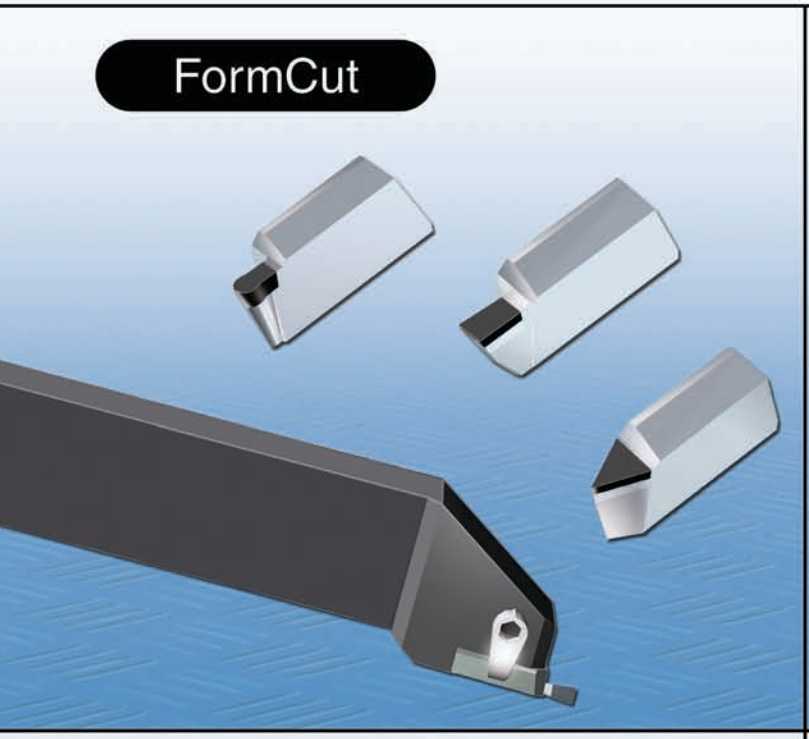
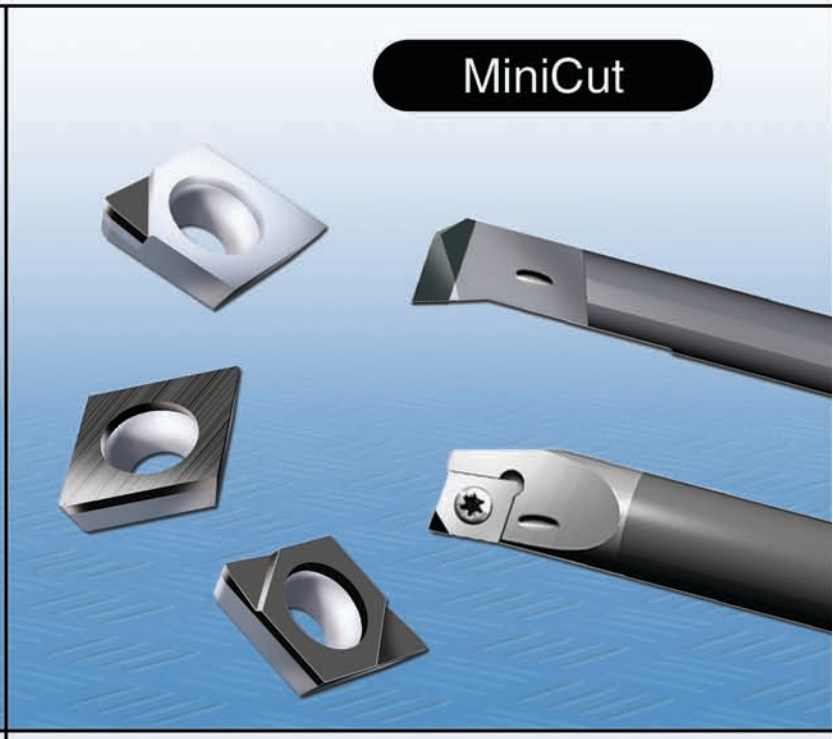
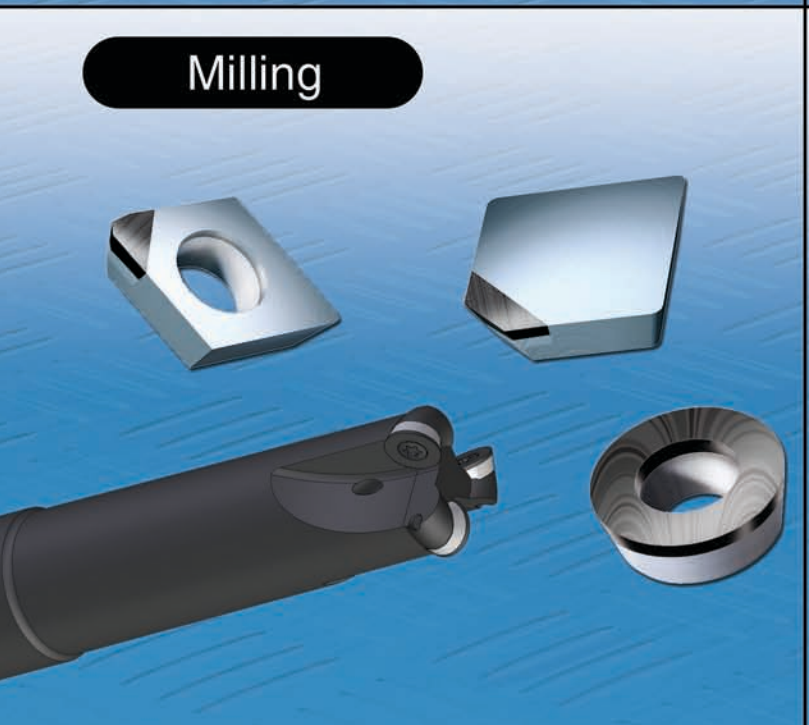
RTC Rani Tool Corp.

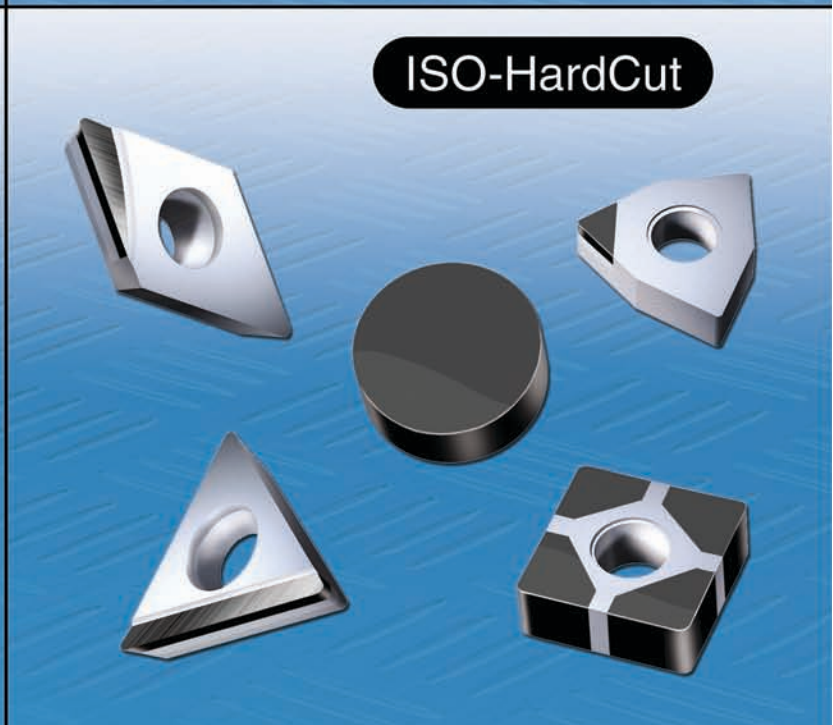
High Performance Milling Cutters & Inserts

PCD / CBN
Inserts & Tooling









BECKER

Taking Non-Ferrous Machining to New Heights

PCD Chipbreaking Revolution!

Call for your Chipbreaker Catalog today!

Unsurpassed chip control and dramatically increased tool life

Low cutting pressure results in minimal heat expansion

True 3D PCD chipbreaker forms produced at the cutting point

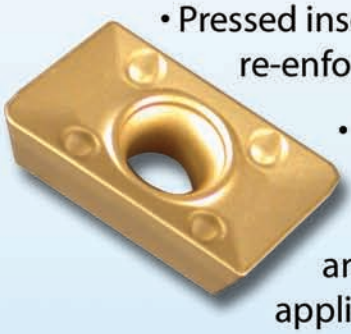
MAXICOOL™

An extensive line of

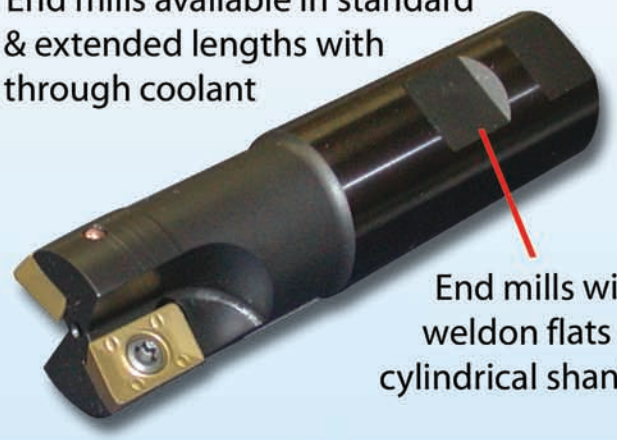
through coolant face mills & through coolant arbors

Maximize tool life & surface finish, while minimizing thermal shock & re-cutting of chips

A90 High Shear Square Shoulder Milling Cutters



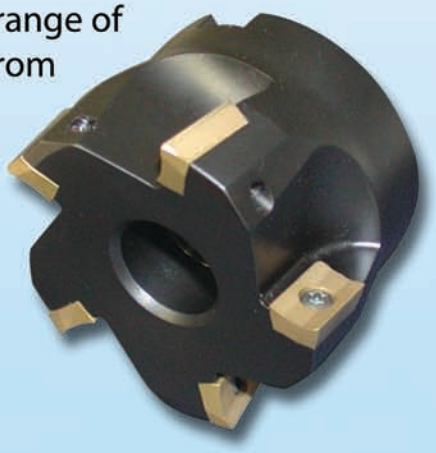
- Pressed insert with re-enforced cutting edge
- Allows for high machining rates in semi-finishing and rough milling applications

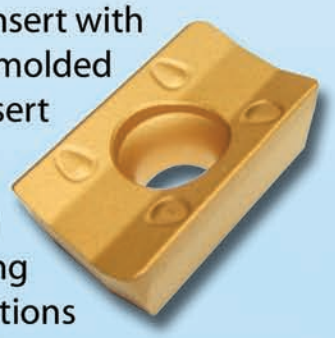


- End mills available in standard & extended lengths with through coolant

End mills with weldon flats or cylindrical shanks

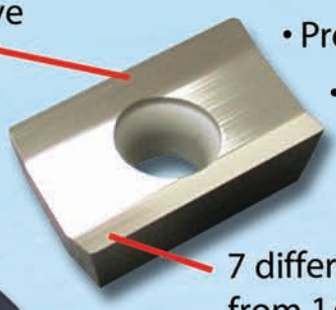
- Complete range of face mills from 1½" to 8"





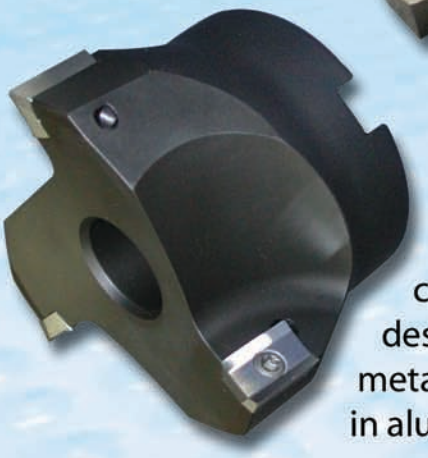
- Pressed insert with extra chip control molded into the top of the insert
- For high machining rates in semi-finishing and rough milling operations

Higher positive rake angle



- Precision insert
- Specially designed for aluminum

7 different radii from 1/32" to 5/32"



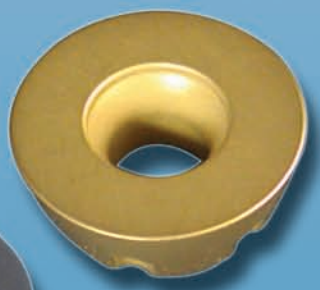
- Coarse pitch cutters specifically designed for high metal removal rates in aluminum

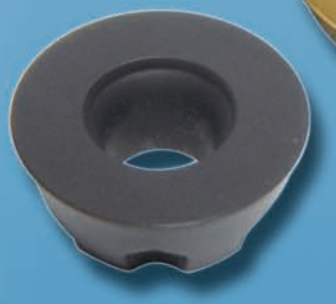
Available in threaded shanks: M6, M8, M10, M12 & M16

- Wide range of screw-on mills for modular milling system

R360
Copy Milling Cutters

New Sizes Available
for Face Mills & End Mills
in 8mm & 10mm Insert Range!





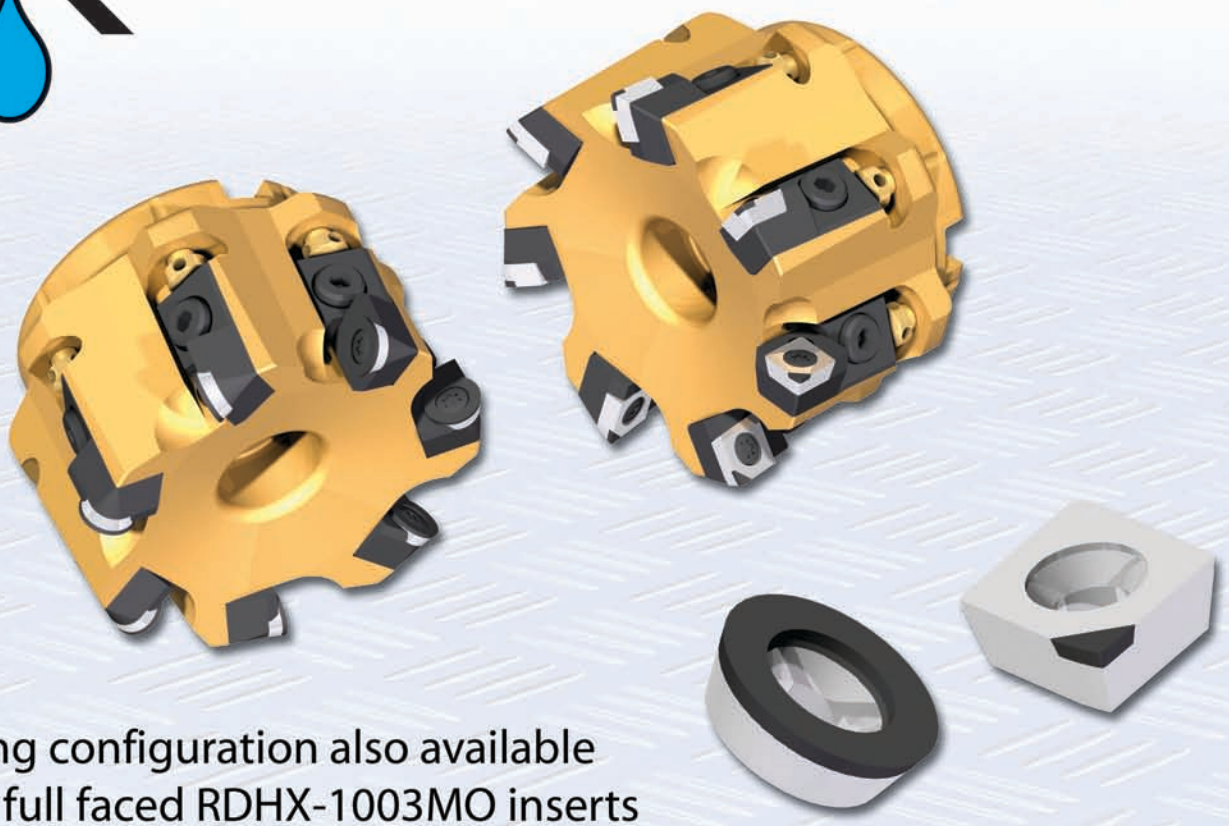
- **Positive insert geometry enabling a smoother cutting action, resulting in better surface finishes**
- **Robust design with large chip gullets for an efficient evacuation of chips**
- **Ability to face, copy and plunge with the same cutter, thus allowing more versatility and fewer setups**
- **Integrated anti-rotation lock on 12 and 16mm inserts for more precise insert indexing**
- **Lower cutting forces at higher feeds**
- **Ideally suited for mold and die manufacturing**

CP90 AL Milling Cutters

Featuring BECKER PCD Inserts

New advanced milling cutter program engineered for high speed machining of non-ferrous materials

Ultra precise finishing with unique wiper-radius PCD inserts and micro-adjustable cartridges



Copy Milling configuration also available using PCD full faced RDHX-1003MO inserts

Milling cutter bodies made from light weight 7075-T6 aviation grade aluminum

Maxicool through coolant enabled for maximum chip evacuation and temperature control

Turning Tools & Inserts

Carbide End Mills

ORION

2 & 3 Flute Aluminum Series End Mills

Achieve maximum performance in:

- Aluminum
- Non-ferrous metals

- Use the two flute style for greater stock removal and flute volume
- Use the three flute style for finishing applications or roughing on lower horsepower machines

Great for roughing & finishing!

Ideal for finishing and low horsepower applications!

STRATUS

High Performance Variable Flute Carbide End Mills

For maximum performance in:

- inconel
- tool steels
- stainless steels
- titanium
- low & medium carbon steels
- high temperature alloys
- cast iron

Performance leader in:

- reliability ..... *delivers the quality & performance you expect*
- durability ..... *stands up to the most extreme conditions*
- productivity ..... *attacks the most demanding application*
- longevity ..... *reduced chatter enhances tool life*
- versatility ..... *one tool for slotting, pocketing, roughing, & finishing*

VEGA

Super High Output 6 Flute Carbide End Mills

For maximum performance in:

- inconel 625 & 718
- titanium 6AL-4V
- monel
- rene 41
- waspalloy
- hastelloy-C
- hardened tool & die steels

Performance leader in:

- reliability ..... *specially formulated carbide grade delivers reliable performance*
- versatility ..... *roughing applications to fine finishing cuts with same tool*
- durability ..... *long life due to new coating technology*
- range ..... *regular, long reach, neck relieved, and radius tools available as standards*

Milling Grade Comparisons

Rani Tool Corp. grades are designed to deliver long tool life in a variety of applications. We are providing this grade comparison in order to help you in selecting the proper Rani Tool Corp. grades. We are in no way implying that our grades are the same as any of the competitors listed in this chart. They are better!

Grade ISO	Company						
	Rani Tool Corp.	Iscar	Kennametal	Kyocera	Mitsubishi	Plansee	Sandvik
HC-P25	MPS RP350 SLK MPX	IC520M IC250	KC725M	PR630	F7030 F620	Sr226	GC4020 GC4030
HC-P35	RP354 TP30MC SLX	IC928 IC635	KC735M	PR660	--	Sr246 GM43	GC4030 GC4040
HC-M40	RP350 RM352	IC328	KC710	PR660	UP20M	GM246	GC2030 GC2040
HC-K15	RK150 RP350 TK10MP HMF* TK20*	IC220	KC992M	PR510	F5010	Sr216	GC3020

*** Uncoated polished for non-ferrous materials**

Grade ISO	Company						
	Rani Tool Corp.	Seco	Sumitomo	Toshiba	Valenite	Walter	Widia
HC-P25	MPS RP350 SLK MPX	F30M T25M	ACZ310	T325	--	WTL41 WAP25 WQM25	TN7525
HC-P35	RP354 TP30MC SLX	F40M	ACZ350	GH330	--	WTL71 WAP35 WQM35	TN7535 TN450
HC-M40	RP350 RM352	FT25M	ACZ350	GH330	--	WTL71 WAP35 WQM35	TPC35
HC-K15	RK150 RP350 TK10MP HMF* TK20*	T150M	AC211	T1020	VN8	WAK15 WAK25	TN5515

*** Uncoated polished for non-ferrous materials**

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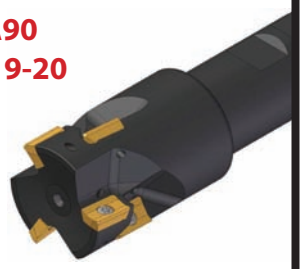

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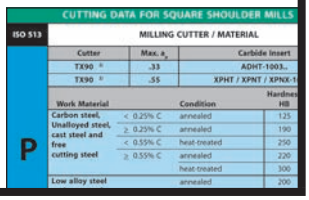

CUTTING DATA FOR SQUARE SHOULDER MILLS

ISO 513	MILLING CUTTER / MATERIAL		
	Cutter	Max. a_p	Carbide Insert
	TX90 [1]	.33	ADHT-1003...
	TX90 [2]	.55	XPHT / XPNT / XPNX-1

	Work Material		Condition	Hardness HB
P	Carbon steel, Unalloyed steel, cast steel and free cutting steel	< 0.25% C	annealed	125
		≥ 0.25% C	annealed	190
		< 0.55% C	heat-treated	250
		≥ 0.55% C	annealed	220
			heat-treated	300
	Low alloy steel		annealed	200

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Milling

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This completely updated milling section features many new tools to improve your part processing and shop through put. Choose the right milling tool for your applications from one of the largest standard tool offerings available. New carbide grades take advantage of the latest coating technologies to deliver long life at maximum feeds and speeds. New designs for milling aluminum and aerospace materials, as well as our new high performance carbide end mill program may be found in this catalog.

