000	1250	12000	720	15000	1250	6900	410	10600	850	7400	380	7400	380	3200	140	4200	200	2700	110
4	11000	1400	9200	810	11000	1400	5600	490	8000	960	5600	400	5600	400	2400	150	3200	220	2000	120
5	9600	1920	7600	1060	9600	1920	4500	630	6400	1020	4500	410	4500	430	1900	170	2500	250	1600	130
6	8000	2240	6400	1280	8000	2240	3700	740	5300	1060	3700	440	3700	440	1600	190	2100	250	1300	160
7	6800	1900	5500	1210	6800	1900	3200	700	4500	1010	3200	410	3200	450	1400	190	1800	260	1100	140
8	6000	1680	4800	1150	6000	1680	2800	670	4000	960	2800	390	2800	450	1200	190	1600	260	1000	130
9	5300	1480	4200	1010	5300	1480	2500	600	3500	840	2500	350	2500	450	1100	180	1400	220	900	130
10	4800	1440	3800	910	4800	1440	2200	530	3200	770	2200	350	2200	440	1000	160	1300	210	800	130
11	4400	1350	3500	900	4400	1350	2000	530	2900	760	2000	320	2000	400	900	160	1200	190	720	120
12	4000	1250	3200	900	4000	1250	1900	530	2700	760	1900	300	1900	380	800	160	1100	180	660	110
13	3700	1180	2900	810	3700	1180	1700	480	2500	700	1700	290	1700	360	730	150	1000	160	610	100
14	3400	1160	2700	760	3400	1160	1600	450	2300	640	1600	290	1600	350	680	140	900	140	570	90
16	3000	1140	2400	670	3000	1140	1400	390	2000	560	1400	280	1400	340	600	120	800	130	500	80
18	2700	970	2100	670	2700	970	1200	380	1800	550	1200	270	1200	340	530	120	700	110	440	70
20	2400	860	1900	610	2400	860	1100	350	1600	510	1100	260	1100	330	480	120	600	100	400	60
Depth of cut	ae≤0.2D ap≤1.5D		ap≤1D (Max : 12 mm.)		ae≤0.2D ap≤1.5D		ap≤1D (Max : 12 mm.)		ae≤0.1D ap≤1.5D		ap≤0.5D		ae≤0.05D ap≤1.5D		ap≤0.2D		ae≤0.05D ap≤1.5D		ap≤0.2D	

- When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective. When cutting heat-resistant alloys, the use non water-soluble cutting fluid is recommended.
- If the depth of cut is shallow, the revolution and feed rate can be increased.
- The irregular helix flute end mill has a larger effect on controlling the vibrations when compared to standard end mills. However, if the rigidity or the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set the depth of cut smaller.
- For shoulder milling, climb cutting is recommended.

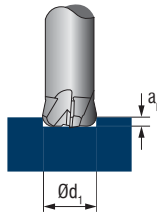


# Solid Carbide High Speed End Mills, With Corner Radius

## Recommended Cutting Data

SF5

Diametres (mm)	Material											
	Mild Steel Carbon steel, Cast iron ( $\sim 750 \text{ N/mm}^2$ )		Alloy steel, Tool Steel, Prehardened Steel (HRC 25 – 38)		Hardened Steel Stainless Steel (HRC 38 - 45)		Hardened Steel Heat Resistant Alloys, Titanium Alloy (HRC 45 – 55 HRC)		Hardened Steel (HRC 55 – 60 HRC)			
	Speed (rpm)	Feed (mm/min)	Speed (rpm)	Feed (mm/min)	Speed (rpm)	Feed (mm/min)	Speed (rpm)	Feed (mm/min)	Speed (rpm)	Feed (mm/min)		
4	15200	12350	15200	11400	11400	8550	11400	7790	7550	3370		
5	11870	13300	11870	12060	9070	9070	9070	8170	6030	3610		
6	10070	13300	10070	12060	7550	9070	7550	8170	5030	3610		
8	7550	13300	7550	12060	5650	9070	5650	8170	3800	3610		
10	6030	13300	6030	12060	4510	9070	4510	8170	3040	3610		
12	5030	13300	5030	12060	3800	9070	3800	8170	2520	3610		
Depth of cut	$a_p : 0,1 \times R$						$a_p$		$a_e$			
	$a_e : 0,3 \times \varnothing d_1$						$R \leq 2$	$0,1 \times R$	$0,3 \times \varnothing d_1$	$R \leq 2$	$0,05 \times R$	$0,3 \times \varnothing d_1$
							$2 < R$	0,2 mm	$0,3 \times \varnothing d_1$	$2 < R$	0,1 mm	$0,3 \times \varnothing d_1$