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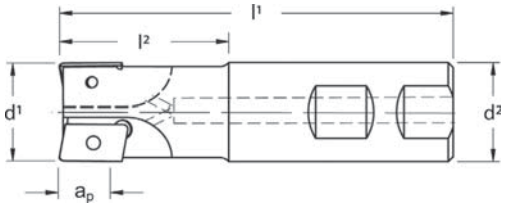
High Shear Square Shoulder Milling Cutters

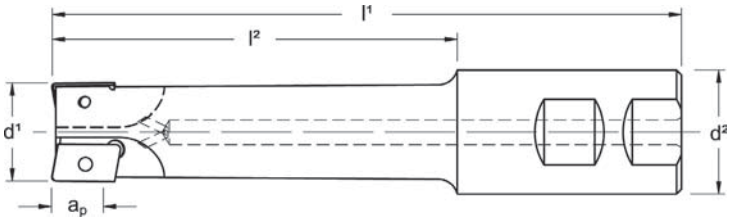


Standard Length End Mills with Coolant

Designation	d¹	d²	l¹	l²	Max. a_p	Flutes	Insert	Insert Screw	Wrench
AD90-0500C	.500	.625	3.00	1.09	.33	1	ADHT-0903__	TX08S	T8F
AD90-0625C	.625	.625	3.00	1.09	.33	2			
AD90-0750C	.750	.750	3.50	1.47	.33	2			
AD90-0750FC	.750	.750	3.50	1.47	.33	3			
AD90-0875C	.875	.750	3.50	1.47	.33	3			
AD90-1000C	1.000	.750	3.50	1.47	.33	3			
AD90-1000-4C	1.000	1.000	4.00	1.72	.33	3			
AD90-1000FC	1.000	1.000	4.00	1.72	.33	4			
AD90-1250C	1.250	1.250	4.00	1.72	.33	5			
AD90-1500C	1.500	1.250	4.40	2.12	.33	5			
AP90-0750C	.750	.750	3.50	1.47	.55	1	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP90-1000C	1.000	.750	3.70	1.67	.55	2			
AP90-1000-4C	1.000	1.000	4.00	1.72	.55	2			
AP90-1250C	1.250	1.250	4.00	1.72	.55	3			
AP90-1500C	1.500	1.250	4.40	2.12	.55	3			
AP90-1500FC	1.500	1.250	4.40	2.12	.55	4			
AP90-2000EMC	2.000	1.250	4.00	1.72	.55	4			

Remember to use COPASLIP® anti-seize compound on all insert screws

High Shear Square Shoulder Milling Cutters



Extended Length End Mills with Coolant

Designation	d¹	d²	l¹	l²	Max. a_p	Flutes	Insert	Insert Screw	Wrench
AD90-0500-XLC	.500	.625	3.91	2.00	.33	1	ADHT-0903__	TX08S	T8F
AD90-0625-XLC	.625	.750	4.53	2.50	.33	2			
AD90-0750-LC	.750	.750	3.78	1.75	.33	2			
AD90-0750-XLC	.750	1.000	4.81	2.53	.33	2			
AD90-0750-XXLC	.750	1.000	6.31	4.03	.33	2			
AD90-1000-4XXLC	1.000	1.000	8.00	2.25	.33	3			
AP90-1000-4LC	1.000	1.000	5.28	3.00	.55	2	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP90-1000-4XXLC	1.000	1.000	8.00	2.25	.55	2			
AP90-1000-5LC	1.000	1.250	5.00	2.72	.55	2			
AP90-1000-5XLC	1.000	1.250	6.40	4.12	.55	2			
AP90-1000-5XXLC	1.000	1.250	8.40	6.12	.55	2			
AP90-1250-LC	1.250	1.250	5.00	2.72	.55	3			
AP90-1250-XLC	1.250	1.250	6.40	4.12	.55	3			
AP90-1250-5XXLC	1.250	1.250	10.00	3.00	.55	3			
AP90-1500-LC	1.500	1.250	6.00	3.72	.55	3			
AP90-1500-XLC	1.500	2.000	7.25	4.00	.55	3			
AP90-1500-5XXLC	1.500	1.250	10.00	7.72	.55	3			
AP90-1500-XXLC	1.500	2.000	9.25	6.00	.55	3			

Remember to use COPASLIP® anti-seize compound on all insert screws

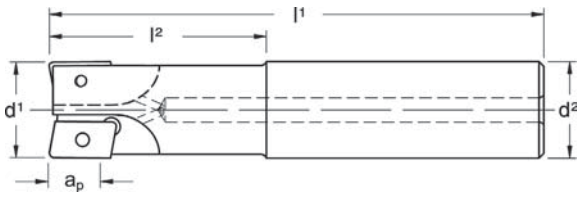
High Shear Square Shoulder Milling Cutters

Featuring:

- Cylindrical Shanks
- Coolant through
- Extra long shanks

Specifically designed for:

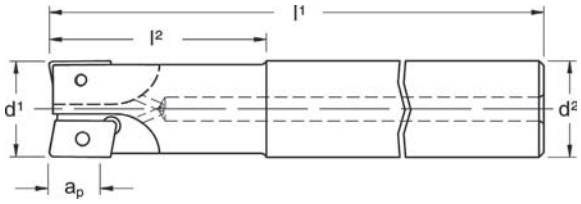
- Milling Chucks
- Hydraulic Chucks
- Shrink-fit Systems



Standard Length Cylindrical Shank End Mills with Coolant

Designation	d¹	d²	l¹	l²	Max. a_p	Flutes	Insert	Insert Screw	Wrench
AD90CY-0625C	.625	.625	3.00	1.09	.33	2	ADHT-0903__	TX08S	T8F
AD90CY-0750C	.750	.750	3.50	1.46	.33	2			
AD90CY-1000-4C	1.000	1.000	4.00	1.71	.33	3			
AP90CY-1000-4C	1.000	1.000	4.00	1.71	.55	2	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP90CY-1250-5C	1.250	1.250	4.00	1.71	.55	3			
AP90CY-1500-5C	1.500	1.250	4.50	2.00	.55	4			

Remember to use COPASLIP® anti-seize compound on all insert screws

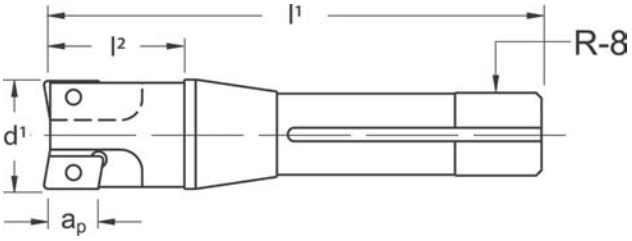


Extended Length Cylindrical Shank End Mills with Coolant

Designation	d¹	d²	l¹	l²	Max. a_p	Flutes	Insert	Insert Screw	Wrench
AD90CY-0625-XXLC	.625	.625	6.00	2.00	.33	2	ADHT-0903__	TX08S	T8F
AD90CY-0750-XXLC	.750	.750	8.00	2.00	.33	2			
AD90CY-1000-4XXLC	1.000	1.000	8.00	2.25	.33	3			
AP90CY-1000-4XXLC	1.000	1.000	8.00	2.25	.55	2	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP90CY-1250-5XXLC	1.250	1.250	10.00	3.00	.55	3			
AP90CY-1500-5XXLC	1.500	1.250	10.00	7.50	.55	3			

Remember to use COPASLIP® anti-seize compound on all insert screws

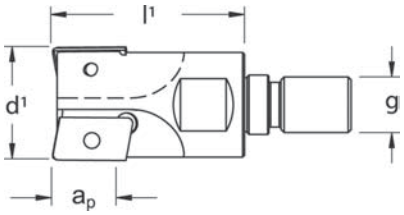
High Shear Square Shoulder Milling Cutters



R-8 Shank End Mills

Designation	d¹	Shank	l¹	l²	Max. a_p	Flutes	Insert	Insert Screw	Wrench
AP90-1250-R8	1.250	R-8	5.63	1.50	.55	3	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP90-1500-R8	1.500	R-8	5.63	1.50	.55	3			
AP90-2000-R8	2.000	R-8	5.63	1.50	.55	3			

Remember to use COPASLIP® anti-seize compound on all insert screws



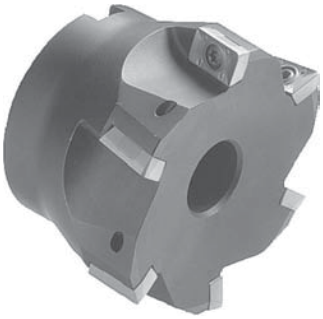
Screw-On Milling Cutters

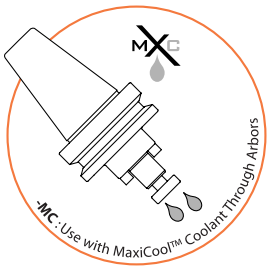
Designation	d¹	d¹ mm	g	l¹	Max. a_p	Flutes	Insert	Insert Screw	Wrench
AD90-0500-TS	.500	12.70	M6	1.10	.33	1	ADHT-0903__	TX08S	T8F
AD90-0625-TS	.625	15.87	M8	1.10	.33	2			
AD90-0750-TS	.750	19.05	M10	1.18	.33	2			
AD90-0984-TS	.984	25.00	M12	1.18	.33	3			
AD90-1000-TS	1.000	25.40	M12	1.50	.33	3			
AD90-1260-TS	1.260	32.00	M16	1.57	.33	5			
AP90-0975-TS	.975	24.77	M12	1.50	.55	2	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP90-0984-TS	.984	25.00	M12	1.18	.55	2			
AP90-1000-TS	1.000	25.40	M12	1.50	.55	2			
AP90-1250-TS	1.250	31.75	M16	1.75	.55	3			
AP90-1260-TS	1.260	32.00	M16	1.57	.55	3			
AP90-1378-TS	1.378	35.00	M16	1.57	.55	3			
AP90-1500-TS	1.500	38.10	M16	1.75	.55	3			
AP90-1575-TS	1.575	40.00	M16	1.57	.55	4			

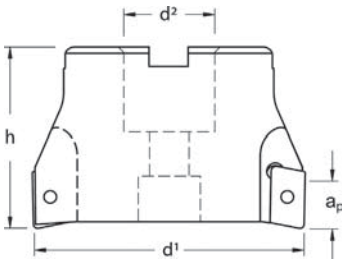
Remember to use COPASLIP® anti-seize compound on all insert screws

A90

High Shear Square Shoulder Milling Cutters







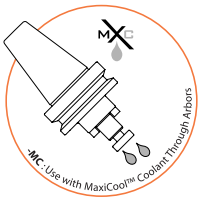
Standard Series Face Mills

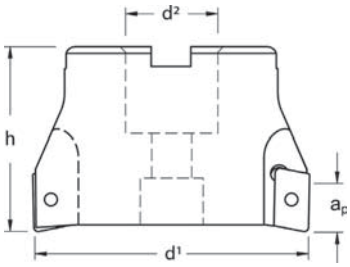
Designation	d¹	d²	h	Max. a_p	Flutes	lbs.	Insert	Insert Screw	Wrench
AD90-1500SM-MC	1.500	.750	1.75	.33	5	.55	ADHT-0903__	TX08S	T8F
AD90-2000-MC	2.000	.750	1.50	.33	7	.70			
AP90-1500SM-MC	1.500	.750	1.75	.55	4	.45	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP90-2000-MC	2.000	.750	1.50	.55	4	.60			
AP90-2000F-MC	2.000	.750	1.50	.55	5	.60			
AP90-2500-MC	2.500	1.000	1.75	.55	5	1.30			
AP90-3000-MC	3.000	1.000	2.00	.55	6	2.25			
AP90-4000-MC	4.000	1.250	2.00	.55	7	3.20			
AP90-4000F	4.000	1.500	2.00	.55	8	3.35			
AP90-5000	5.000	1.500	2.00	.55	8	5.15			
AP90-6000	6.000	1.500	2.00	.55	9	7.65			
AP90-6000F	6.000	2.000	2.50	.55	10	7.95			
AP90-8000*	8.000	2.500	2.50	.55	12	14.00			
* Cutter supplied with 4 holes on a 4" bolt circle									

Remember to use COPASLIP® anti-seize compound on all insert screws

Featuring:

- Specifically designed for aluminum machining
- Allows for full depths of cut and wider widths of cut
- Optimized speeds and feeds while lowering horsepower consomption





Coarse Pitch Face Mills

Designation	d¹	d²	h	Max. a_p	Flutes	lbs.	Insert	Insert Screw	Wrench
AP90-2000AL-3-MC	2.000	.750	1.50	.55	3	.60	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP90-2500AL-3-MC	2.500	1.000	2.00	.55	3	1.15			
AP90-3000AL-3-MC	3.000	1.000	2.00	.55	3	1.90			
AP90-4000AL-4-MC	4.000	1.250	2.00	.55	4	2.85			
AP90-4000AL-4C	4.000	1.500	2.00	.55	4	2.70			
AP90-5000AL-5	5.000	1.500	2.00	.55	5	4.80			
AP90-6000AL-6	6.000	2.000	2.50	.55	6	8.45			

Remember to use COPASLIP® anti-seize compound on all insert screws

Helical Square Shoulder Milling Cutters

The Extended Program:

In addition to the proven helical end mills in the 1" to 2" diameter range, helical shell mills are also available from 2" to 3" diameters with coarse tooth pitches, for low-powered machine tools and slot milling, as well as trimming and shoulder milling.
The parallelogram-shaped indexable inserts, used successfully for years on the A90 square shoulder mill, are also used with the HA90 helical cutter. The small size ADHT-090308 insert can be used for 1", 1¼" and 1½" end mills and the large size APNT, APHT, APNX insert for 1¼" to 2" HA90 end mills and all shell mills. This appreciably simplifies inventories. APNX and APNT inserts feature an innovative chip control geometry, and are particularly efficient for medium to rough milling operations.

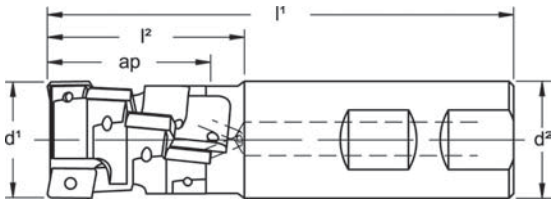
Applications:

- For slot-milling, profiling, shoulder milling and trimming with large axial depths of cut
- For pre-milling and rough-milling steel castings, as well as cast-iron materials and titanium alloys

Our HA90 helical cutters are ideal for rough-milling large grooves and shoulders. Large overall cutting-edge lengths, and the efficient use of each flute, guarantees a wide range of applications and high performance.

Advantages:

- Robust tools with large flutes for optimum chip removal
- Indexable inserts with reinforced cutting edges for high production reliability
- High-performance hardmetal grades give long service life
- Efficient utilization of each flute makes for high feed rates
- Smooth running action and lower cutting forces



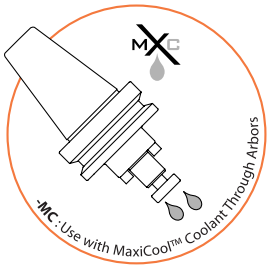
Helical End Mills with Coolant Through for Profiling & Milling

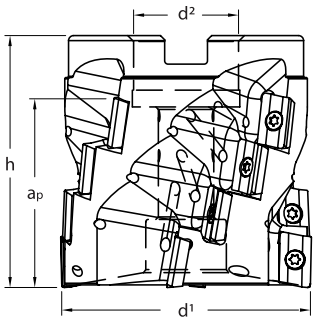
Designation	d¹	d²	l¹	l²	Max. a_p	Flutes	No. of inserts	Insert	Insert Screw	Wrench
HAD90-1000	1.000	1.000	4.00	1.72	1.30	2	8	ADHT-0903__	TX08S	T8F
HAD90-1250	1.250	1.250	4.49	2.21	1.30	3	12			
HAD90-1500	1.500	1.250	4.84	2.56	1.61	3	15			
HAP90-1250	1.250	1.250	4.63	2.35	1.15	2	4	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15SL	T15F
HAP90-1250L	1.250	1.250	4.84	2.59	1.70	2	6			
HAP90-1500	1.500	1.250	5.01	2.73	1.17	3	6			
HAP90-1500L	1.500	1.250	5.01	2.73	1.70	3	9			
HAP90-1750	1.750	1.250	5.01	2.73	1.17	3	6			
HAP90-2000EM	2.000	1.250	5.25	2.97	2.25	3	12			

Remember to use COPASLIP® anti-seize compound on all insert screws

HA90

Helical Square Shoulder Milling Cutters

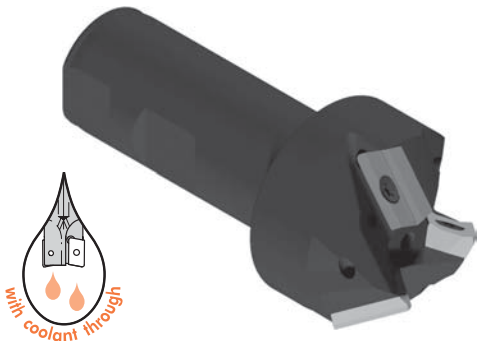


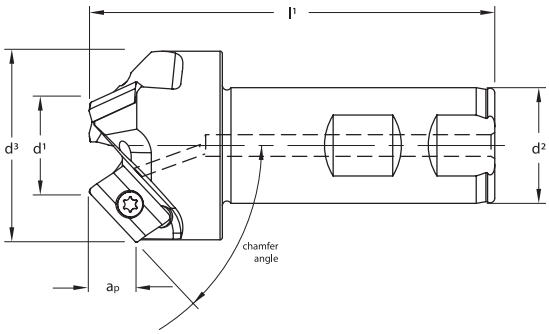


Helical Shell Mills with Coolant Through for Profiling & Milling

Designation	d¹	d²	h	Max. a_p	Flutes	No. of inserts	Insert	Insert Screw	Wrench
HAP90-2000-MC	2.000	.750	2.00	1.17	3	6	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15SL	T15F
HAP90-2000L-MC	2.000	.750	2.50	1.65	3	9			
HAP90-2500-MC	2.500	1.000	2.50	1.65	3	9			
HAP90-2500L-MC	2.500	1.000	3.00	2.13	3	12			
HAP90-3000-MC	3.000	1.250	3.00	2.25	4	16			

Remember to use COPASLIP® anti-seize compound on all insert screws





30° Chamfer Mills with Coolant Through

Designation	d¹	d²	d³	l¹	Max. a_p	Flutes	Insert	Insert Screw	Wrench
AP30-0750-CH	.750	.750	1.275	3.00	.50	2	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP30-1000-CH	1.000	1.000	1.525	3.50	.52	3			
AP30-1250-CH	1.250	1.250	1.775	3.50	.52	3			

Remember to use COPASLIP® anti-seize compound on all insert screws

41° Chamfer Mills with Coolant Through

Designation	d¹	d²	d³	l¹	Max. a_p	Flutes	Insert	Insert Screw	Wrench
AP41-0688-CH	.688	.750	1.375	3.00	.68	2	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP41-0938-CH	.938	1.000	1.625	3.50	.68	3			
AP41-1188-CH	1.188	1.250	1.875	3.50	.68	3			

Remember to use COPASLIP® anti-seize compound on all insert screws

45° Chamfer Mills with Coolant Through

Designation	d¹	d²	d³	l¹	Max. a_p	Flutes	Insert	Insert Screw	Wrench
AP45-0688-CH	.688	.750	1.425	3.00	.73	2	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP45-0938-CH	.938	1.000	1.675	3.50	.73	3			
AP45-1188-CH	1.188	1.250	1.925	3.50	.73	3			

Remember to use COPASLIP® anti-seize compound on all insert screws

60° Chamfer Mills with Coolant Through

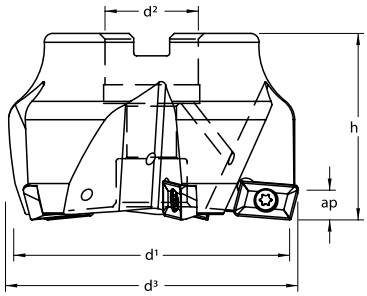
Designation	d¹	d²	d³	l¹	Max. a_p	Flutes	Insert	Insert Screw	Wrench
AP60-0500-CH	.500	.750	1.355	3.00	.85	2	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP60-0750-CH	.750	1.000	1.605	3.50	.85	3			
AP60-1000-CH	1.000	1.250	1.855	3.50	.85	3			

Remember to use COPASLIP® anti-seize compound on all insert screws

AP75

75° Face Mills

AP75 face mills are specifically designed to use the popular APHT / APNT insert and utilizes the opposing unused corners. The 100° corners offer strong cutting edges and allow for a maximum depth of cut. High machining rates can be achieved in semi-finishing and rough-milling operations. There are no additional insert costs for those who currenlty use APHT / APNT inserts with AP90 style cutters.



Face Mills

Designation	d¹	d²	d³	h	Max. a_p	Flutes	lbs.	Insert	Insert Screw	Wrench
AP75-2500	2.500	1.000	2.60	2.00	.275	4	1.85	APHT-1604__ APNT-1604__ APNX-1604__	TX15S	T15F
AP75-3000	3.000	1.000	3.10	2.00	.275	5	2.60			
AP75-4000	4.000	1.250	4.10	2.00	.275	6	3.90			

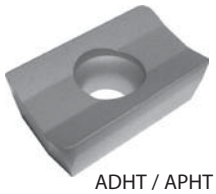
Remember to use COPASLIP® anti-seize compound on all insert screws

Insert Geometry Descriptions:

Inserts with optimized geometries and large selection of radii from .008" - .250" for steel, cast steel and aluminum alloys. Very effective with high metal removal rates in medium and heavy duty milling.

ADHT - APHT

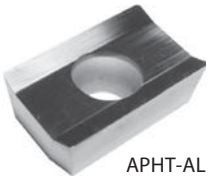
- High shear radial angles allow for good performance in all applications and materials. Precision ground.



ADHT / APHT

APHT-AL

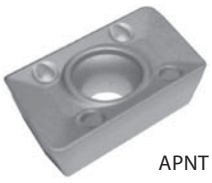
- Sharp rake angles on this precision ground insert make these inserts the first choice for all aluminum machining applications, as well as other nonferrous materials.



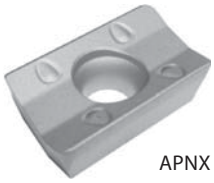
APHT-AL

APNT-APNX

- This pressed insert has extra chip control molded into the top of the insert allowing for high machining rates in semi-finishing and rough milling operations.

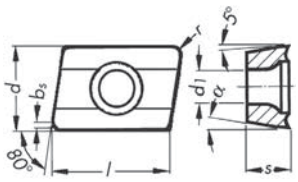


APNT



APNX

Inserts for Square Shoulder Milling Cutters



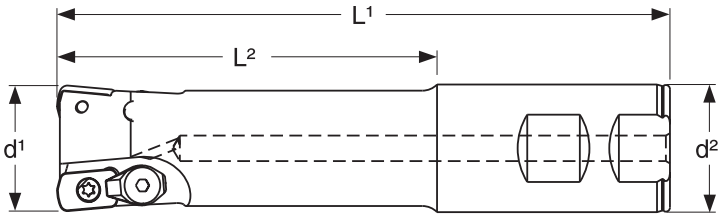
Insert	Designation	Dimensions l	s	r	d	d^1	b_s	a	RP350	RP354	RM352	TP30MC	RK150	ALP-XL	RP35	HMF	
									Coated						Uncoated		
	ADHT-090304	.381	1/8	1/64	1/4	.110	--	15°		■	■						
	ADHT-090308			1/32			--	15°		■	■				■		
	ADHT-090312			3/64			--	15°		■	■						
	ADHT-090316			1/16			--	15°		■	■						
	ADHT-090302-AL	.381	1/8	.005	1/4	.110	--	15°						■		■	
	ADHT-090304-AL			1/64			--	15°						■		■	
	ADHT-090308-AL			1/32			--	15°						■		■	
	ADHT-090312-AL			3/64			--	15°						■		■	
	ADHT-090316-AL			1/16			--	15°						■		■	
	APHT-160408	.635	3/16	1/32	3/8	.173	.071	11°		■		■					
	APHT-160412			3/64			.059	11°	■	■		■	■				
	APHT-160416			1/16			.031	11°		■		■					
	APHT-160432			1/8			--	11°		■		■					
	APHT-160408-AL	.635	3/16	1/32	3/8	.173	.067	11°						■		■	
	APHT-160412-AL			3/64			.055	11°						■		■	
	APHT-160416-AL			1/16			.035	11°						■		■	
	APHT-160420-AL			5/64			.016	11°						■		■	
	APHT-160424-AL			3/32			--	11°						■		■	
	APHT-160432-AL			1/8			--	11°						■		■	
	APHT-160464-AL			1/4			--	11°						■		■	
	APNT-160412	.635	3/16	3/64	3/8	.173	.047	11°	■			■	■				
	APNX-160412	.635	3/16	3/64	3/8	.173	.047	11°	■			■	■				

XD95

High Feed Milling Cutters

Remarkably high metal removal rates are delivered by the new XD95 High Feed mills. Feed ranges of 0.050" to 0.060" per tooth are easily achieved in tool and mold steels with reduced chatter and vibration during machining of deep cavities.The XD95 High Feed mills will completely change your approach to material removal.

- High feed rates
- Reduced power consumption
- Reduced chatter / vibration
- Smooth cutting action even while fully extended from spindle
- Depth of cut up to .060"
- New nickel finish for improved surface wear and chip evacuation
- Excellent grade selection (9 grades available)
- Innovative insert design with reinforced cutting edge
- Unique top clamp design provides excellent insert stability for extended tool life



End Mills with Coolant

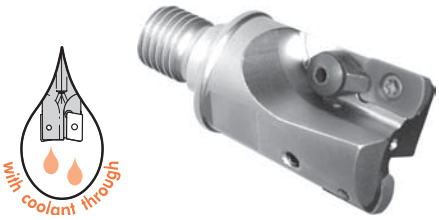
Designation	d1	d2	l1	l2	Flutes	Insert	Clamp	Clamp Screw	Torx Screw	Torx Wrench
XD95HF-1250C	1.25	1.25	6.00	3.71	2	XDGW-1604H0 XDGW-1604H20 XDGW-1604TH05 XDGW-1604TH20	RT892	RT898	TX15S	T15F
XD95HF-1500C	1.50	1.25	6.00	3.71	3					

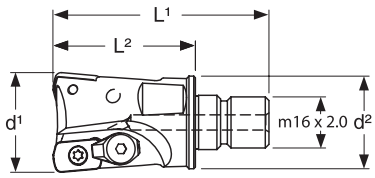
Remember to use COPASLIP® anti-seize compound on all insert screws

Cylindrical Shank End Mills with Coolant

Designation	d1	d2	l1	l2	Flutes	Insert	Clamp	Clamp Screw	Torx Screw	Torx Wrench
XD95HFCY-1250-XLC	1.250	1.250	10.00	3.50	2	XDGW-1604H0 XDGW-1604H20 XDGW-1604TH05 XDGW-1604TH20	RT892	RT898	TX15S	T15F
XD95HFCY-1500-XLC	1.500	1.250	10.00	2.50	3					

Remember to use COPASLIP® anti-seize compound on all insert screws

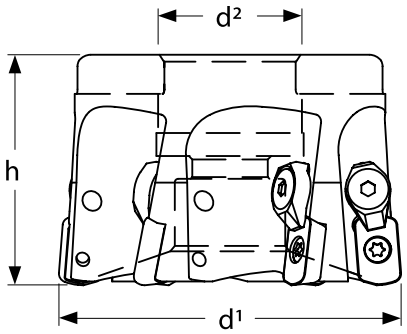




Screw On Milling Cutters

Designation	d1	d2	l1	l2	Flutes	Insert	Clamp	Clamp Screw	Torx Screw	Torx Wrench
XD95HF-1250-TS	1.250	1.142	2.65	1.75	2	XDGW-1604H0 XDGW-1604H20 XDGW-1604TH05 XDGW-1604TH20	RT892	RT898	TX15S	T15F
XD95HF-1500-TS	1.500	1.142	3.03	2.12	3					

Remember to use COPASLIP® anti-seize compound on all insert screws



Face Mills

Designation	d¹	d²	l²	Flutes	Insert	Clamp	Clamp Screw	Torx Screw	Torx Wrench
XD95HF-2000	2.00	.75	1.75	4	XDGW-1604H0 XDGW-1604H20 XDGW-1604TH05 XDGW-1604TH20	RT892	RT898	TX15S	T15F
XD95HF-2500	2.50	1.00	1.75	5					
XD95HF-3000	3.00	1.25	2.00	6					
XD95HF-4000	4.00	1.50	2.00	7					

Remember to use COPASLIP® anti-seize compound on all insert screws

Insert Grade Descriptions:

TP765A (HC-P25)
First choice for steel applications. Good balance of wear resistance, toughness and edge strength. The coating is AlTiN for high performance milling in steel. Must be run dry.

TP745T (HC-P40)
For steel applications where greater toughness is required (i.e. scale or severe interruption). The substrate for this grade is very tough, making it the perfect choice for unfavourable conditions. The coating is TiAlN for high performance milling in steel. This grade can be run dry or wet.

TP765T (HC-P25)
Similar to TP765A using the same substrate but with TiAlN coating. This grade can be run dry or wet.

TP745A (HC-P40)
Similar to TP745T using the same tough substrate but with AlTiN coating for harder materials and high temperature conditions. This grade must be run dry.

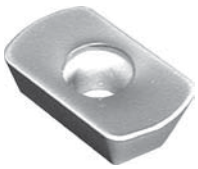
TK532T (HC-K15)
For machining of cast irons and austenitic (300 and PH series) stainless steels. High wear resistance, with a micro grain substrate, suitable for abrasive materials. The coating is TiAlN. This grade can be run dry or wet.

TK532A (HC-K15)
Very similar to TK532T but with AlTiN coating. This grade must be run dry.

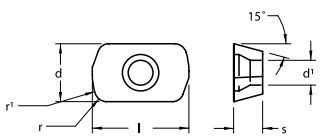
TK209A (HC-K30)
Very wear resistant AlTiN grade with a micro grain substrate designed for machining of hardened steels and chilled cast irons. High cutting speed can be achieved even on pre-hardened mold and die steels.

TK209T (HC-K30)
Very similar to TK209A but with TiAlN coating.

TK532 (HW-K15)
This uncoated grade is for machining of aluminum and other non-ferrous materials. Also suitable for short chipping cast irons when an uncoated grade is desired.

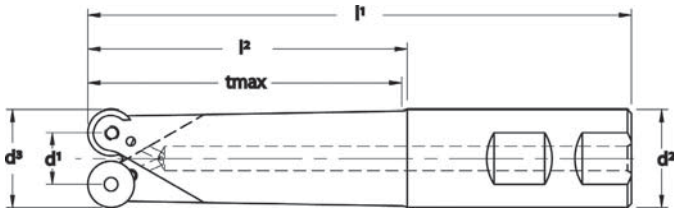


XD95 Inserts

Insert	Designation	Dimensions							TP765A	TP765T	TP745A	TP745T	TK532A	TK532T	TK209A	TK209T		TK532	
		l	s	r	r¹	d	d¹	Hone	Coated								Uncoated		
	XDGW-1604H0	.625	.875	.078	.375	.375	.160	--										■	
	XDGW-1604H20							.002"					■	■	■	■			
	Inserts with T-Land .010" x 20°																		
	XDGW-1604TH05	.625	.875	.078	.375	.375	.160	.0005"	■	■									
	XDGW-1604TH20							.002"			■	■							

R360

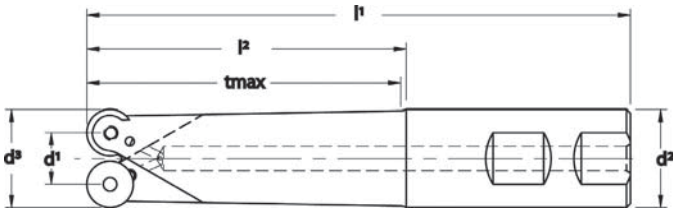
Copy Milling Cutters



End Mills with Coolant Through using 15° Positive Inserts for Profiling & Contouring

Designation	d³	d¹	d²	l¹	l²	tmax	ramp angle	flutes	Insert	Insert Screw	Wrench
R360-0500-36	.500	.185	.625	3.65	1.74	1.64	10°	1	8mm inserts RDMW-0802MOT RDGT-0802MO-AL	TX08SS	T8F
R360-0500-44	.500	.185	.625	4.40	2.49	2.39	10°	1			
R360-0500-51	.500	.185	.625	5.15	3.24	3.14	10°	1			
R360-0625-36A	.625	.310	.625	3.65	1.74	1.74	10°	1			
R360-0625-36	.625	.310	.625	3.65	1.74	1.74	60°	2			
R360-0625-44A	.625	.310	.625	4.40	2.49	2.49	10°	1			
R360-0625-44	.625	.310	.625	4.40	2.49	2.49	60°	2			
R360-0625-52A	.625	.310	.750	5.28	3.25	3.14	10°	1			
R360-0625-52	.625	.310	.750	5.28	3.25	3.14	60°	2			
R360-0625-60	.625	.310	.750	6.03	4.00	3.89	60°	2			
R360-0625-70	.625	.310	1.000	7.03	4.75	1.65	60°	2			
R360-0750-37X	.750	.435	.750	3.78	1.75	1.74	22°	2			
R360-0750-45X	.750	.435	.750	4.53	2.50	2.40	22°	2			
R360-0750-55X	.750	.435	1.000	5.53	3.25	3.06	22°	2			
R360-0750-70X	.750	.435	1.000	7.03	4.75	4.56	22°	2			
R360-1000R08-47	1.000	.685	1.000	4.78	2.50	2.50	10°	3			
R360-1000R08-55	1.000	.685	1.000	5.53	3.25	3.25	10°	3			
R360-1000R08-67	1.000	.685	1.000	6.78	4.50	4.50	10°	3			
R360-1250R08-47	1.250	.935	1.250	4.78	2.50	2.50	6°	5			
R360-1250R08-62	1.250	.935	1.250	6.28	4.00	4.00	6°	5			

Remember to use COPASLIP® anti-seize compound on all insert screws

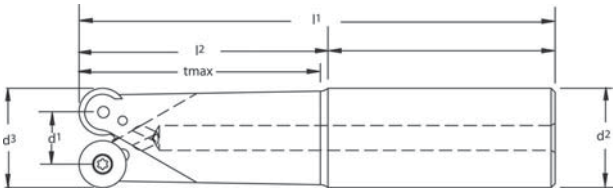


End Mills with Coolant Through using 15° Positive Inserts for Profiling & Contouring

Designation	d³	d¹	d²	l¹	l²	tmax	ramp angle	flutes	Insert	Insert Screw	Wrench
R360-0750-37	.750	.356	.750	3.78	1.75	1.74	40°	2	10mm inserts RDMW-1003MOT RDGT-1003MO-AL	T15SS	T15F
R360-0750-45	.750	.356	.750	4.53	2.50	2.49	40°	2			
R360-0750-55	.750	.356	1.000	5.53	3.25	3.06	40°	2			
R360-0750-62	.750	.356	1.000	6.28	4.00	3.81	40°	2			
R360-0750-70	.750	.356	1.000	7.03	4.75	4.56	40°	2			
R360-1000-52X	1.000	.606	1.000	5.28	3.00	2.94	17°	2			
R360-1000-67X	1.000	.606	1.250	6.78	4.50	4.44	17°	2			
R360-1000-74X	1.000	.606	1.250	7.46	5.19	5.12	17°	2			
R360-1000R10-40	1.000	.606	1.000	4.00	1.71	1.67	86°	3			
R360-1000R10-52	1.000	.606	1.000	5.28	3.00	2.95	94°	3			
R360-1000R10-67	1.000	.606	1.000	6.78	4.50	4.45	97°	3			
R360-1250R10-40	1.250	.856	1.250	4.00	1.71	1.67	105°	4			
R360-1250R10-52	1.250	.856	1.250	5.28	3.00	2.95	109°	4			
R360-1250R10-67	1.250	.856	1.250	6.78	4.50	4.45	119°	4			
R360-1000-47	1.000	.528	1.000	4.78	2.50	2.49	50°	2	12mm inserts RDMW-1204MOT-X	TX15S	T15F
R360-1000-55	1.000	.528	1.000	5.53	3.25	3.19	50°	2			
R360-1000-64	1.000	.528	1.250	6.40	4.12	3.93	50°	2			
R360-1000-71	1.000	.528	1.250	7.15	4.87	4.68	50°	2			
R360-1250-54	1.250	.778	1.250	5.40	3.12	3.11	23°	2			
R360-1250-61	1.250	.778	1.250	6.15	3.87	3.86	23°	2			
R360-1250-72	1.250	.778	1.500	7.25	4.56	4.34	23°	2			
R360-1250-80	1.250	.778	1.500	8.00	5.31	5.09	23°	2			
R360-1500-56X	1.500	1.028	1.250	5.65	3.37	3.25	27°	3			
R360-1500-71X	1.500	1.028	1.250	7.15	4.87	4.75	27°	3			

Remember to use COPASLIP® anti-seize compound on all insert screws

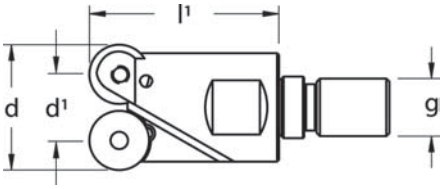
Copy Milling Cutters



Cylindrical Shank End Mills with Coolant Through using 15° Positive Inserts for Profiling & Contouring

Designation	d³	d¹	d²	l¹	l²	tmax	ramp angle	flutes	Insert	Insert Screw	Wrench
R360CY-0500-36	.500	.185	.625	3.65	1.74	1.64	10°	1	8mm inserts RDMW-0802MOT RDGT-0802MO-AL	TX08SS	T8F
R360CY-0500-51	.500	.185	.625	5.15	3.24	3.14	10°	1			
R360CY-0625-36	.625	.310	.625	3.65	1.74	1.74	60°	2			
R360CY-0625-44	.625	.310	.625	4.40	2.49	2.49	60°	2			
R360CY-0625-60	.625	.310	.750	6.03	4.00	3.89	60°	2			
R360CY-0750-37X	.750	.435	.750	3.78	1.75	1.74	22°	2			
R360CY-0750-45X	.750	.435	.750	4.53	2.50	2.49	22°	2			
R360CY-0750-62X	.750	.435	.750	6.28	4.25	4.24	22°	2			
R360CY-1000-47	1.000	.528	1.000	4.78	2.50	2.49	50°	2	RDMW-1204MOT-X	TX15S	T15F
R360CY-1000-71	1.000	.528	1.250	7.15	4.87	4.68	50°	2			

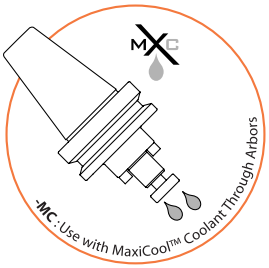
Remember to use COPASLIP® anti-seize compound on all insert screws

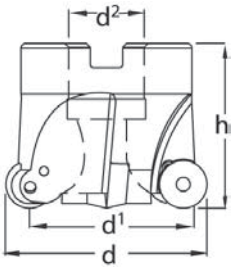


Screw-on Mills using 15° Positive Inserts for Copying & Face Milling

Designation	d	d mm	d¹	g	l¹	flutes	Insert	Insert Screw	Wrench
R360-0500-TS	.500	12.70	.185	M6	1.10	1	8mm inserts RDMW-0802MOT RDGT-0802MO-AL	TX08SS	T8F
R360-0500L-TS	.500	12.70	.185	M8	2.00	1			
R360-0625-TS	.625	15.87	.310	M8	1.10	2			
R360-0750-TS	.750	19.05	.435	M10	1.18	2			
R360-1000R08-TS	1.000	25.40	.528	M12	1.50	3			
R360-1250R08-TS	1.250	31.75	.778	M16	1.75	5			
R360-0984-TS	.984	25.00	.591	M12	1.18	2	RDMW-1003MOT RDGT-1003MO-AL	T15SS	T15F
R360-1000R10-TS	1.000	25.40	.606	M12	1.50	3			
R360-1181-TS	1.181	30.00	.787	M16	1.57	3			
R360-1250R10-TS	1.250	31.75	.856	M16	1.75	4			
R360-0945-TS	.945	24.00	.472	M12	1.18	2	12mm inserts RDMW-1204MOT-X	TX15S	T15F
R360-1000-TS	1.000	25.40	.528	M12	1.50	2			
R360-1250-TS	1.250	31.75	.778	M16	1.75	2			
R360-1378-TS	1.378	35.00	.906	M16	1.57	3			
R360-1500-TS	1.500	38.10	1.028	M16	1.75	3			
R360-1575-TS	1.575	40.00	1.102	M16	1.57	4			

Remember to use COPASLIP® anti-seize compound on all insert screws

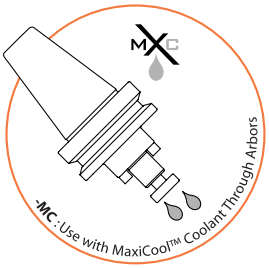


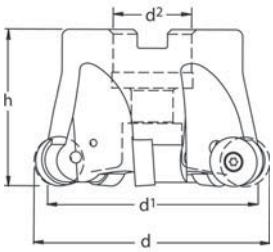


Face Mills using 15° Positive Inserts for Copying & Face Milling

Designation	d	d¹	d²	h	flutes	lbs	Insert	Insert Screw	Wrench
R360-2RD08-MC	2.000	1.685	.750	1.63	7	.85	RDMW-0802MOT	TX08SS	T8F
R360-2R10-MC	2.000	1.606	.750	1.63	5	.65	RDMW-1003MOT RDGT-1003MO-AL	TX15S	T15F
R360-2.5R10-MC	2.500	2.106	1.000	1.74	6	1.20			
R360-3R10-MC	3.000	2.803	1.000	2.00	7	2.00			
R360-2RD12-MC	2.000	1.530	.750	1.63	4	.65	RDMW-1204MOT-X	TX15S	T15F
R360-2RD12F-MC	2.000	1.530	.750	1.63	5	.65			
R360-2.5RD12F-MC	2.500	2.028	1.000	1.75	6	1.20			
R360-3RD12F-MC	3.000	2.528	1.000	2.00	7	2.00			

Remember to use COPASLIP® anti-seize compound on all insert screws





Face Mills using 7° Positive Inserts for Milling, Duplicating & Drilling

Designation	d	d¹	d²	h	flutes	lbs	Insert	Insert Screw	Wrench
R360-2RC16-MC	2.000	1.370	.750	1.63	3	.60	16mm inserts RCMT-1606MOT-X	TX20S	T20F
R360-2.5RC16-MC	2.500	1.870	1.000	1.75	4	1.10			
R360-3RC16-MC	3.000	2.370	1.000	2.00	5	1.70			
R360-3RC16X-MC	3.000	2.370	1.250	2.00	5	2.60			
R360-4RC16-MC	4.000	3.370	1.250	2.00	7	2.60			
R360-4RC16X	4.000	3.370	1.500	2.00	7	2.65			
R360-6RC16	6.000	5.370	1.500	2.00	9	6.60			
R360-6RC16X	6.000	5.370	2.000	2.50	9	7.15			
R360-8RC16*	8.000	7.370	2.000	2.50	11	14.25			

* Cutter supplied with 4 holes on a 4" bolt circle

Remember to use COPASLIP® anti-seize compound on all insert screws

R360

Copy Milling Cutters - Inserts

R360 milling inserts are designed to withstand the tremendous forces applied in most contour milling applications. Tough carbide grades and strong cutting edges allow these inserts to be used for ramping and plunging operations as well as helical milling of pockets and roughing in contours. Inserts 12mm and up have an unique locking system which prevents insert movement while engaged in high feed applications.