## Calculation of cutting speed and feed rate for drills

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Cutting Speed

$$V_c = \frac{\pi \times d_1 \times n}{1000}$$

Feed Rate For Drills

$$V_f = n \times f_n$$

$$n = \frac{1000 \times V_c}{\pi \times d_1}$$

$V_c$  : Cutting speed (m / min)  
 $d_1$  : End Mill diameter (mm)  
 $n$  : Revolution (rpm)

$V_f$  : Feed speed (mm / min)  
 $f_n$  : Feed rate per revolution (mm / r)



# Solid Carbide Drills Without External Coolant Recommended Cutting Data

## D302 / D502 / DM-502 / DM-802 Series

Material Group			Cutting Speed	$f_n$ mm/rev.					
				Drill Diameter (mm)					
			Vc m/min.	3 - 5 mm	5 - 8 mm	8 - 12 mm	12 - 16 mm	16 - 20 mm	
Steel and Cast Steel	Low-alloy steel and cast steel up to 600 N/mm <sup>2</sup>	Si37 - Si42 - C22 - GS38	65 - 145	0.09 - 0.13	0.16 - 0.23	0.2 - 0.30	0.26 - 0.37	0.28 - 0.40	
	Steel and cast steel up to 600 N/mm <sup>2</sup>	Si50 - Si60 - C35 - GS52	60 - 140	0.09 - 0.13	0.16 - 0.23	0.2 - 0.30	0.26 - 0.35	0.28 - 0.40	
	Steel and cast steel 700 - 1000 N/mm <sup>2</sup>	Si70 - C45 - GS62	50 - 120	0.06 - 0.14	0.11 - 0.25	0.14 - 0.31	0.17 - 0.39	0.19 - 0.44	
	Steel and cast steel 1000 - 1300 N/mm <sup>2</sup>	90MnCrV8 - 100Cr6	40 - 70	0.05 - 0.09	0.09 - 0.16	0.12 - 0.20	0.15 - 0.25	0.16 - 0.27	
	Steel and cast steel 1300 - 1600 N/mm <sup>2</sup>	X210Cr12 - 34CrAlNi7	30 - 40	0.03 - 0.05	0.06 - 0.08	0.07 - 0.11	0.09 - 0.13	0.1 - 0.15	
	Steel hardened	45 - 55 HRC	15 - 30	0.025 - 0.036	0.032 - 0.06	0.05 - 0.072	0.067 - 0.096	0.075 - 0.11	
	Steel hardened	55 - 65HRC	10 - 15	0.008 - 0.012	0.009 - 0.015	0.017 - 0.024	0.025 - 0.036	0.025 - 0.036	
	Stainless steel ferritic		35 - 85	0.069 - 0.12	0.85 - 0.14	0.15 - 0.26	0.19 - 0.32	0.22 - 0.38	
	Stainless steel austenitic, sulphured		40 - 80	0.04 - 0.07	0.07 - 0.13	0.10 - 0.17	0.13 - 0.22	0.15 - 0.25	
	Stainless steel hardened		25 - 45	0.04 - 0.07	0.07 - 0.12	0.08 - 0.14	0.11 - 0.18	0.12 - 0.21	
Ni and Co alloys	up to 900 N/mm <sup>2</sup>		15 - 30	0.03 - 0.05	0.05 - 0.08	0.07 - 0.11	0.09 - 0.13	-	
	between 900 - 1200 N/mm <sup>2</sup>		10 - 20	0.02 - 0.04	0.05 - 0.07	0.06 - 0.09	0.07 - 0.11	-	
	above 1200 N/mm <sup>2</sup>		5 - 15	0.02 - 0.03	0.04 - 0.05	0.06 - 0.08	0.07 - 0.09		
Grey and Nodular Cast Iron	up to 200 HB	GG20, GGG40, GTS45	75 - 90	0.15 - 0.25	0.20 - 0.35	0.25 - 0.45	0.30 - 0.50	0.35 - 0.55	
	up to 250 HB	GG30, GGG60, GTW40	65 - 80						
	above 250 HB	GG40, GGG70, GTS70	55 - 70	0.12 - 0.20	0.15 - 0.25	0.20 - 0.35	0.25 - 0.40	0.30 - 0.45	
Malleable cast iron	between 350 - 450 HB		35 - 60	0.06 - 0.10	0.08 - 0.12	0.10 - 0.14	0.12 - 0.16	0.14 - 0.18	
Aluminium	Aluminium < 10% Si		80 - 300	0.07-0.15	0.10 - 0.25	0.15 - 0.35	0.25 - 0.45	0.30 - 0.50	
	Aluminium > 10% Si		70 - 200	0.07-0.15	0.10 - 0.25	0.15 - 0.35	0.25 - 0.45	0.30 - 0.50	
Titanium	WASPALLOY	NiCr20Co14MoTi	10 - 30	0.02 - 0.5	0.02 - 0.07	0.04 - 0.10	0.06 - 0.12	0.08 - 0.15	
	INCONEL	NiCr20Co18MoNb							
	NIMONIC	NiCr20Co18Ti							
	RENE 41	NiCr20Co11TiAl							