Insert Descriptions:

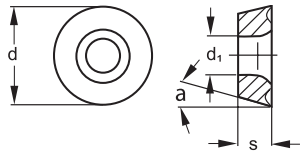
RCMT
Particularly used for face and drill milling, or in particularly rigid conditions. Strong edge and extra thickness allow this insert to be used in the most demanding applications. Secure insert locking insures better tool life.

RDGT
Ground edges and polished tops makes this insert a perfect choice for rough milling aluminum at very high feed rates. Excellent shearing action of the up sharp edge reduces horsepower consumption and helps to increase production.

RDMW
Ideal for vibration prone applications because the insert is less positive. Works well in long reach situations and the strong edge provides excellent performance in rough milling contours and pockets.

RCMT-X

R360 Inserts 7° Inserts

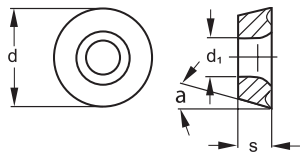
Insert	Designation	Dimensions l	s	r	d	d1	a	RP350	RP354	RM352	TP30MC	RK150	ALP-XL	RP35	HMF	TK20
								Coated						Uncoated		
	RCMT-1606MOT-X*	---	1/4	---	.630	.217	7°	■	■	■				■		

* Inserts have integrated anti-rotation lock

RDGT

RDMW

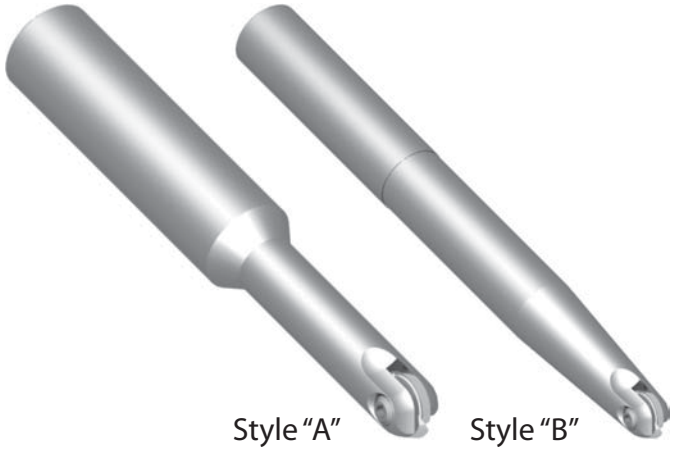
R360 Inserts 15° Inserts

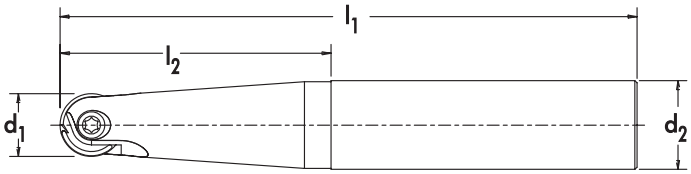
Insert	Designation	Dimensions l	s	r	d	d1	a	RP350	RP354	RM352	TP30MC	RK150	ALP-XL	RP35	HMF	TK20
								Coated						Uncoated		
	RDGT-0802M0-AL	---	3/32	---	.315	.134	15°						■			■
	RDGT-1003M0-AL	---	1/8	---	.394	.173	15°						■			■
	RDMW-0802MOT	--	3/32	--	.315	.134	15°	■	■	■				■		
	RDMW-1003MOT	--	1/8	--	.394	.173	15°	■	■	■				■		
	RDMW-1204MOT-X*	--	3/16	--	.472	.173	15°	■	■	■				■		

* Inserts have integrated anti-rotation lock

Ball Nose End Mills

- Positive cutting edge geometry for superior surface finishes, especially on inclined surfaces
- Inserts are precision ground to ensure precise milling
- Two cutter styles offer extended reach or extra rigid taper, and are available in diameters from 5/16" to 1-1/4"
- Screw-on mills, ranging in diameters from 3/8" to 1" allows for adaptation to modular screw-on systems
- Tools are designed to perform in conventional copy milling applications
- Leading edge technology produces superior finishes
- Eliminates solid carbide regrinds leading to cost effective machining
- High speed milling for reduced cycle times



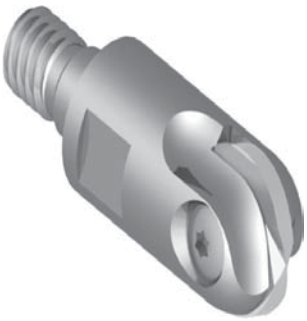


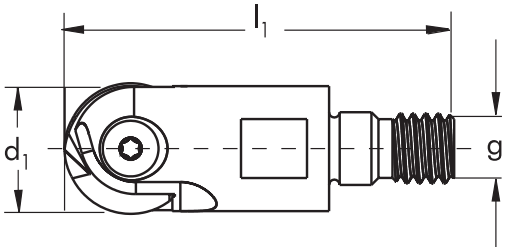
Designation	d¹	d²	l¹	l²	Style	Insert	Insert Screw	Wrench
BNK-0312-55T	.312	.500	5.50	1.90	B	XCEG-2.51	KBN-08	T8F
BNK-0375-35	.375	.500	3.56	1.34	A	XCCG-31.5 XCE_-31.5	KBN-10	T10F
BNK-0375-58T	.375	.500	5.87	1.37	B			
BNK-0500-35	.500	.500	3.56	1.25	A	XCCG-41.5-HG XCE_-41.5	KBN-15	T15F
BNK-0500-51	.500	.500	5.12	1.25	A			
BNK-0500-58	.500	.500	5.87	1.81	A			
BNK-0500-62T	.500	.625	6.28	2.31	B			
BNK-0625-55	.625	.625	5.50	1.37	A	XCCG-52-HG XCE_-52	KBN-15L	T15F
BNK-0625-62	.625	.625	6.28	2.00	A			
BNK-0625-68T	.625	.750	6.87	2.56	B			
BNK-0750-45	.750	.750	4.50	1.75	A	XCCG-62-HG XCE_-62	KBN-20	T20F
BNK-0750-62	.750	.750	6.28	1.75	A			
BNK-0750-68	.750	.750	6.87	2.37	A			
BNK-0750-75T	.750	1.000	7.50	3.00	B			
BNK-0750-82	.750	0.750	8.25	2.37	A			
BNK-0750-94T	.750	1.000	9.43	3.00	B			
BNK-1000-62	1.000	1.000	6.28	1.75	A	XCCG-82.5-HG XCE_-82.5	KBN-25	T25F
BNK-1000-75	1.000	1.000	7.50	2.75	A			
BNK-1000-82T	1.000	1.250	8.25	3.87	B			
BNK-1000-90	1.000	1.000	9.06	3.12	A			
BNK-1000-94T	1.000	1.200	9.43	3.87	B			
BNK-1250-68	1.250	1.250	6.87	2.18	A	XCCG-103-HG XCE_-103	KBN-25L	T25F
BNK-1250-82	1.250	1.250	8.25	3.12	A			
BNK-1250-94T	1.250	1.500	9.43	4.75	B			

Remember to use COPASLIP® anti-seize compound on all insert screws

BNK

Ball Nose End Mills & Inserts

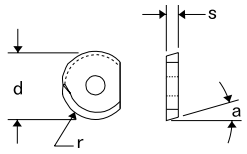
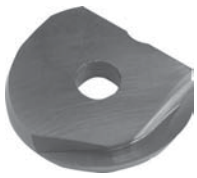
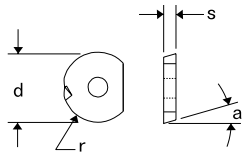
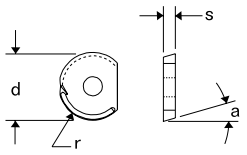




Designation	d¹	g	l¹	Insert	Insert Screw	Wrench
BNK-0375-TS	.375	M6	1.25	XCCG-31.5 XCE_-31.5	KBN-10	T10F
BNK-0500-TS	.500	M6	1.25	XCCG-41.5-HG XCE_-41.5	KBN-15	T15F
BNK-0625-TS	.625	M8	1.5	XCCG-52-HG XCE_-52	KBN-15L	T15F
BNK-0750-TS	.750	M10	1.5	XCCG-62-HG XCE_-62	KBN-20	T20F
BNK-1000-TS	1.000	M12	1.5	XCCG-82.5-HG XCE_-82.5	KBN-25	T25F

Remember to use COPASLIP® anti-seize compound on all insert screws

BNK Inserts

Insert		Designation	Dimensions				SLX	MPX	MPS
			d	r	s	a	Coated		
		XCCG-31.5-HG	.375	3/16	.098	7°		■	■
		XCCG-41.5-HG	.500	1/4	.098	7°		■	■
		XCCG-52-HG	.625	5/16	.118	7°		■	■
		XCCG-62-HG	.750	3/8	.118	7°		■	■
		XCCG-82.5-HG	1.000	1/2	.157	7°		■	□
		XCCG-103-HG	1.250	5/8	.197	7°		■	□
		XCEA-31.5	.375	3/16	.098	7°	■		■
		XCEA-41.5	.500	1/4	.098	7°	■		■
		XCEA-52	.625	5/16	.118	7°	■		■
		XCEA-62	.750	3/8	.118	7°	■		■
		XCEA-82.5	1.000	1/2	.157	7°	■		□
		XCEA-103	1.250	5/8	.197	7°	■		□
		XCEG-2.51	.312	5/32	.078	7°	■		■
		XCEG-31.5	.375	3/16	.098	7°	■		■
		XCEG-41.5	.500	1/4	.098	7°	■		■
		XCEG-52	.625	5/16	.118	7°	■		■
		XCEG-62	.750	3/8	.118	7°	■		■
		XCEG-82.5	1.000	1/2	.157	7°	■		□
		XCEG-103	1.250	5/8	.197	7°	■		□

Insert Geometry Descriptions:

XCCG-

- Innovative precision ground helical chipbreaker
- Advanced high-positive cutting rake
- Achieve higher speeds & feeds
- Produces less deflection
- Better insert tolerance
- Improves surface finishes
- Better chip control
- Creates less pressure
- Increased wear resistance from coating, which also reduces insert chipping
- Suited for soft, gummy materials, i.e.; aluminum, brass, low carbon steels and stainless
- First choice geometry for light roughing to precision finishing applications

XCEA-

- Precision ground non-chipbreaker
- For finishing in high carbon, die and mold steels
- Strongest cutting edge design

XCEG-

- Precision ground with positive chipbreaker
- For soft gummy materials, i.e. aluminum, brass, low carbon steels, and stainless
- Light roughing to semi-finishing
- Economical alternative to the helical ground chipbreaker

Insert Grade Descriptions:

MPX

- PVD AlTiN Coating (black) on a micro grain C3 substrate
- Suitable for dies, molds, and other fabricating tools that operate at high temperatures
- Performs well in difficult to machine materials, i.e. titanium, nickel alloys, as well as steel alloys and cast iron
- Excels in high speed and dry machining applications where coolant is restricted, and machining of hardened steel
- Ideal for high speed, high temperature cutting applications
- Excellent malleability which makes inserts less susceptible to chipping
- Increased production with longer tool life
- High aluminum content in coating produces higher hardness and a smoother surface finish

MPS

- PVD TiAlN coating (bronze) on a micro grain C3 substrate
- Provides extended toughness beyond working parameters of MPX
- Better suited for difficult to machine and hardened materials, i.e stainless steel
- Ideal for a variety of high temperature cutting applications in various materials
- Can be used in all machining operations where edge heat/temperature is generated
- Exceptional high temperature oxidation resistance

SLX

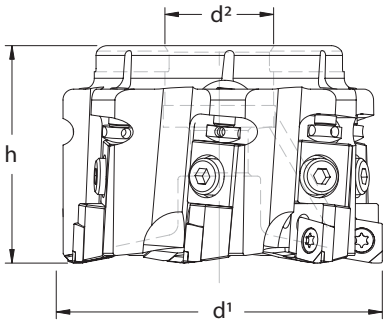
- PVD AlTiN Coating (black) on a medium grain C5 substrate
- Good choice for machining all mold, die, and tool steels
- Tougher substrate is able to operate in harsher machining environments and can withstand more shock and vibration than MPX
- Can be used in light roughing to finishing operations

CP90

AL Milling Cutters featuring BECKER PCD inserts

- New advanced milling cutter program engineered for high speed machining of non-ferrous materials
- Ultra precise finishing with unique wiper-radius PCD inserts and micro-adjustable cartridges
- Copy Milling configuration also available using PCD full faced RDHX-1003MO inserts*
- Milling cutter bodies made from lightweight 7075-T6 aviation grade aluminum
- Maxicool through coolant enabled for maximum chip evacuation and temperature control

PCD Milling



Designation	d¹	d²	h	Flutes	Insert	Cartridge	Cartridge Clamp Screw	Insert Torx Screw	Height Adj. Screw
Through Coolant Enabled					CPGW-32.51PDR CPMW-32.52	TT2057	CSM5X16	TX15S	HAS6823
CP90-2000-AL	2.000	.750	2.00	3					
CP90-2500-AL	2.500	1.000	2.00	5					
CP90-3000-AL	3.000	1.000	2.00	7					
CP90-4000-AL	4.000	1.250	2.00	10					
Standard Non Through Coolant									
CP90-5000-AL	5.000	1.500	2.00	11					
CP90-6000-AL	6.000	1.500	2.00	13					

Remember to use COPASLIP® anti-seize compound on all insert screws

Designation	d¹	d²	h	Flutes	Insert	Cartridge	Cartridge Clamp Screw	Insert Torx Screw	Height Adj. Screw
Through Coolant Enabled					RDHX-1003MO	TT2176	CSM5X16	TX15S	HAS6823
RD360-2000-AL	2.000	.750	2.00	3					
RD360-2500-AL	2.500	1.000	2.00	5					
RD360-3000-AL	3.000	1.000	2.00	7					
RD360-4000-AL	4.000	1.250	2.00	10					
Standard Non Through Coolant									
RD360-5000-AL	5.000	1.500	2.00	11					
RD360-6000-AL	6.000	1.500	2.00	13					

Remember to use COPASLIP® anti-seize compound on all insert screws

AL Milling Cutters featuring BECKER PCD inserts

Insert Grade Descriptions:

PDC-S:

Performance:
Polycrystalline carbide reinforced diamond of coarse grit size, good edge sharpness and low cutting pressure allowing close tolerances. Best performances for milling. High flank wear resistance and toughness.

Application:
Finishing, general purpose and milling of all nonmetallics with medium to high content of abrasive reinforcement or silicon.

CVD:

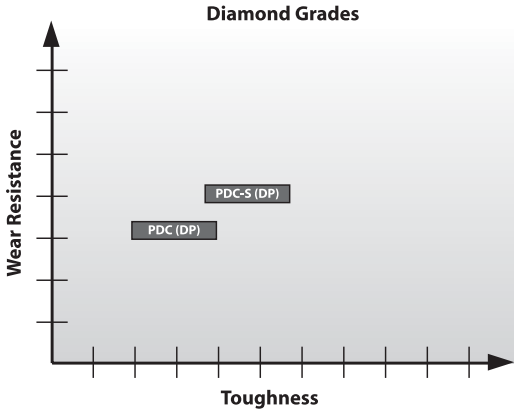
Performance:
Solid diamond with no structure. Cutting edge is extremely sharp and without microfractures generating no cutting pressure, allowing burr-free results with tolerances close to zero. Extremely flank wear resistant with maximum thermal conductivity, and good toughness.

Application:
Super finishing to roughing of all nonferrous metals and non-metallics with abrasive reinforcement or silicon. (HSC - High Tech)

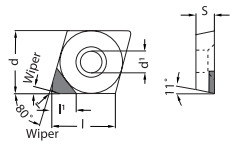
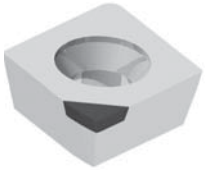
PDC:

Performance:
Polycrystalline, carbide reinforced diamond of fine grit size, good cutting edge sharpness and low cutting pressure allowing close tolerances. Increased flank wear resistance and toughness.

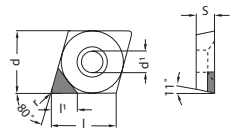
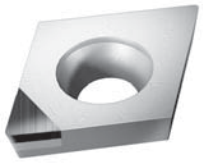
Application:
Finishing and general purpose of all nonferrous metals and nonmetallics with low content of abrasive reinforcement or silicon.



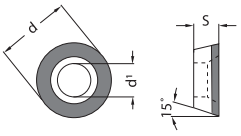
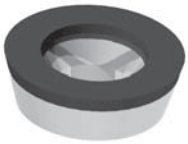
BECKER CPGW Milling Insert with Wiper

Insert		Designation	Dimensions l	l¹	s	r	d	d¹	PDC-S DP	PDC DP	CVD DP
		CPGW-32.51PDR	.382	.169	.156	.016	.375	.173	■		□

BECKER CPMW Milling Insert Neutral

Insert		Designation	Dimensions l	l¹	s	r	d	d¹	PDC-S DP	PDC DP	CVD DP
		CPMW-32.52	.382	.161	.156	.031	.375	.173		■	

BECKER RDHX Full Face Milling Insert

Insert		Designation	Dimensions l	l¹	s	r	d	d¹	PDC-S DP	PDC DP	CVD DP
		RDHX-1003MO	--	--	.125	--	.394	.150	■		

V90

Milling Cutters for Non-Ferrous & Plastic Materials

Application:

- High speed milling of
  - aluminum alloys
  - copper alloys
  - plastic materials
- Can be used for edge and slot milling, as well as axial plunge milling
- Excellent for deep cavity work
- Suitable for soft non-ferrous materials
- Up to .500" depth of cut
- Exceptionally high feed rates (over 200 IPM)
- Maximum metal removal on any machine
- Wide range of product available

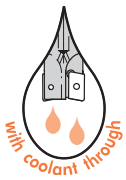
Features / Benefits

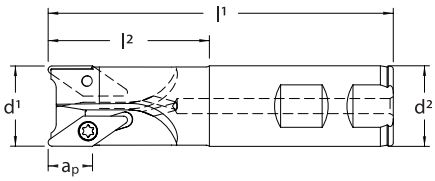
- High positive geometry insert with wave shape topography eliminates edge build-up and provides efficient chip removal
- End mills designed with coolant bore holes directed toward cutting edges
- New insert grade TK10MP is specifically designed for the machining of aluminum and non-ferrous materials that require high cutting speeds
- New grade ALP-XL has an extremely smooth self lubricating surface coupled with the latest coating technology ensures frictionless chip removal resulting in significant increases in tool life when machining materials with less than 10% silicon such as 6061 and 7075 aluminum.

featuring

MAXICOOL™

through coolant technology





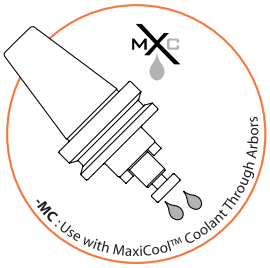
End Mills Optimized Design for Aluminum

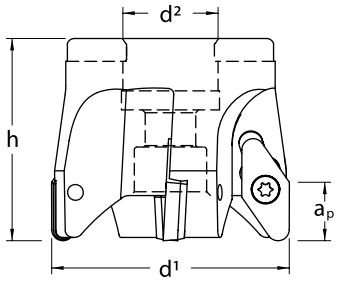
Designation	d1	d2	l1	l2	Max. ap	Max Plunge	flutes	Insert	Insert Screw	Wrench
VP90-0750C	.750	.750	3.28	1.25	.40	.200	2	VPGT-221-ALM	LF-89972	T8F
VP90-1000XC	1.000	1.000	4.28	2.00	.40	.200	3			
VP90-1000C	1.000	1.000	4.28	2.00	.53	.250	2	VPGT-333-ALM	LF-51706	T15F
VP90-1250C	1.250	1.250	4.28	2.00	.53	.250	2			
VP90-1500C	1.500	1.250	4.28	2.00	.53	.250	3			

Extra Length End Mills Optimized Design for Aluminum

Designation	d1	d2	l1	l2	Max. ap	Max Plunge	flutes	Insert	Insert Screw	Wrench
VP90CY-0750-XLC	.750	.750	6.75	1.25	.40	.200	2	VPGT-221-ALM	LF-89972	T8F
VP90CY-1000X-XLC	1.000	1.000	8.00	2.00	.40	.200	3			
VP90CY-1000-XLC	1.000	1.000	8.00	2.00	.53	.250	2	VPGT-333-ALM	LF-51706	T15F
VP90CY-1250-XLC	1.250	1.250	8.00	2.00	.53	.250	2			
VP90CY-1500-XLC	1.500	1.250	8.00	2.00	.53	.250	3			

Milling Cutters for Non-Ferrous & Plastic Materials and Inserts





Face Mills Optimized Design for Aluminum

Designation	d¹	d²	h	Max. a_p	Max Plunge	No. of inserts	Insert	Insert Screw	Wrench
VP90-2000-MC	2.00	.750	2.12	.53	.250	4	VPGT-333-ALM	LF-51706	T15F
VC90-2000-MC	2.00	.750	2.12	.59	.300	3	VCGT-43.58-ALM	C-1250	T20F
VC90-2500-MC	2.50	1.000	2.12	.59	.300	4			
VC90-3000-MC	3.00	1.000	2.12	.59	.300	5			
VC90-4000	4.00	1.500	2.12	.59	.300	6			

Face Mills Optimized Design for Aluminum

Designation	d¹	d²	h	Max. a_p	Max Plunge	No. of inserts	Insert	Insert Screw	Wrench
VC90-2500AL-3-MC	2.50	1.000	2.12	.59	.300	3	VCGT-43.58-ALM	C-1250	T20F
VC90-3000AL-3-MC	3.00	1.000	2.12	.59	.300	3			
VC90-4000AL-4	4.00	1.500	2.12	.59	.300	4			

Insert Grade Descriptions:

TK10M

Uncoated K10/C2 wear resistant grade, suited for machining of non-ferrous materials, high temp. alloys as well as synthetic materials including fiberglass, graphite and plastic. Recommended to run with coolant only when materials require wet machining.

TK10MP

TiAlN coating. Recommended grade for high speed machining of aluminum and non-ferrous materials. Good wear resistance. Designed to be used with coolant.

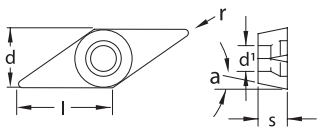
TK10TB

PVD diamond film coating offering greatly extended tool life over conventional carbide. Recommended specifically for synthetic materials such as graphite.

V90 Inserts

VCGT

VPGT



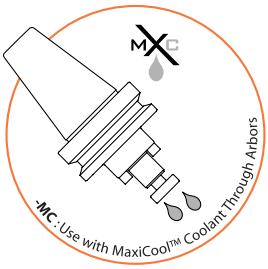
Insert	Designation	Dimensions						TK10MP			TK10TB				TK10M	
		l	s	r	d	d¹	a	Coated			Dia. Coated				Uncoated	
	VCGT-43.58-ALM	.87	7/32	.118	1/2	.216	7°		■						■	
	VPGT-221-ALM	.437	1/8	1/64	1/4	.110	11°		■			■			■	
	VPGT-333-ALM	.654	3/16	3/64	3/8	.173	11°		■			■			■	

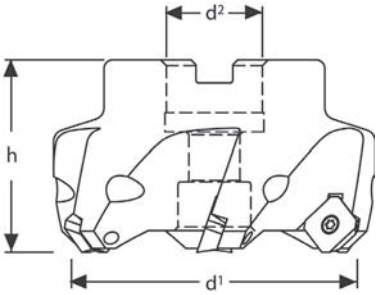
S45F

Super Positive Milling Cutters & Inserts

Super milling cutter with 45° entering angle that decreases cutting forces and allows a high feed on limited capacity machines. Inserts are mounted using Torx® locking screws for uninterrupted chip flow.

S45F cutters use thicker inserts, allowing for high feed rates. This face milling cutter works well on steels, stainless steels, alloyed steels, cast iron and aluminum alloys.

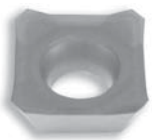




Face Mills

Designation	d¹	d²	h	Flutes	lbs.	Insert	Insert Screw	Wrench
S45F-20SE43X-MC	2.000	.750	1.75	4	1.05	SEHT-43 SEKT-43 SEKW-43	TX20S	T20F
S45F-25SE43X-MC	2.500	1.000	2.00	5	2.00			
S45F-30SE43X-MC	3.000	1.000	2.00	6	2.65			
S45F-40SE43X-MC	4.000	1.250	2.00	7	3.50			
S45F-40SE43X	4.000	1.500	2.00	7	3.50			
S45F-50SE43X	5.000	1.500	2.00	8	5.95			
S45F-60SE43X	6.000	1.500	2.00	9	8.90			

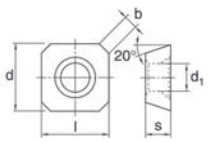
Remember to use COPASLIP® anti-seize compound on all insert screws


SEHT-ALC

SEHT / SEKT

SEKW

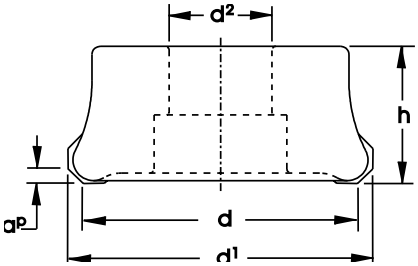
S45F Inserts

Insert	Designation	Dimensions						TP30MC	RM350	TK10MP	ALP-XL			TK10M			
		l	s	r	d	d¹	b	Coated						Uncoated			
	SEHT-43 AFSN	.500	3/16	---	1/2	.217	.062		■								
	SEHT-43 AFFN-ALC	.500	3/16	---	1/2	.217	.062			■	■			■			
	SEKT-43 AFSN	.500	3/16	---	1/2	.217	.062	■									
	SEKW-43 AFSN	.500	3/16	---	1/2	.217	.062	■	■								

For High Speed Milling

Smooth cutting positive / negative geometry delivers high feed facing of parts in a full range of machining environments. Suitable for Bridgeport style tool room machines as well as more powerful CNC machining centers. Up to 8 indexes per insert lowers per edge cost. Cutter bodies hold both octagon and round inserts for even more versatility.

Cutter holds both round & octagonal inserts

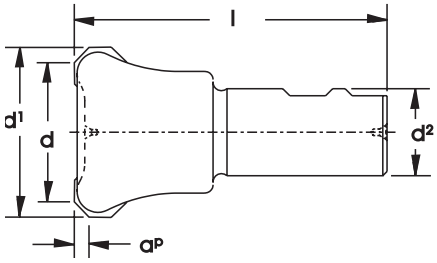


Designation	d	d¹	d²	h	Max. a_p	Flutes	lbs	Insert	Insert Screw	Wrench
RT45VF-200-075-OE4	2.000	2.30	.750	2.00	.140/.250	4	2.00	OECX-432 RECX-43	CE73382	T15F
RT45VF-250-100-OE4	2.500	2.80	1.000	2.00	.140/.250	5	2.75			
RT45VF-300-100-OE4	3.000	3.30	1.000	2.00	.140/.250	6	3.50			
RT45VF-400-150-OE4	4.000	4.29	1.500	2.00	.140/.250	6	5.00			
RT45VF-200-075-OE5	2.000	2.36	.750	2.00	.173/.312	3	2.00	OECX-534 RECX-53	CE73921	T20F
RT45VF-250-100-OE5	2.500	2.86	1.000	2.00	.173/.312	4	2.75			
RT45VF-300-100-OE5	3.000	3.36	1.000	2.00	.173/.312	5	3.50			
RT45VF-400-150-OE5	4.000	4.36	1.500	2.00	.173/.312	6	5.00			
RT45VF-500-150-OE5	5.000	5.36	1.500	2.00	.173/.312	6	7.75			
RT45VF-800-200-OE5	8.000	8.38	2.000	2.00	.173/.312	9	21.00			
RT45VF-200-075-OE6	2.000	2.44	.750	2.00	.208/.375	3	2.00	OECX-634 RECX-63	CE73921	T20F
RT45VF-250-100-OE6	2.500	2.94	1.000	2.00	.208/.375	4	2.75			
RT45VF-300-100-OE6	3.000	3.44	1.000	2.00	.208/.375	4	3.50			
RT45VF-400-150-OE6	4.000	4.44	1.500	2.00	.208/.375	5	5.00			
RT45VF-500-150-OE6	5.000	5.44	1.500	2.00	.208/.375	6	7.75			
RT45VF-600-200-OE6	6.000	6.44	2.000	2.00	.208/.375	7	9.00			

Remember to use COPASLIP® anti-seize compound on all insert screws

RT45V

For High Speed Milling



Designation	d	d¹	d²	l	Max. a_p	Flutes	Insert	Insert Screw	Wrench
RT45VE-125-075-OE4C	1.250	1.55	.750	4.25	.140 /.250	3	OECX-432 RECX-43	CE73382	T15F
RT45VE-150-075-OE4C	1.500	1.80	.750	4.25	.140 /.250	3			
RT45VE-125-100-OE5C	1.250	1.61	1.000	4.50	.173 / .312	2	OECX-534 RECX-53	CE73921	T20F
RT45VE-150-100-OE5C	1.500	1.86	1.000	4.50	.173 / .312	3			

Remember to use COPASLIP® anti-seize compound on all insert screws

SLK (C1-C2 / P40-P25, M30-M20, K40-K20)

- PVD AlTiN coated grade, high speed range, and excellent wear resistance, medium shock resistance. Semi roughing to finishing applications. Excellent choice for hi-temp, 300 Series stainless and cast iron.

SLX (C5-C6 / P40-P15)

- PVD AlTiN coated, general purpose milling of ferrous materials at high speeds. Excellent impact and wear resistant. Used in roughing to finishing of steels.

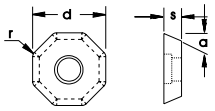
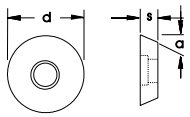
ALP-XL (C2, K20)

- Extremely smooth self lubricating surface coupled with the latest coating technology ensures frictionless chip removal resulting in significant increases in tool life when machining materials with less than 10% silicon such as 6061 and 7075 aluminum.

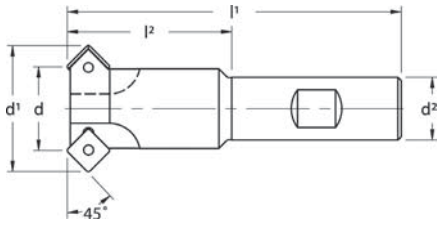
OECX

RECX

RT45V Inserts

Insert	Designation	s	d	r	a	SLK	SLX	ALP-XL
						Coated		
	Geometry: K = K-Land Edge							
	OECX-432-K	.188	.500	.032	23°	■		
	OECX-534-K	.188	.625	.062	23°	■	■	■
	Geometry: P = Dish Face							
	OECX-432-P	.188	.500	.032	23°	■	■	■
	OECX-534-P	.188	.625	.062	23°	■	■	■
	Geometry: K = K-Land Edge							
	RECX-43-K	.188	.500	.032	23°	■	■	
	RECX-53-K	.188	.625	.062	23°	■	■	■
	Geometry: P = Dish Face							
	RECX-43-P	.188	.500	.032	23°	■	■	
	RECX-53-P	.188	.625	.062	23°		■	■

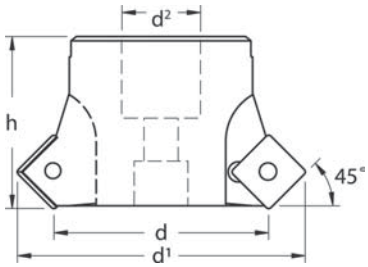
45° Chamfer Milling Cutters & Inserts



End Mills

Designation	d	d¹	d²	l¹	l²	flutes	chamfer min-max	Insert	Insert Screw	Wrench
REGULAR LENGTH:										
SD45-0625	.625	1.13	.750	3.00	.97	2	.67-1.11	SDMT-322 SDMW-322	TX15SS	T15F
SD45-0750	.750	1.25	.750	3.30	1.27	2	.79-1.23			
SD45-1000	1.000	1.50	.750	4.00	1.97	2	1.04-1.48			
SD45-1250	1.250	1.75	1.250	4.00	1.72	3	1.29-1.73			
SP45-1500	1.500	2.18	1.250	4.00	1.72	3	1.54-2.11	SPMT-432 SPMW-432	TX20S	T20F
EXTENDED LENGTH:										
SD45-0625-L	.625	1.13	.750	8.00	1.49	2	.67-1.11	SDMT-322 SDMW-322	TX15SS	T15F
SD45-1000-L	1.000	1.50	1.000	8.00	1.49	2	1.04-1.48			

Remember to use COPASLIP® anti-seize compound on all insert screws



Face Mills

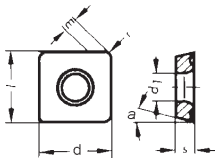
Designation	d	d¹	d²	h	flutes	chamfer min-max	Insert	Insert Screw	Wrench
SP45-2000	2.000	2.68	.750	1.60	4	2.04-2.66	SPMT-432 SPMW-432	TX20S	T20F

Remember to use COPASLIP® anti-seize compound on all insert screws

SDMW / SPMW

SDMT / SPMT

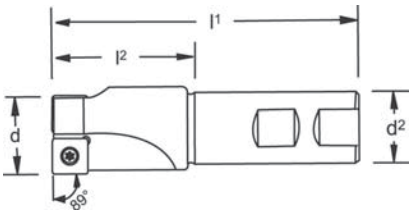
S45 Inserts

Insert	Designation	Dimensions l	s	r	d	d¹	m	a	RP15K (Coated)	RP25K (Coated)								
															Uncoated			
	SDMW-322	.375	1/8	1/32	3/8	.173	.065	15°	■	■								
	SPMW-432	.500	3/16	1/32	1/2	.217	.091	11°	■	■								
	SDMT-322	.375	1/8	1/32	3/8	.173	.065	15°	■	■								
	SPMT-432	.500	3/16	1/32	1/2	.217	.091	11°	■	■								

Plunge Milling Cutters & Inserts

The PC cutter permits the machine operator to drill and side mill with the same tool. Drilling depths of 3/4 of the insert height are possible. (Deeper holes are attainable, but chip evacuation is extremely important.)

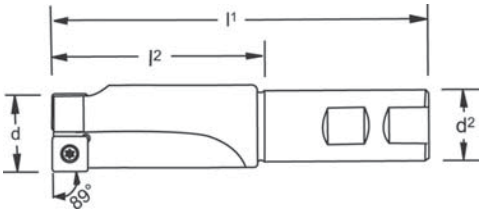
Enclosed pockets are an ideal application for the PC end mill. Several different insert styles are available, both in coated and uncoated milling grades.



Standard Length End Mills for Drilling & Milling

Designation	d	d²	l¹	l²	flutes	Insert	Insert Screw	Wrench
PC-0730	.730	.750	3.03	1.00	1	SDMT-322 SDMW-322	TX15SS	T15F
PC-1000	1.000	1.000	3.50	1.25	2			
PC-1000-3	1.000	.750	3.25	1.25	2			
PC-1250	1.250	1.000	4.00	1.50	2	SPMT-432 SPMW-432	TX20S	T20F
PC-1500	1.500	1.250	4.00	1.50	2			

Remember to use COPASLIP® anti-seize compound on all insert screws



Extended Length End Mills for Drilling & Milling

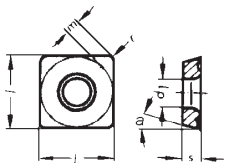
Designation	d	d²	l¹	l²	flutes	Insert	Insert Screw	Wrench
PC-0730-XL	.730	.750	3.53	1.50	1	SDMT-322 SDMW-322	TX15SS	T15F
PC-1000-XL	1.000	1.000	4.31	2.03	2			
PC-1250-XL	1.250	1.000	4.81	2.50	2	SPMT-432 SPMW-432	TX20S	T20F
PC-1500-XL	1.500	1.250	5.40	3.00	2			

Remember to use COPASLIP® anti-seize compound on all insert screws

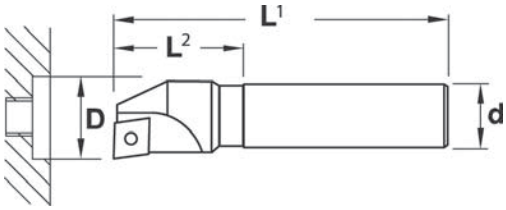
SDMW / SPMW

SDNT / SPNT

PC Inserts

Insert	Designation	Dimensions							RP15K	RP25K									
		l	s	r	d	d¹	m	a	Coated						Uncoated				
	SDMW-322	.375	1/8	1/32	3/8	.173	.065	15°	■	■									
	SPMW-432	.500	3/16	1/32	1/2	.217	.091	11°	■	■									
	SDMT-322	.375	1/8	1/32	3/8	.173	.065	15°	■	■									
	SPMT-432	.500	3/16	1/32	1/2	.217	.091	11°	■	■									

Counterbore Milling Cutters & Inserts



Counterbore Milling Cutters

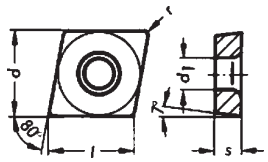
Inch

Designation	D	d	L¹	L²	cap screw size	Insert	Insert Lock Screw	Wrench
CCBE-025-CC2	.406	.500	3.00	.59	1/4	CCM_-21.5_	C-1425	C-5507
CCBE-031-CC2	.500	.500	3.00	.74	5/16			
CCBE-037-CC3	.594	.625	3.50	1.18	3/8	CCM_-32.5_	C-1440	C-5515
CCBE-050-CC3	.781	.625	3.50	1.26	1/2			
CCBE-062-CC3	.969	.750	3.50	1.26	5/8			
CCBE-075-CC3	1.188	.750	3.50	1.26	3/4			

Metric

Designation	D	d	L¹	L²	cap screw size	Insert	Insert Lock Screw	Wrench
CCBE-M6-CC2	11	12	85	15	M6	CCM_-21.5_	C-1425	C-5507
CCBE-M8-CC2	14	12	85	19	M8			
CCBE-M10-CC3	17	16	95	30	M10	CCM_-32.5_	C-1440	C-5515
CCBE-M12-CC3	19	16	95	32	M12			
CCBE-M14-CC3	22	16	95	32	M14			
CCBE-M16-CC3	25	16	95	32	M16			

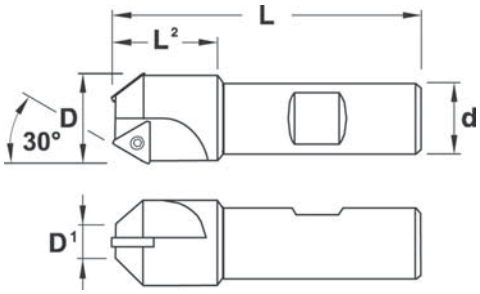
CCBE Inserts

Insert	Designation	Dimensions					RK120C	RP15K	RP25K	RP35K						
		l	s	r	d	d¹	Coated						Uncoated			
	CCMT-21.51-STM	.254	3/32	1/64	1/4	.114		■	■							
	CCMT-21.52-STM			1/32				■	■							
	CCMT-32.51-STM	.380	5/32	1/64	3/8	.173	■	■	■	■						
	CCMT-32.52-STM			1/32			■	■	■	■						

For other insert choices refer to CCMT inserts in the turning section

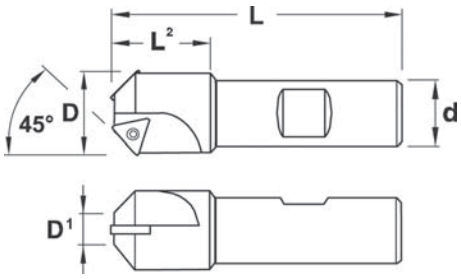
T30E / T45E

Chamfer & Countersink Cutters & Inserts



STYLE "A" - 30° **Inch**

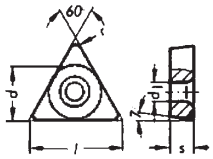
Designation	D	D¹	d	L	L²	flutes	Insert	Insert Lock Screw	Wrench
T30E-062TC2	.625	.213	.500	2.75	.94	1	TCM_-21.5_	C-1425	C-5507
T30E-102TC2	1.020	.622	.750	3.54	1.18	2			