NC5, reduce cutting data 30%.



# Solid Carbide Drills With Internal Coolant

## Recommended Cutting Data

### D312 / D512 Series

Material Group			Cutting Speed	f <sub>n</sub> mm/rev.				
				Drill Diameter (mm)				
			Vc m/min.	3 - 5 mm	5 - 8 mm	8 - 12 mm	12 - 16 mm	16 - 20 mm
Steel and Cast Steel	Low-alloy steel and cast steel up to 600 N/mm <sup>2</sup>	Si37 - Si42 - C22 - GS38	75 - 180	0.09 - .13	0.16 - 0.23	0.2 - 0.29	0.26 - 0.37	0.28 - 0.41
	Steel and cast steel up to 600 N/mm <sup>2</sup>	Si50 - Si60 - C35 - GS52	65 - 155	0.09 - 0.13	0.16 - 0.23	0.2 - 0.29	0.26 - 0.37	0.28 - 0.41
	Steel and cast steel 700 - 1000 N/mm <sup>2</sup>	Si70 - C45 - GS62	55 - 135	0.06 - 0.14	0.11 - 0.25	0.14 - 0.31	0.17 - 0.39	0.19 - 0.44
	Steel and cast steel 1000 - 1300 N/mm <sup>2</sup>	90MnCrV8 - 100Cr6	45 - 80	0.05 - 0.09	0.09 - 0.16	0.12 - 0.2	0.15 - 0.25	0.16 - 0.27
	Steel and cast steel 1300 - 1600 N/mm <sup>2</sup>	X210Cr12 - 34CrAlNi7	45 - 80	0.05 - 0.09	0.09 - 0.16	0.12 - 0.2	0.15 - 0.25	0.16 - 0.27
	Steel hardened	45 - 55 HRC	25 - 40	0.025 - 0.036	0.04 - 0.06	0.05 - 0.07	0.065 - 0.095	0.075 - 0.11
	Steel hardened	55 - 65HRc	20 - 30	0.015 - 0.025	0.02 - 0.04	0.03 - 0.05	0.045 - 0.075	0.055 - 0.09
	Stainless steel ferritic		45 - 105	0.070 - 0.12	0.13 - 0.22	0.16 - 0.27	0.2 - .34	0.22 - 0.38
	Stainless steel austenitic, sulphured		45 - 85	0.035 - 0.075	0.09 - 0.16	0.12 - 0.21	0.15 - 0.25	0.18 - 0.3
	Stainless steel hardened		35 - 55	0.045 - 0.080	0.075 - 0.13	0.11 - 0.18	0.13 - 0.22	0.15 - 0.25
Ni and Co alloys	up to 900 N/mm <sup>2</sup>		25 - 40	0.030 - 0.045	0.055 - 0.080	0.75 - 0.11	0.090 - 0.13	0.11 - 0.16
	between 900 - 1200 N/mm <sup>2</sup>		15 - 25	0.025 - 0.035	0.040 - 0.060	0.05 - 0.070	0.065 - 0.095	0.075 - 0.11
	above 1200 N/mm <sup>2</sup>		10 - 15	0.020 - 0.030	0.040 - 0.055	0.045 - 0.065	0.060 - 0.080	0.070 - 0.095
Grey and Nodular Cast Iron	up to 200 HB	GG20, GGG40, GTS45	85 - 105	0.15 - 0.25	0.20 - 0.35	0.25 - 0.45	0.30 - 0.50	0.35 - 0.55
	up to 250 HB	GG30, GGG60, GTW40	75 - 90	0.15 - 0.26	0.20 - 0.36	0.25 - 0.46	0.30 - 0.51	0.35 - 0.56
	above 250 HB	GG40, GGG70, GTS70	65 - 80	0.12 - 0.20	0.15 - 0.25	0.20 - 0.35	0.25 - 0.40	0.30 - 0.45
Malleable cast iron	between 350 - 450 HB		40 - 70	0.06 - 0.10	0.08 - 0.12	0.10 - 0.14	0.12 - 0.16	0.14 - 0.18
Aluminium	Aluminium < 10% Si		100 - 400	0.10 - 0.25	0.15 - 0.35	0.25 - 0.45	0.30 - 0.50	0.35 - 0.55
	Aluminium > 10% Si		90 - 300	0.10 - 0.26	0.15 - 0.36	0.25 - 0.46	0.30 - 0.51	0.35 - 0.56
Titanium	WASPALLOY	NiCr20Co14MoTi	15 - 35	0.02 - 0.07	0.04 - 0.10	0.06 - 0.12	0.08 - 0.15	0.08 - 0.18
	INCONEL	NiCr20Co18MoNb						
	NIMONIC	NiCr20Co18Ti						
	RENE 41	NiCr20Co11TiAl						