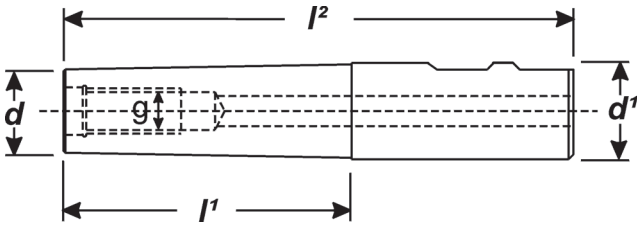
STYLE "B" - 45° **Inch**

Designation	D	D¹	d	L	L²	flutes	Insert	Insert Lock Screw	Wrench
T45E-062TC2	.625	.047	.500	2.75	.94	1	TCM_-21.5_	C-1425	C-5507
T45E-083TC2	.830	.244	.750	3.54	1.10	2			

T30E / T45E Inserts

Insert	Designation	Dimensions l	s	r	d	d¹	RP15K	RP25K	RP35K							
							Coated						Uncoated			
	TCMT-21.51-STM	.433	3/32	1/64	1/4	.110	■	■	■							
	TCMT-21.52-STM			1/32			■	■	■							

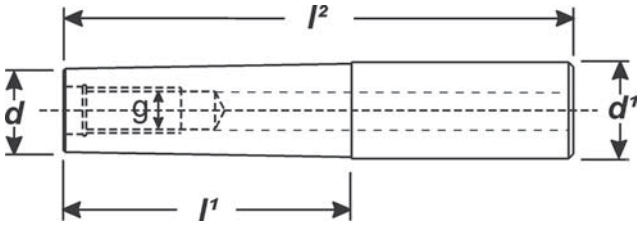
For other insert choices refer to TCMT inserts in the turning section



Weldon Straight Shanks

Designation	g	d	d¹	l¹	l²
SS050-M6-2	M6	.382	.500	2.00	3.78
SS050-M6-3	M6	.382	.500	3.00	4.78
SS063-M8-2	M8	.512	.625	2.00	3.90
SS063-M8-3	M8	.512	.625	3.00	4.90
SS063-M8-4	M8	.512	.625	4.00	5.90
SS075-M10-3	M10	.709	.750	3.00	5.03
SS075-M10-5	M10	.709	.750	5.00	7.03
SS100-M12-3*	M12	.827	1.000	3.00	5.28
SS125-M12-5*	M12	.827	1.250	5.00	7.28
SS125-M16-3*	M16	1.142	1.250	3.00	5.28
SS125-M16-5*	M16	1.142	1.250	5.00	7.28
SS125-M16-7*	M16	1.142	1.250	7.00	9.28

* with internal coolant supply



Cylindrical Straight Shanks

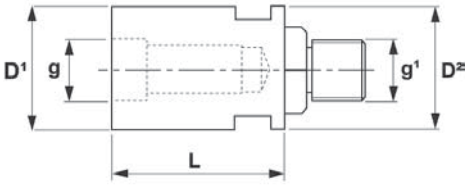
Designation	g	d	d¹	l¹	l²
SS050CY-M6-2	M6	.382	.500	2.00	3.78
SS050CY-M6-3	M6	.382	.500	3.00	4.78
SS063CY-M8-2	M8	.512	.625	2.00	3.90
SS063CY-M8-3	M8	.512	.625	3.00	4.90
SS063CY-M8-4	M8	.512	.625	4.00	5.90
SS075CY-M10-3	M10	.709	.750	3.00	5.03
SS075CY-M10-5	M10	.709	.750	5.00	7.03
SS100CY-M12-3*	M12	.827	1.000	3.00	5.28
SS125CY-M12-5*	M12	.827	1.250	5.00	7.28
SS125CY-M16-3*	M16	1.142	1.250	3.00	5.28
SS125CY-M16-5*	M16	1.142	1.250	5.00	7.28
SS125CY-M16-7*	M16	1.142	1.250	7.00	9.28

* with internal coolant supply

Modular Milling System

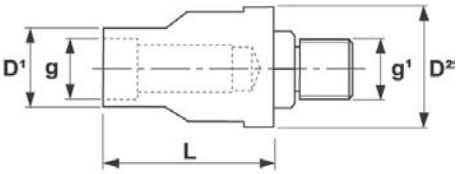
Extensions & Reducers

Precision manufactured extensions and reducers enhance the capability of the modular milling system. If you need to extend an existing tool or add a smaller tool to your existing arbor, the extensions and reducers shown below should meet your requirements.



Extensions

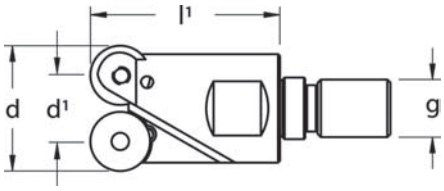
Designation	g	g¹	D¹	D²	L
EX-M6	M6	M6	.382	.382	.98
EX-M8	M8	M8	.512	.512	1.18
EX-M10	M10	M10	.709	.709	1.37
EX-M12*	M12	M12	.827	.827	1.57
EX-M16*	M16	M16	1.142	1.142	1.57
* with internal coolant supply					



Reducers

Designation	g	g¹	D¹	D²	L
RD-M8/M6	M6	M8	.382	.512	.98
RD-M10/M8	M8	M10	.512	.709	1.18
RD-M12/M10	M10	M12	.709	.827	1.38
RD-M16/M12*	M12	M16	.827	1.142	1.57
* with internal coolant supply					

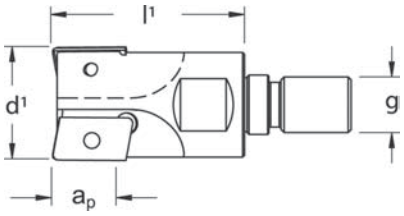
- Multi-functional milling
- 15° positive insert
- Round insert has a strong cutting edge
- Ideally suited for mold & die manufacturing



Designation	d	d mm	d¹	g	l¹	flutes	Insert	Insert Screw	Wrench
R360-0500-TS	.500	12.70	.185	M6	1.10	1	RDMW-0802MOT RDGT-0802MO-AL	TX08SS	T8F
R360-0500L-TS	.500	12.70	.185	M8	2.00	1			
R360-0625-TS	.625	15.87	.310	M8	1.10	2			
R360-0750-TS	.750	19.05	.435	M10	1.18	2			
R360-1000R08-TS	1.000	25.40	.528	M12	1.50	3			
R360-1250R08-TS	1.250	31.75	.778	M16	1.75	5			
R360-0984-TS	.984	25.00	.591	M12	1.18	2	RDMW-1003MOT RDGT-1003MO-AL	T15SS	T15F
R360-1000R10-TS	1.000	25.40	.606	M12	1.50	3			
R360-1181-TS	1.181	30.00	.787	M16	1.57	3			
R360-1250R10-TS	1.250	31.75	.856	M16	1.75	4			
R360-0945-TS	.945	24.00	.472	M12	1.18	2	RDMW-1204MOT-X	TX15S	T15F
R360-1000-TS	1.000	25.40	.528	M12	1.50	2			
R360-1250-TS	1.250	31.75	.778	M16	1.75	2			
R360-1378-TS	1.378	35.00	.906	M16	1.57	3			
R360-1500-TS	1.500	38.10	1.028	M16	1.75	3			
R360-1575-TS	1.575	40.00	1.102	M16	1.57	4			

Remember to use COPASLIP® anti-seize compound on all insert screws

- For slot milling and square shoulder milling
- High performance and reliablilty
- High machining rates

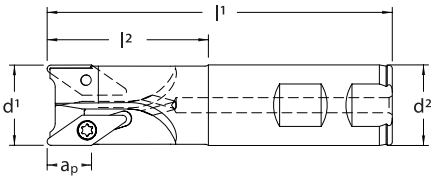


Designation	d¹	d¹ mm	g	l¹	Max. a_p	Flutes	Insert	Insert Screw	Wrench
AD90-0500-TS	.500	12.70	M6	1.10	.33	1	ADHT-0903__	TX08S	T8F
AD90-0625-TS	.625	15.87	M8	1.10	.33	2			
AD90-0750-TS	.750	19.05	M10	1.18	.33	2			
AD90-0984-TS	.984	25.00	M12	1.18	.33	3			
AD90-1000-TS	1.000	25.40	M12	1.50	.33	3			
AD90-1260-TS	1.260	32.00	M16	1.57	.33	5			
AP90-0975-TS	.975	24.77	M12	1.50	.55	2	APHT-1604__ APHT-1604__-AL APNT-1604__ APNX-1604__	TX15S	T15F
AP90-0984-TS	.984	25.00	M12	1.18	.55	2			
AP90-1000-TS	1.000	25.40	M12	1.50	.55	2			
AP90-1250-TS	1.250	31.75	M16	1.75	.55	3			
AP90-1260-TS	1.260	32.00	M16	1.57	.55	3			
AP90-1378-TS	1.378	35.00	M16	1.57	.55	3			
AP90-1500-TS	1.500	38.10	M16	1.75	.55	3			
AP90-1575-TS	1.575	40.00	M16	1.57	.55	4			

Remember to use COPASLIP® anti-seize compound on all insert screws

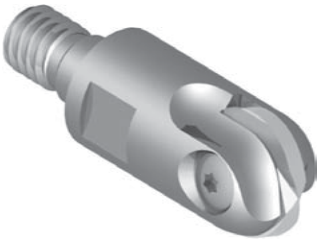
Modular Milling System

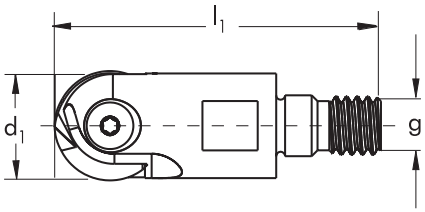
Screw On Milling Cutters



Optimized Design for Aluminum

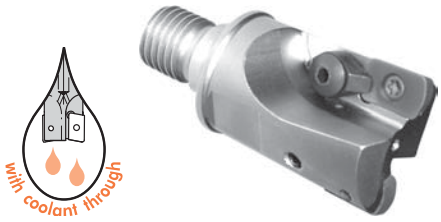
Designation	d¹	d²	l²	m	Max. a_p	Max Plunge	flutes	Insert	Insert Screw	Wrench
Standard Non Through Coolant								VPGT-221-ALM	LF-89972	T8F
VP90-0750-TS	.750	.709	1.18	1.25	.40	.200	2			
Through Coolant Enabled										
VP90-1000XC-TS	1.000	.827	1.57	2.00	.40	.200	3			
Through Coolant Enabled								VPGT-333-ALM	LF-51706	T15F
VP90-1000C-TS	1.000	.827	1.57	2.00	.53	.250	2			
VP90-1250C-TS	1.250	1.142	1.97	2.00	.53	.250	2			
VP90-1500C-TS	1.500	1.142	1.97	2.00	.53	.250	3			

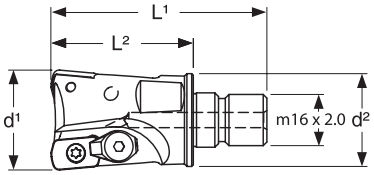




Designation	d¹	g	l¹	Insert	Insert Screw	Wrench
BNK-0375-TS	.375	M6	1.25	XCCG-31.5 / XCE_-31.5	KBN-10	T10F
BNK-0500-TS	.500	M6	1.25	XCCG-41.5-HG / XCE_-41.5	KBN-15	T15F
BNK-0625-TS	.625	M8	1.5	XCCG-52-HG / XCE_-52	KBN-15L	T15F
BNK-0750-TS	.750	M10	1.5	XCCG-62-HG / XCE_-62	KBN-20	T20F
BNK-1000-TS	1.000	M12	1.5	XCCG-82.5-HG / XCE_-82.5	KBN-25	T25F

Remember to use COPASLIP® anti-seize compound on all insert screws





Designation	d¹	d²	l¹	l²	Flutes	Insert	Clamp	Clamp Screw	Torx Screw	Torx Wrench
XD95HF-1250-TS	1.250	1.142	2.65	1.75	2	XDGW-1604H0 XDGW-1604H20 XDGW-1604TH05 XDGW-1604TH20	RT892	RT898	TX15S	T15F
XD95HF-1500-TS	1.500	1.142	3.03	2.12	3					

Remember to use COPASLIP® anti-seize compound on all insert screws

Coolant through shell arbors used with coolant through face mills are designed to ***BLAST AWAY*** the effects of thermal shock

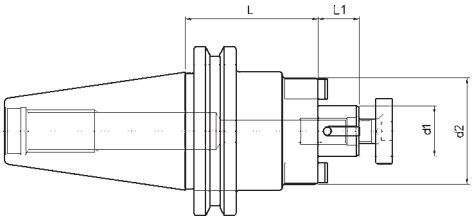
- Maximize cutting parameters!
- Maximize insert life!
- Maximize profits!
- Minimize thermal shock!
- Minimize possible re-cutting of chips!
- Superior surface finishes!

CV40 Coolant Through Arbors

Designation	d¹	d²	L¹	L²	kg
CV40SM-0750-2.00	3/4	1.57	2.00	.68	0.7
CV40SM-0750-4.00			4.00		0.9
CV40SM-1000-2.00	1.00	1.96	2.00	.68	0.9
CV40SM-1000-4.00			4.00		1.2
CV40SM-1250-2.25	1-1/4	2.36	2.25	.68	1.5
CV40SM-1250-4.00			4.00		1.8
CV40SM-1500-2.25	1-1/2	2.75	2.25	.94	2.6
CV40SM-1500-4.00			4.00		2.9

CV50 Coolant Through Arbors

Designation	d¹	d²	L¹	L²	kg
CV50SM-0750-2.00	3/4	1.57	2.00	.68	2.3
CV50SM-0750-4.00			4.00		2.8
CV50SM-0750-6.00			6.00		4.5
CV50SM-1000-2.00	1.00	1.96	2.00	.68	2.5
CV50SM-1000-4.00			4.00		3.1
CV50SM-1000-6.00			6.00		5.5
CV50SM-1250-2.25	1-1/4	2.36	2.25	.68	3.4
CV50SM-1250-4.00			4.00		4.0
CV50SM-1250-6.00			6.00		6.5
CV50SM-1500-2.25	1-1/2	2.75	2.25	.94	3.8
CV50SM-1500-4.00			4.00		4.3
CV50SM-1500-6.00			6.00		7.5



BT40 Coolant Through Arbors

Designation	d¹	d²	L¹	L²	kg
BT40SM-0750-2.00	3/4	1.57	2.00	.68	0.7
BT40SM-0750-4.00			4.00		1.8
BT40SM-1000-2.00	1.00	1.96	2.00	.68	0.9
BT40SM-1000-4.00			4.00		2.2
BT40SM-1250-2.25	1-1/4	2.36	2.25	.68	1.5
BT40SM-1250-4.00			4.00		2.7

ORION 2 & 3 Flute Aluminum Series

for Aluminum & Non-Ferrous Metals

Rani Tool's Orion end mills increase productivity when machining all types of aluminum including high silicon, die cast, and extruded metal parts. Orion mills resist clogging and are designed for aggressive chip evacuation under extremely high chip loads while maintaining excellent surface finish.

- Use the two flute style for greater stock removal and flute volume
- Use the three flute style for finishing applications or roughing on lower horsepower machines

Achieve maximum performance in:

- Aluminum
- Non-ferrous metals

Stub Length Cylindrical Shank End Mills

without Corner Radius Designation	dia.	shank dia.	flute length	OAL
OS3SC-0125	1/8	1/8	1/4	1-1/2
OS3SC-0187	3/16	3/16	5/16	2
OS3SC-0250	1/4	1/4	3/8	2-1/2
OS3SC-0312	5/16	5/16	7/16	2-1/2
OS3SC-0375	3/8	3/8	1/2	2-1/2
OS3SC-0500	1/2	1/2	5/8	3
OS3SC-0625	5/8	5/8	3/4	3-1/2
OS3SC-0750	3/4	3/4	1	4
OS3SC-1000	1	1	1-1/4	4

Ideal for finishing and low horsepower applications!

Standard Length Cylindrical Shank End Mills

without Corner Radius Designation	dia.	shank dia.	flute length	OAL
OR3SC-0125	1/8	1/8	3/8	1-1/2
OR3SC-0187	3/16	3/16	9/16	2
OR3SC-0250	1/4	1/4	3/4	2-1/2
OR3SC-0312	5/16	5/16	13/16	2-1/2
OR3SC-0375	3/8	3/8	1	2-1/2
OR3SC-0500	1/2	1/2	1-1/4	3
OR3SC-0625	5/8	5/8	1-5/8	3-1/2
OR3SC-0750	3/4	3/4	1-5/8	4
OR3SC-1000	1	1	2	4

Standard Length Weldon Shank End Mills

without Corner Radius Designation	dia.	shank dia.	flute length	OAL
OR3SW-0250	1/4	1/4	3/4	2-1/2
OR3SW-0375	3/8	3/8	1	2-1/2
OR3SW-0500	1/2	1/2	1-1/4	3
OR3SW-0625	5/8	5/8	1-5/8	3-1/2
OR3SW-0750	3/4	3/4	1-5/8	4
OR3SW-1000	1	1	2	4

- three flute design for smooth cutting action and less harmonic stress
- capable of very aggressive feed rates

Stub Length Cylindrcial Shank End Mills

without Corner Radius Designation	dia.	shank dia.	flute length	OAL
OS2SC-0125	1/8	1/8	1/4	1-1/2
OS2SC-0187	3/16	3/16	5/16	2
OS2SC-0250	1/4	1/4	3/8	2-1/2
OS2SC-0312	5/16	5/16	7/16	2-1/2
OS2SC-0375	3/8	3/8	1/2	2-1/2
OS2SC-0500	1/2	1/2	5/8	3
OS2SC-0625	5/8	5/8	3/4	3-1/2
OS2SC-0750	3/4	3/4	1	4
OS2SC-1000	1	1	1-1/4	4

Great for roughing & finishing!

Standard Length Cylindrcial Shank End Mills

without Corner Radius Designation	dia.	shank dia.	flute length	OAL
OR2SC-0125	1/8	1/8	3/8	1-1/2
OR2SC-0187	3/16	3/16	9/16	2
OR2SC-0250	1/4	1/4	3/4	2-1/2
OR2SC-0312	5/16	5/16	13/16	2-1/2
OR2SC-0375	3/8	3/8	1	2-1/2
OR2SC-0500	1/2	1/2	1-1/4	3
OR2SC-0625	5/8	5/8	1-5/8	3-1/2
OR2SC-0750	3/4	3/4	1-5/8	4
OR2SC-1000	1	1	2	4

- two flute design for extremely high chip loads
- works equally well in low and high speed applications
- high strength carbide grade for heavy feed applications
- use for maximum metal removal rates
- produces excellent surface finishes
- available with corner radius for increased corner strength
- chips are pulled up and away from workpiece thereby protecting the work piece finish and alleviating chip packing

Standard Length Weldon Shank End Mills

without Corner Radius Designation	dia.	shank dia.	flute length	OAL
OR2SW-0250	1/4	1/4	3/4	2-1/2
OR2SW-0312	5/16	5/16	13/16	2-1/2
OR2SW-0375	3/8	3/8	7/8	2-1/2
OR2SW-0500	1/2	1/2	1	3
OR2SW-0500L	1/2	1/2	1-1/4	3-1/4
OR2SW-0625	5/8	5/8	1-1/4	3-1/2
OR2SW-0750	3/4	3/4	1-5/8	4
OR2SW-1000	1	1	2	4-1/2

Long Length Cylindrical Shank End Mills

without Corner Radius Designation	dia.	shank dia.	flute length	OAL
OU2SC-0250	1/4	1/4	1-1/4	3
OU2SC-0312	5/16	5/16	1-3/8	3
OU2SC-0375	3/8	3/8	1-1/2	3-1/4
OU2SC-0500	1/2	1/2	2	4
OU2SC-0750	3/4	3/4	2-1/2	5
OU2SC-1000	1	1	2-5/8	5

STRATUS 4 Flute End Mills

High Performance Variable Flute End Mills

A variable flute end mill uses variations in geometry to help eliminate harmonics and thereby provide a quiet cutting action. Part of the geometric variation is evident in the unequal flute spacing visible on this end mill.The Stratus also boasts the use of a very tough premium carbide substrate and new generation multi layer coating.

These features will all combine to provide silent vibration free machining in both roughing and finishing throughout a wide variety of work materials.

For maximum performance in:

- » stainless steels
- » high temperature alloys
- » inconel
- » titanium
- » low & medium carbon steels
- » tool steels
- » cast iron

Performance leader in:

- » reliability ..... *delivers the quality & performance you expect*
- » durability ..... *stands up to the most extreme conditions*
- » productivity ..... *attacks the most demanding application*
- » longevity ..... *reduced chatter enhances tool life*
- » versatility ..... *one tool for slotting, pocketing, roughing, & finishing*

TIP: use tools with corner radius whenever possible for longer tool life

4 Flute Stub Length End Mills

with Corner Radius Straight Shank Designation	without Corner Radius Straight Shank Designation	dia.	shank dia.	flute length	OAL	radius
SS4RC-0250	SS4SC-0250	1/4	1/4	3/8	2	.020
SS4RC-0375	SS4SC-0375	3/8	3/8	1/2	2	.020
SS4RC-0500	SS4SC-0500	1/2	1/2	5/8	2-1/2	.030
SS4RC-0625	SS4SC-0625	5/8	5/8	3/4	3	.030
SS4RC-0750	SS4SC-0750	3/4	3/4	7/8	3	.030

4 Flute Standard Length End Mills

with Corner Radius Straight Shank Designation	without Corner Radius Straight Shank Designation	dia.	shank dia.	flute length	OAL	radius
SR4RC-0125	SR4SC-0125	1/8	1/8	1/2	1-1/2	.015
SR4RC-0156	SR4SC-0156	5/32	3/16	9/16	2	.015
SR4RC-0187	SR4SC-0187	3/16	3/16	5/8	2	.015
SR4RC-0219	SR4SC-0219	7/32	1/4	5/8	2-1/2	.020
SR4RC-0250	SR4SC-0250	1/4	1/4	3/4	2-1/2	.020
SR4RC-0312	SR4SC-0312	5/16	5/16	13/16	2-1/2	.020
SR4RC-0375	SR4SC-0375	3/8	3/8	7/8	2-1/2	.020
SR4RC-0437	SR4SC-0437	7/16	7/16	1	2-3/4	.020
SR4RC-0500	SR4SC-0500	1/2	1/2	1	3	.030
SR4RC-0500L	SR4SC-0500L	1/2	1/2	1-1/4	3-1/2	.030
SR4RC-0625	SR4SC-0625	5/8	5/8	1-1/4	3-1/2	.030
SR4RC-0750	SR4SC-0750	3/4	3/4	1-1/2	4	.030
SR4RC-1000	SR4SC-1000	1	1	1-1/2	4	.030

VEGA 6 Flute End Mills

Super High Output 6 Flute Carbide End Mills

Rani is introducing it's new high helix 6 flute end mills for roughing and finishing. The advanced flute design allows the user to achieve excellent surface finishes at higher feed rates. Excellent choice for peripheral milling in tough materials due to advanced smooth cutting helix design.

All Vega end mills are coated with an advanced Ti-Al coating for maximum heat resistance and longer tool life.

For maximum performance in:

- » inconel 625 & 718
- » titanium 6AL-4V
- » monel
- » rene 41
- » waspalloy
- » hastelloy-C
- » hardened tool & die steels

Performance leader in:

- » reliability ..... *specially formulated carbide grade delivers reliable performance*
- » versatility ..... *roughing applications to fine finishing cuts with same tool*
- » durability ..... *long life due to new coating technology*
- » range ..... *regular, long reach, neck relieved, and radius tools available as standards*

6 Flute Stub Length Square End

without Corner Radius Straight Shank Designation	dia.	shank dia.	flute length	OAL
VS6SC-0125	1/8	1/8	1/4	1-1/2
VS6SC-0187	3/16	3/16	5/16	2
VS6SC-0250	1/4	1/4	3/8	2-1/2
VS6SC-0375	3/8	3/8	1/2	2-1/2
VS6SC-0500	1/2	1/2	5/8	3
VS6SC-0625	5/8	5/8	3/4	3-1/2
VS6SC-0750	3/4	3/4	1	4

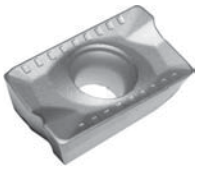
TIP: use tools with corner radius whenever possible for longer tool life

6 Flute Standard Length Square End

with Corner Radius Straight Shank Designation
VR6RC-012515
VR6RC-018715
VR6RC-025020
VR6RC-031230
VR6RC-037530
VR6RC-043730
VR6RC-050030
VR6RC-062530
VR6RC-075030
VR6RC-100030

without Corner Radius Straight Shank Designation	dia.	shank dia.	flute length	OAL	corner radius
VR6SC-0125	1/8	1/8	1/2	1-1/2	.015
VR6SC-0187	3/16	3/16	9/16	2	.015
VR6SC-0250	1/4	1/4	3/4	2-1/2	.020
VR6SC-0312	5/16	5/16	13/16	2-1/2	.030
VR6SC-0375	3/8	3/8	1	2-1/2	.030
VR6SC-0437	7/16	7/16	1	2-3/4	.030
VR6SC-0500	1/2	1/2	1-1/4	3	.030
VR6SC-0625	5/8	5/8	1-5/8	3-1/2	.030
VR6SC-0750	3/4	3/4	1-5/8	4	.030
VR6SC-1000	1	1	2	4	.030

Indexable Inserts for Milling



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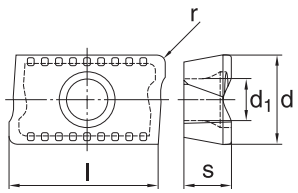
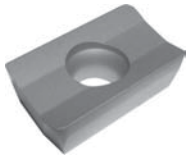


Insert	Designation	Dimensions l	s	r	d	d¹	b_s	a	TP25MP	TP30MC	TP40MP	TK10MP			TP25M	TK10M	
									Coated						Uncoated		
	APKT-1003 PDSR-MR	.431	.138	.020	.262	.110	--	--			■						
	APKT-1003 PDSR-PR			.020			--	--	□	■					■		
	APKT-1604 PDSR-MR	.642	.207	.031	.375	.177	--	--			■						
	APKT-1604 PDSR-PR			.031			--	--	■	■					■		
	APKT-160416 SR-PR			.062			--	--	□	■					■		
	APKT-160424 SR-PR			.094			--	--	□	■					■		
	APKT-160432 SR-PR			.125			--	--	□	■					■		



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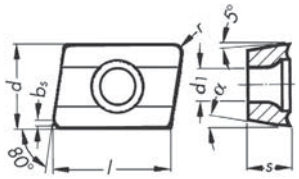
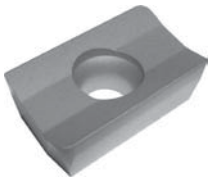
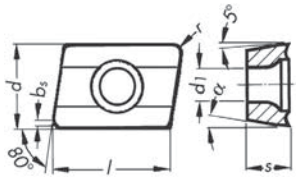


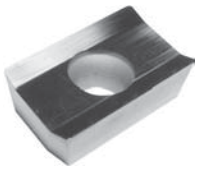
Insert	Designation	Dimensions l	s	r	d	d¹	b_s	a	RP350	RP354	RM352	TP30MC	RK150	ALP-XL	RP35	HMF	
									Coated						Uncoated		
	ADHT-090304	.381	1/8	1/64	1/4	.110	--	15°		■	■				■		
	ADHT-090308			1/32			--	15°		■	■				■		
	ADHT-090312			3/64			--	15°		■	■				■		
	ADHT-090316			1/16			--	15°		■	■				■		



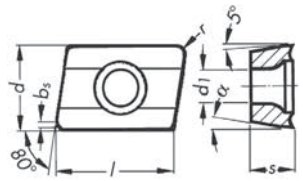
APHT-1604..



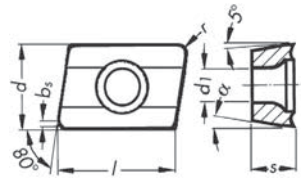
Insert	Designation	Dimensions l	s	r	d	d¹	b_s	a	RP350	RP354	RM352	TP30MC	RK150	ALP-XL	RP35	HMF	
									Coated						Uncoated		
	APHT-160408	.635	3/16	1/32	3/8	.173	.071	11°				■					
	APHT-160412			3/64			.059	11°	■			■	■				
	APHT-160416			1/16			.031	11°				■					
	APHT-160432			1/8			--	11°				■					



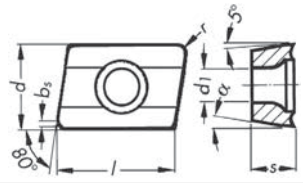
APHT-1604..-AL

Insert	Designation	Dimensions l	s	r	d	d¹	b_s	a	RP350	RP354	RM352	TP30MC	RK150	ALP-XL	RP35	HMF
									Coated						Uncoated	
	APHT-160408-AL			1/32			.067	11°						■		■
	APHT-160412-AL			3/64			.055	11°						■		■
	APHT-160416-AL			1/16			.035	11°						■		■
	APHT-160420-AL	.635	3/16	5/64	3/8	.173	.016	11°						■		■
	APHT-160424-AL			3/32			--	11°						■		■
	APHT-160432-AL			1/8			--	11°						■		■
	APHT-160464-AL			1/4			--	11°						■		■

APNT-160412

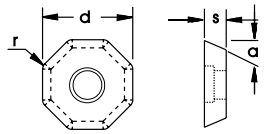
Insert	Designation	Dimensions l	s	r	d	d¹	b_s	a	RP350	RP354	RM352	TP30MC	RK150	ALP-XL	RP35	HMF
									Coated						Uncoated	
	APNT-160412	.635	3/16	3/64	3/8	.173	.047	11°	■			■	■			

APNX-160412

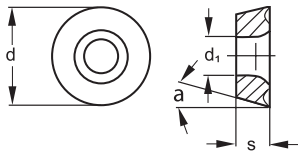
Insert	Designation	Dimensions l	s	r	d	d¹	b_s	a	RP350	RP354	RM352	TP30MC	RK150	ALP-XL	RP35	HMF
									Coated						Uncoated	
	APNX-160412	.635	3/16	3/64	3/8	.173	.047	11°	■			■	■			

Indexable Inserts for Milling

OECX-..

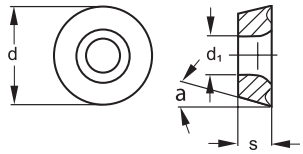
Insert	Designation	s	d	r	a	SLK	SLX	ALP-XL						
						Coated					Uncoated			
	Geometry: K = K-Land Edge													
	OECX-432-K	.188	.500	.032	23°		■							
	OECX-534-K	.188	.625	.062	23°		■	■	■					
	Geometry: P = Dish Face													
	OECX-432-P	.188	.500	.032	23°		■	■	■					
	OECX-534-P	.188	.625	.062	23°		■	■	■					

RCMT-1606MOT-X

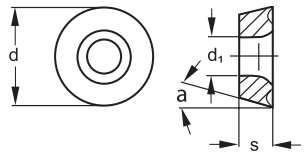
Insert	Designation	Dimensions l	s	r	d	d[1]	a	RP350	RP354	RM352	TP30MC	RK150	ALP-XL		RP35	HMF	TK20
								Coated						Uncoated			
	RCMT-1606MOT-X*	---	1/4	---	.630	.217	7°	■	■	■					■		

* Inserts have integrated anti-rotation lock

RDGT-...-AL

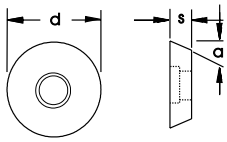
Insert	Designation	Dimensions l	s	r	d	d[1]	a	RP350	RP354	RM352	TP30MC	RK150	ALP-XL		RP35	HMF	TK20
								Coated						Uncoated			
	RDGT-0802M0-AL	---	3/32	---	.315	.134	15°						■				■
	RDGT-1003M0-AL	---	1/8	---	.394	.173	15°						■				■

RDMW-....MOT

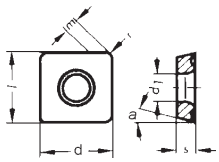
Insert	Designation	Dimensions l	s	r	d	d1	a	RP350	RP354	RM352	TP30MC	RK150	ALP-XL		RP35	HMF	TK20
								Coated						Uncoated			
	RDMW-0802MOT	--	3/32	--	.315	.134	15°	■	■	■					■		
	RDMW-1003MOT	--	1/8	--	.394	.173	15°	■	■	■					■		
	RDMW-1204MOT-X*	--	3/16	--	.472	.173	15°	■	■	■					■		

* Inserts have integrated anti-rotation lock

RECX-..

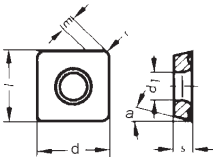
Insert	Designation	s	d	r	a		SLK	SLX	ALP-XL						
						Coated						Uncoated			
	Geometry: K = K-Land Edge														
	RECX-43-K	.188	.500	--	23°		■	■							
	RECX-53-K	.188	.625	--	23°		■	■	■						
	Geometry: P = Dish Face														
	RECX-43-P	.188	.500	--	23°		■	■							
	RECX-53-P	.188	.625	--	23°			■	■						

SDMT-322

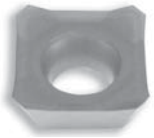
Insert	Designation	Dimensions l	s	r	d	d1	m	a	RP15K	RP25K							
									Coated					Uncoated			
	SDMT-322	.375	1/8	1/32	3/8	.173	.065	15°	■	■							

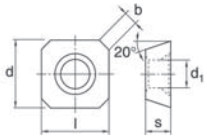
Indexable Inserts for Milling

SDMW-322

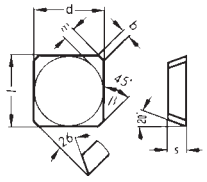
Insert	Designation	Dimensions							RP15K	RP25K								
		l	s	r	d	d[1]	m	a	Coated						Uncoated			
	SDMW-322	.375	1/8	1/32	3/8	.173	.065	15°	■	■								

SEHT-43..

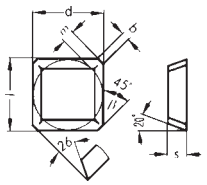


Insert	Designation	Dimensions						TP30MC	RM350	TK10MP	ALP-XL			TK10M			
		l	s	r	d	d[1]	b	Coated						Uncoated			
	SEHT-43 AFSN	.500	3/16	---	1/2	.217	.062		■								
	SEHT-43 AFFN-ALC	.500	3/16	---	1/2	.217	.062			■	■			■			

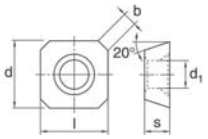
SEKN-..

Insert	Designation	Dimensions						TP30MC	RM350			TK10MP		TK10M			
		l	s	r	d	b_s	m	Coated						Uncoated			
	SEKN-42 AFN-1	.500	1/8	--	1/2	.077	.065	■	■								
	SEKN-43 AFN-1	.500	3/16	--	1/2	.077	.065	■	■								
	SEKN-53 AFN-1	.625	3/16	--	5/8	.075	.089	■	■								

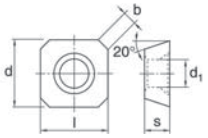
SEKR-..

Insert	Designation	Dimensions						TP30MC	RM350			TK10MP		TK10M			
		l	s	r	d	b_s	m	Coated						Uncoated			
	SEKR-42 AFN-1	.500	1/8	--	1/2	.065	.065	■	■								
	SEKR-43 AFN-1	.500	3/16	--	1/2	.065	.065	■	■								
	SEKR-53 AFN-1	.625	3/16	--	5/8	.075	.089	■	■								

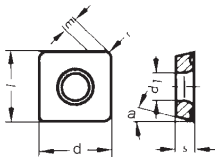
SEKT-43..

Insert	Designation	Dimensions						TP30MC	RM350			TK10MP		TK10M			
		l	s	r	d	d¹	b	Coated						Uncoated			
	SEKT-43 AFSN	.500	3/16	---	1/2	.217	.062	■									

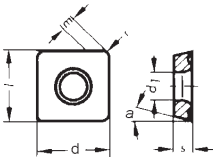
SEKW-43..

Insert	Designation	Dimensions						TP30MC	RM350			TK10MP		TK10M			
		l	s	r	d	d¹	b	Coated						Uncoated			
	SEKW-43 AFSN	.500	3/16	---	1/2	.217	.062	■	■								

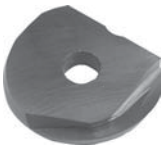
SPMT-432

Insert	Designation	Dimensions							RP15K	RP25K							
		l	s	r	d	d¹	m	a	Coated					Uncoated			
	SPMT-432	.500	3/16	1/32	1/2	.217	.091	11°	■	■							

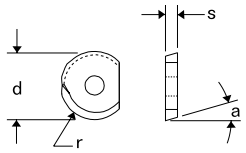
SPMW-432

Insert	Designation	Dimensions							RP15K	RP25K							
		l	s	r	d	d¹	m	a	Coated					Uncoated			
	SPMW-432	.500	3/16	1/32	1/2	.217	.091	11°	■	■							

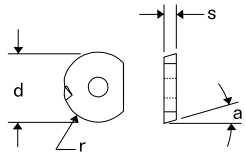
Indexable Inserts for Milling



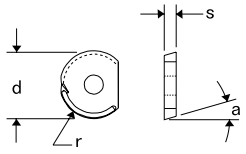
XCCG-..

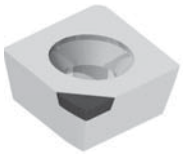
Insert	Designation	Dimensions s	Dimensions r	Dimensions d	Dimensions a	SLX	MPX	MPS						
						Coated					Uncoated			
	XCCG-31.5-HG	.098	3/16	.375	7°			■	■					
	XCCG-41.5-HG	.098	1/4	.500	7°			■	■					
	XCCG-52-HG	.118	5/16	.625	7°			■	■					
	XCCG-62-HG	.118	3/8	.750	7°			■	■					
	XCCG-82.5-HG	.157	1/2	1.000	7°			■	□					
	XCCG-103-HG	.197	5/8	1.250	7°			■	□					

XCEA-..

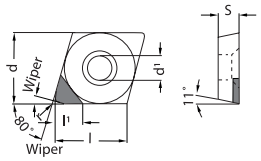
Insert	Designation	Dimensions s	Dimensions r	Dimensions d	Dimensions a	SLX	MPX	MPS						
						Coated					Uncoated			
	XCEA-31.5	.098	3/16	.375	7°		■		■					
	XCEA-41.5	.098	1/4	.500	7°		■		■					
	XCEA-52	.118	5/16	.625	7°		■		■					
	XCEA-62	.118	3/8	.750	7°		■		■					
	XCEA-82.5	.157	1/2	1.000	7°		■		□					
	XCEA-103	.197	5/8	1.250	7°		■		□					

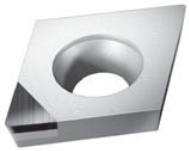
XCEG-..

Insert	Designation	Dimensions s	Dimensions r	Dimensions d	Dimensions a	SLX	MPX	MPS						
						Coated					Uncoated			
	XCEG-2.51	.078	5/32	.312	7°		■		■					
	XCEG-31.5	.098	3/16	.375	7°		■		■					
	XCEG-41.5	.098	1/4	.500	7°									
	XCEG-52	.118	5/16	.625	7°		■		■					
	XCEG-62	.118	3/8	.750	7°		■		■					
	XCEG-82.5	.157	1/2	1.000	7°		■		□					
	XCEG-103	.197	5/8	1.250	7°		■		□					

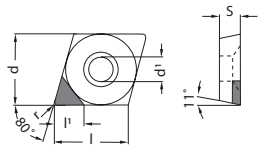


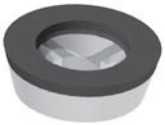
CPGW-..

Insert	Designation	Dimensions						PDC-S	PDC	PDC-L
		l	l¹	s	r	d	d¹	DP		
	CPGW-32.51PDR	.382	.169	.156	.016	.375	.173	■		

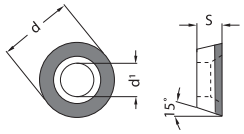


CPMW-..

Insert	Designation	Dimensions						PDC-S	PDC	PDC-L
		l	l¹	s	r	d	d¹	DP		
	CPMW-32.52	.382	.161	.156	.031	.375	.173		■	■



RDHX-..

Insert	Designation	Dimensions						PDC-S	PDC	PDC-L
		l	l¹	s	r	d	d¹	DP		
	RDHX-1003MO	--	--	.125	--	.394	.150	■		

Technical Data

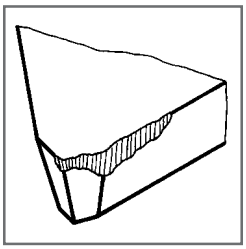
Insert Grade Information

ALP-XL *(K10 - K25)*	Extremely smooth self lubricating surface coupled with the latest coating technology ensures frictionless chip removal resulting in long tool life. Use in materials with less than 10% silicon content. Also may be used in titanium.
HMF *(HW - K15)*	Excellent edge strength and the ability to hold a sharp edge makes this grade a perfect choice for machining non-ferrous materials.
MPS *(HC - K25)*	PVD TiAlN coating holds up well in high heat applications. This grade is used for machining tough materials such as stainless and hardened steel.
MPX *(HC - K15)*	Excellent choice for machining dies, molds and difficult to machine materials such as titanium and nickel alloys. Ideal for high speed and dry machining applications.
PDC *(DP - N25)*	Polycrystalline, carbide reinforced diamond of fine grit size, good cutting edge sharpness and low cutting pressure allowing close tolerances. Increased flank wear resistance and toughness.
PDC-L *(DP - N10)*	Polycrystalline, carbide reinforced diamond of ultrafine grit size, high cutting edge sharpness, minimal cutting pressure allowing close tolerances. Good flank wear resistance and toughness.
PDC-S *(DP - N35)*	Polycrystalline, carbide reinforced diamond of coarse grit size, good edge sharpness and low cutting pressure allowing close tolerances. Best performances for milling. High flank wear resistance and toughness.
RK20C *(K05 - K20)*	Tough carbide substrate layered with ceramic coating gives unsurpassed performance in grey and nodular cast iron applications. The ceramic based coating allows for high speeds and dry cutting.
RK150 *(HC-K15)*	Coated grade for milling cast iron materials. Extremely high wear resistance and edge strength provides for long tool life in abrasive materials. Heat resistant coating allows this grade to be used in dry machining applications.
RM352 *(HC - M35 - P35)*	TiAlN PVD coating on a tough substrate makes this grade an excellent choice for applications in a broad range of materials where good toughness is needed, especially on stainless steel and aerospace alloys.
RP15K *(P10 - P25, M10 - M25)*	Heat resistant Al_2O_3 coating allows for higher cutting speeds and long tool life in a wide range of materials and applications. Four layers of coating are interlocked for excellent adhesion to the insert. Use in semi-finishing to finishing of steel and stainless steel. Can be used in moderate interrupted cut applications.