# Solid Carbide Drills With Internal Coolant from 8xd Recommended Cutting Data

## D812 Series

Material Group			Drilling Depth	Cutting Speed	f <sub>i</sub> mm/rev.			
					Drill Diameter (mm)			
					4 - 8 mm	8 - 12 mm	12 - 16 mm	16 - 20 mm
Steel and Cast Steel	Low-alloy steel and cast steel up to 600 N/mm <sup>2</sup>	St37 - St42 - C22 - GS38	between 8 -12 x d	75 - 150	0.09 - 0.27	0.17 - 0.32	0.24 - 0.32	0.30 - 0.43
			between 12 -16 x d	60 - 120	0.08 - 0.26	0.16 - 0.30	0.23 - 0.31	0.28 - 0.40
	Steel and cast steel up to 600 N/mm <sup>2</sup>	St50 - St60 - C35 - GS52	between 8 -12 x d	75 - 150	0.08 - 0.26	0.16 - 0.30	0.23 - 0.31	0.25 - 0.40
			between 12 -16 x d	60 - 120	0.07 - 0.25	0.15 - 0.29	0.21 - 0.30	0.24 - 0.38
	Steel and cast steel 700 - 1000 N/mm <sup>2</sup>	St70 - C45 - GS62	between 8 -12 x d	60 - 120	0.07 - 0.25	0.14 - 0.29	0.22 - 0.39	0.24 - 0.39
			between 12 -16 x d	60 - 100	0.07 - 0.24	0.14 - 0.28	0.20 - 0.28	0.23 - 0.38
	Steel and cast steel 1000 - 1600 N/mm <sup>2</sup>	90MnCrV8 - 100Cr6	between 8 -12 x d	40 - 100	0.04 - 0.16	0.10 - 0.18	0.12 - 0.20	0.14 - 0.22
			between 12 -16 x d	30 - 80	0.04 - 0.16	0.10 - 0.18	0.12 - 0.20	0.14 - 0.22
	Stainless steel ferritic		between 8 -12 x d	25 - 40	0.05 - 0.16	0.12 - 0.18	0.14 - 0.20	0.16 - 0.24
			between 12 -16 x d	20 - 40	0.05 - 0.16	0.12 - 0.18	0.14 - 0.20	0.16 - 0.24
Stainless steel austenitic, sulphured		between 8 -12 x d	40 - 60	0.05 - 0.16	0.12 - 0.18	0.14 - 0.20	0.16 - 0.24	
		between 12 -16 x d	30 - 50	0.05 - 0.16	0.12 - 0.18	0.14 - 0.20	0.16 - 0.24	
Stainless steel austenitic		between 8 -12 x d	20 - 50	0.04 - 0.14	0.06 - 0.15	0.08 - 0.17	0.10 - 0.20	
		between 12 -16 x d	20 - 40	0.04 - 0.14	0.06 - 0.15	0.08 - 0.17	0.10 - 0.20	
Grey and Nodular Cast Iron		GG20, GGG40, GTS45	between 8 -12 x d	80 - 140	0.10 - 0.25	0.12 - 0.30	0.14 - 0.35	0.16 - 0.45
			between 12 -16 x d	70 - 120	0.08 - 0.27	0.10 - 0.28	0.12 - 0.34	0.15 - 0.42
	up to 250 HB	GG30, GGG60, GTW40	between 8 -12 x d	75 - 130	0.10 - 0.25	0.12 - 0.30	0.14 - 0.35	0.16 - 0.45
			between 12 -16 x d	60 - 120	0.08 - 0.28	0.10 - 0.28	0.12 - 0.34	0.15 - 0.42
above 250 HB	GG40, GGG70, GTS70	between 8 -12 x d	75 - 100	0.08 - 0.20	0.10 - 0.25	0.12 - 0.30	0.14 - 0.40	
		between 12 -16 x d	40 - 80	0.06 - 0.18	0.08 - 0.22	0.10 - 0.28	0.12 - 0.35	
Malleable cast iron	between 350 - 450 HB		between 8 -12 x d	50 - 100	0.07 - 0.19	0.09 - 0.24	0.11 - 0.29	0.13 - 0.39
			between 12 -16 x d	40 - 70	0.05 - 0.18	0.07 - 0.22	0.09 - 0.28	0.11 - 0.35
Aluminium	Aluminium < 10% Si		between 8 -12 x d	200 - 450	0.10 - 0.30	0.14 - 0.35	0.18 - 0.40	0.20 - 0.50
			between 12 -16 x d	175 - 350	0.09 - 0.28	0.13 - 0.33	0.17 - 0.38	0.19 - 0.48
	Aluminium > 10% Si		between 8 -12 x d	150 - 300	0.09 - 0.29	0.13 - 0.34	0.17 - 0.39	0.19 - 0.49
			between 12 -16 x d	125 - 250	0.08 - 0.27	0.12 - 0.32	0.16 - 0.37	0.18 - 0.47
Titanium	WASPALLOY	Ni Cr 20 Co 14 Mo Ti	between 8 -12 x d between 12 -16 x d	20 - 40 10 - 30	0.04 - 0.08 0.03 - 0.07	0.06 - 0.11 0.05 - 0.10	0.08 - 0.14 0.07 - 0.13	0.10 - 0.17 0.09 - 0.16
	INCONEL	Ni Cr 20 Co 18 Mo Nb						
	NIMONIC	Ni Cr 20 Co 18 Ti						
	RENE 41	Ni Cr 20 Co 11 Ti Al						



## Solid Carbide Drills With Internal Coolant from 8xd

R <sub>m</sub> [N/mm <sup>2</sup> ]	HV 10	HB	HRC
240	75	71	
255	80	76	
270	85	81	
285	90	86	
305	95	90	
320	100	95	
335	105	100	
350	110	105	
370	115	109	
385	120	114	
400	125	119	
415	130	124	
430	135	128	
450	140	133	
465	145	138	
480	150	143	
495	155	147	
510	160	152	
530	165	157	
545	170	162	
560	175	166	
575	180	171	
595	185	176	
610	190	181	
625	195	185	
640	200	190	
660	205	195	
675	210	199	
690	215	204	
705	220	209	
720	225	214	
740	230	219	
755	235	223	
770	240	228	
785	245	233	
800	250	238	22
820	255	242	23
835	260	247	24
860	268	255	25
870	272	258	26
900	280	266	27

R <sub>m</sub> [N/mm <sup>2</sup> ]	HV 10	HB	HRC
920	287	273	28
940	293	278	29
970	302	287	30
995	310	295	31
1020	317	301	32
1050	327	311	33
1080	336	319	34
1110	345	328	35
1140	355	337	36
1170	364	346	37
1200	373	354	38
1230	382	363	39
1260	392	372	40
1300	403	383	41
1330	413	393	42
1360	423	402	43
1400	434	413	44
1440	446	424	45
1480	458	435	46
1530	473	449	47
1570	484	460	48
1620	497	472	49
1680	514	488	50
1730	527	501	51
1790	544	517	52
1845	560	532	53
1910	578	549	54
1980	596	567	55
2050	615	584	56
2140	639	607	57
	655	622	58
	675		59
	698		60
	720		61
	745		62
	773		63
	800		64
	829		65
	864		66
	900		67
	940		68



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