Insert Grade Information

RP25K *(P15 - P30, M15 - M25)*	Universal turning grade with good toughness and excellent wear resistance. Particularly suited for rough to semi-finishing of all steels and stainless steels. May be used in cast iron as well. First choice for an all purpose grade of carbide.
RP35K *(P25 - P45, M25 - M45)*	The toughest of RTC's steel turning family. The tough carbide substrate with the MT-CVD coating guarantees maximum performance in heavily interrupted cutting of steel and stainless steel.
RP35 *(HW - TTR)*	Tough uncoated grade for milling steel and cast steel under unfavorable cutting conditions. Excellent for tough milling with low cutting spreeds and heavy chip loads.
RP350 *(HC - K25, M35, P35)*	CVD coated grade allows for all around successful machining in all the materials groups. Runs at higher surface footages and exhibits excellent toughness. First grade choice for most applications.
RP354 *(HC - M35, P35)*	High resistance to oxidation makes this wear resistant grade an excellent choice for milling applications where long tool life is required at higher surface footages.
SLK *(HC - K25, M25, P25)*	AlTiN coated grade runs at high speed for semi roughing and finishing applications. Excellent choice for aerospace materials and 300 series stainless steel too.
SLX *(HC - P35)*	General machining of steel . Excellent impact and wear resistance for use in finishing to roughing of all steels.
TK10M *(HW - K10)*	Uncoated K10/C2 wear resistant grade, suited for machining of non-ferrous materials, high temp. alloys as well as synthetic materials including fiberglass, graphite and plastic. Recommended to run with coolant only when materials require wet machining.
TK10MP *(HC - K10)*	TiAlN coating. Recommended grade for high speed machining of aluminum and non-ferrous materials. Good wear resistance. Designed to be used with coolant.
TK10TB	PVD diamond film coating offering greatly extended tool life over conventional carbide. Recommended specifically for synthetic materials such as graphite.
TK20 *(HW - K20)*	Micrograin carbide with excellent edge strength allows these tools to have extremely sharp cutting edges. Excellent for use in aluminum alloys and plastic materials. Usually polished to prevent edge build up.
TP30MC *(HC - P30)*	Good balance of toughness and wear resistance makes this a perfect choice for milling of steel at high surface footages especially when good toughness is required.

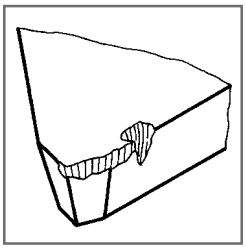
Troubleshooting



Flank Wear

General criteria for the end of tool life, characterized by an admissible amount of flank wear. (Figures usually relate to a tool life of T=15min.)

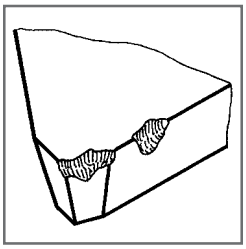
Remedy:
- select more wear-resistant grade
- reduce cutting speed



Notch Wear

Occurs locally in the area of the primary cutting edge where it contacts the workpiece surface. Caused by hard surface layers and work-hardened burrs, especially on stainless austenitic steels. Danger of breakage!

Remedy:
- strengthen cutting edge
- select smaller cutting edge angle (45°)
- reduce feed

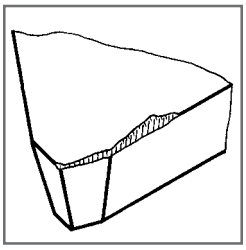


Edge Chipping

Minor chipping along the cutting edge, usually accompanied by flank wear and therefore not always identifiable. Danger of breakage! Edge chipping outside the cutting area is the result of chip impact due to unfavourable chip removal.

Remedy:
- select tougher grade
- use insert with stronger cutting edge geometry
- reduce feed when starting the cut

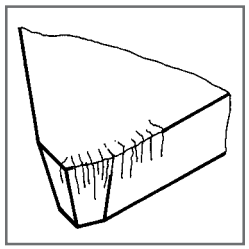
In the case of damage due to chip impact:
- vary feed
- change chipbreaker geometry
- change cutting edge angle



Built-Up Edges

Edge build-up occurs on the rake face as a result of work material welding together with the cutting material, especially when cutting difficult-to-machine materials. From time to time, the built-up edge will break off and may cause damage to the cutting edge. Also, built-up edges produce poor surface finishes.

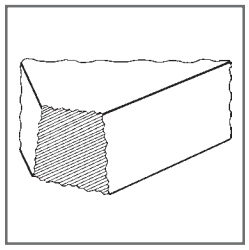
Remedy:
- increase cutting speed
- use coated hardmetals or cermets
- select positive cutting edge geometry
- use cutting fluid



Thermal Cracks

Small cracks running across the cutting edge, caused by thermal shock loads in interrupted cutting operations, particularly in milling. Danger of breakage!

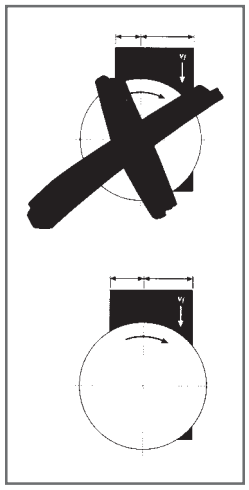
Remedy:
- use grade with greater resistance to thermal shock
- check use of cutting fluid; cutting fluid should not generally be used for milling, except with special grades for wet milling, e.g. TN450, aluminum, titanium alloys and high-temperature materials
- use compressed air to remove chips in slot milling



Insert Breakage

Insert breakage usually means damage to tool and workpiece. The causes are varied and also depend on the machine and workpiece. This often originates in notches or other excessive types of wear.

Remedy:
- select tougher grade
- reduce feed and possibly also depth of cut
- select chip breaker geometry for heavier chip sections



Burring

Chipping of the workpiece edge when cutter leaves the cut (mainly in cast iron).

Remedy:
- select smaller cutting edge angle for the tool
- select more positive cutting edge geometry
- change cutter position relative to workpiece

Workpiece Vibrations

Remedy:
- clamp workpiece more rigidly
- change cutter position relative to workpiece
- select a cutter with a different cutting edge angle

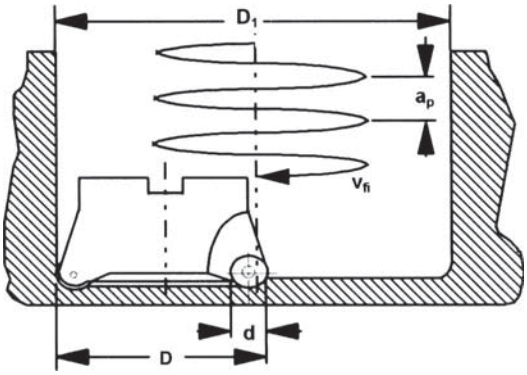
Cutter Vibration

Remedy:
- minimize cutter overhang
- increase feed
- reduce cutting speed

Use of cutting fluids in milling

Remedy:
- cutting fluid should preferably not be used
- if cutting fluid is essential, then in copious amounts at low pressure with TN450 as the primary grade selection

Circular and Helical Interpolation:



Circular and Helical Interpolation is an application where the cutter rotates on its own axis together in an orbiting motion around the workpiece (either internally or externally), while at the same time plunging to the required depth of cut. In order to accomplish this application, a machine with three-axis control capabilities is required.

Calculating feed rate: Unlike linear milling applications (face milling) where the tools cutting edge and centerline is identical, circular and helical interpolation feed rate is based only on the tools centerline (Vfi).The following formulas should be used to obtain the optimal running conditions.

Definitions

- **D** = cutter diameter
- **d** = insert diameter
- **D1** = workpiece bore diameter
- **ap** = depth of cut
- **fz** = feed per tooth
- **fzkor** = correction feed per tooth
- **Vfi** = feed rate at cutters centerline
- **T** = number of cutting teeth
- **rpm** = revolutions per minute

Milling Cutter Diameter Selection Calculation:

Note: all values should be in inch

Minimum Cutter Diameter: $D_{min} = \frac{D_1}{2}$

Optimum / maximum Cutter Diameter: $D_{opt/max} = \frac{D1 + d}{2} - 1$

Calculating Feed Rate:

Note: all values should be in inch

Feed Rate Correction for Drill Milling with Round Inserts: $f_{zkor} = fz \times \frac{d}{a_p} \times \frac{1}{135} \text{ inv cos}^* \left(1 - \frac{1.5 \times a_p}{d}\right)$

Depth of Cut (ap):
max. $ap \leq 0.5 \times d$ **opt.** $ap = 0.25 \times d$ * inv cos = $\cos^{-1}$

Feed Rate at Centerline of Tool when Drill Milling (V_{fi}) $V_{fi} = \left(1 - \frac{D}{D_1}\right) \times rpm \times f_{zkor} \times T$

or approximately: $V_{fi} = .008 \times rpm \times f_{zkor} \times T$

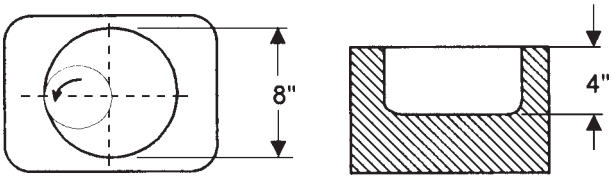
Example:

Cutter Data:

Cutter description: ..... **R360 Face Mill**
Diameter (D): ..... 4″
Insert Diameter: ..... .6299 (16mm)
Insert grade: TN5515
No. of teeth (T): 8

Recommended Machining Conditions:

Surface feet/minute (sfm): 533
Spindle speed (rpm): 509
Feed per tooth (fz): ..... .008″
Depth of Cut (ap): ..... .157″ (opt. ap = .25 x .6299)

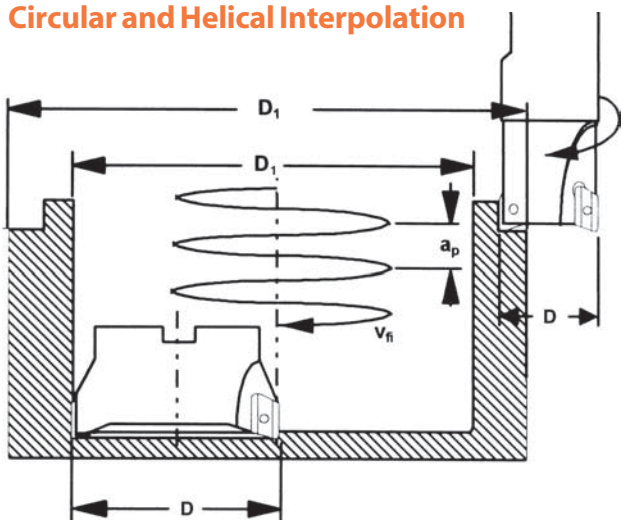


$$f_{zkor} = .008 \times \frac{.6299}{.157} \times \text{inv cos}\left(1 - \frac{1.5 \times .157}{.6299}\right) = 0.0122$$

$$V_{fi} = \left(1 - \frac{4}{8}\right) \times .509 \times 0.122 \times 8 + 24.798 \text{ or } 25 \text{ ipm}$$

Machining Programming:
In order to maintain the recommended .008" feed per tooth (fz) for this insert size and application, the machine tool should be programmed for a feed of 25" per minute (ipm).

Circular and Helical Interpolation



Circular and Helical Interpolation is an application where the cutter rotates on its own axis together in an orbiting motion around the workpiece (either internally or externally), while at the same time plunging to the required depth of cut. In order to accomplish this application, a machine with three-axis control capabilities is required.

Calculating feed rate: Unlike linear milling applications (face milling) where the tools cutting edge and centerline is identical, circular and helical interpolation feed rate is based only on the tools centerline (Vfi). The following formulas should be used to obtain the optimal running conditions.

Definitions

D	=	cutter diameter
d	=	insert diameter
D1	=	workpiece bore diameter
ap	=	depth of cut
fz	=	feed per tooth
fzkor	=	correction feed per tooth
Vfi	=	feed rate at cutters centerline
T	=	number of cutting teeth
rpm	=	revolutions per minute

Milling Cutter Diameter Selection Calculation

Note: all values should be in inch

Minimum Cutter Diameter: $D_{min} = \frac{D_1}{2}$

Optimum / Maximum cutter Diameter: $D_{opt/max} = \frac{D1 + d}{2} - 1$

Calculating Feed Rate:

Note: all values should be in inch

Feed Rate at the Cutting Edge (V_f) Inches per Minute: $V_f = f_z \times rpm \times T$

Feed Rate at Centerline of Tool when Drill Milling (V_{fi}):

Internal Milling Applications:

$$V_{fi} = \frac{V_f \times (D_1 - D)}{D_1}$$

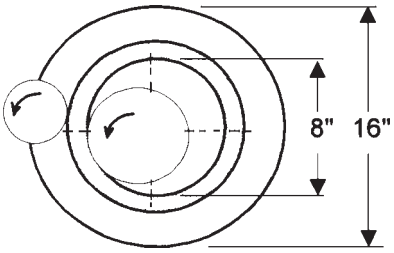
External Milling Applications:

$$V_{fi} = \frac{V_f \times (D_1 - D)}{D_1}$$

Example:

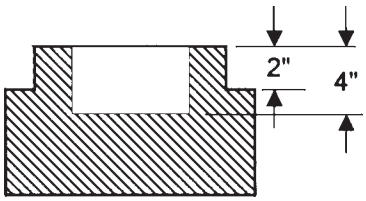
Cutter Data:

Cutter description:	**AP90 Face Mill**	**AP90 End Mill**
Diameter (D):	4"	1.5"
Insert number:	222.79.**400**	222.79.**400**
Insert grade:	TN7525	TN7525
No. of teeth (T):	8	4



ID: Face Mill $\mathbf{V_f = .008 \times 10 \times 358 = 28.6ipm}$

OD: End Mill $\mathbf{V_f = .004 \times 4 \times 1082 = 17.3ipm}$

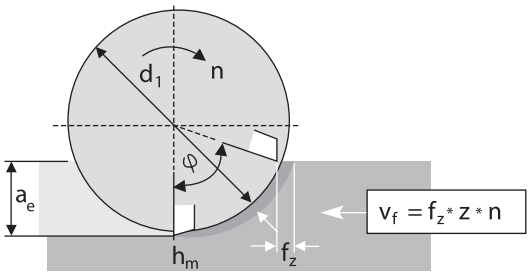


Machining Programming:

Based on the above OD and ID milling calculations, you must program the machine at the appropriate feed rate (Vfi) for each tools centerline.

Cutting Ratios and Undeformed Chip Thickness in Milling

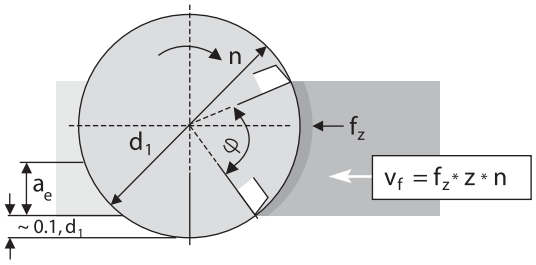
Valid for $a_e < 0.3\ d_1$



$$f_z = h_m * \sqrt{\frac{d_1}{a_e}} \qquad h_m = f_z * \sqrt{\frac{a_e}{d_1}}$$

At least 2 cutting edges in the working area of the feed motion angle φ

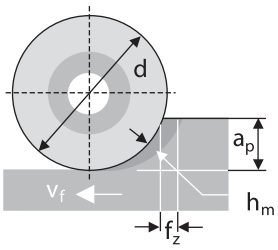
Valid for $a_p < 0.3\ d_1$



min. cutter diameter $d_1 \simeq 1.25 * a_e$

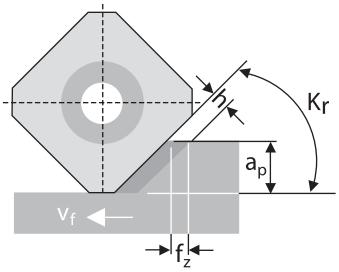
max. width of cut $a_e \simeq 0.8 * d_1$

Valid for $a_p < 0.3$



$$f_z = h_m * \sqrt{\frac{d}{a_p}}$$

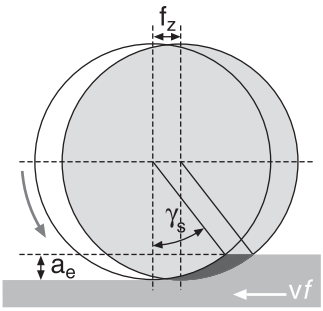
$$h_m = f_z * \sqrt{\frac{a_p}{d}}$$

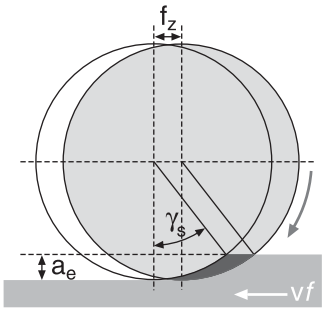


$$f_z = h : \sin \chi_r$$

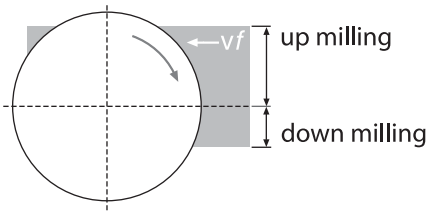
$$h = f_z * \sin \chi_r$$

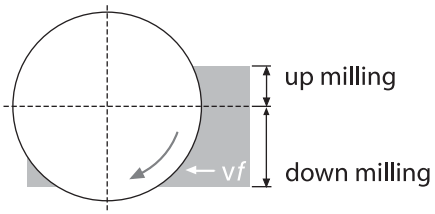
Up Milling / Down Milling with Square Shoulder and Side Face Mills



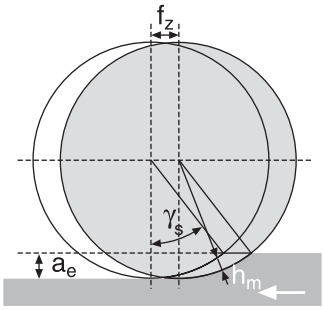


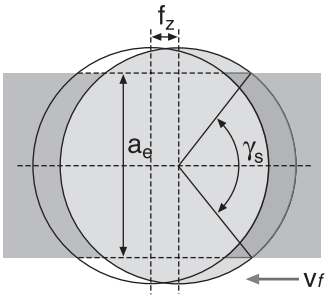
Up Milling / Down Milling with Face Mills





Average Chip Thickness h_m

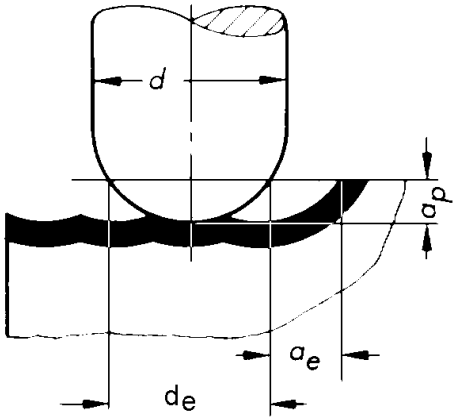




Approximate Formula

$$a_e \leq \frac{D}{4} \; : h_m \approx \sqrt{\frac{a_e}{D}} * f_z * \sin \chi_r \qquad h_m \approx f_z * \sin \chi_r$$

Formulas:



Legend:

- **p** = 3.1416
- **a_e** = Width of cut
- **a_p** = Depth of cut
- **d** = Diameter of milling cutter, in inches
- **d_e** = Effective diameter
- **f_z** = Feed, inches per tooth
- **h** = Scallop height
- **ipm** = Feed, inches per minute
- **ipr** = Inches per revolution
- **mrr** = Metal removal rate in cubic inches
- **rpm** = Revolutions per minute
- **s** = Stepover value between two cutting passes, in inches
- **sfm** = Surface feet per minute
- **z** = Number of effective teeth

To calculate effective diameter of ball nose tool

$$d_e = 2 * \sqrt{\left(\frac{d}{2}\right)^2 - \left(\frac{d}{2} - a_p\right)^2}$$

To calculate sfm when rpm is known

$$sfm = .262 * d * rpm$$

To calculate rpm when sfm is known

$$rpm = \frac{sfm * 3.82}{d}$$

To calculate scallop height (cusp height)

$$h = \frac{d}{2} - \sqrt{\left(\frac{d}{2}\right)^2 - \left(\frac{s}{2}\right)^2}$$

To calculate inches per minute (table feed)

$$ipm = f_z * z * rpm$$

To calculate inches per revolution

$$ipr = \frac{ipm}{rpm}$$

To calculate f_z when ipm, rpm & z are known

$$f_z = \frac{ipm}{z * rpm}$$

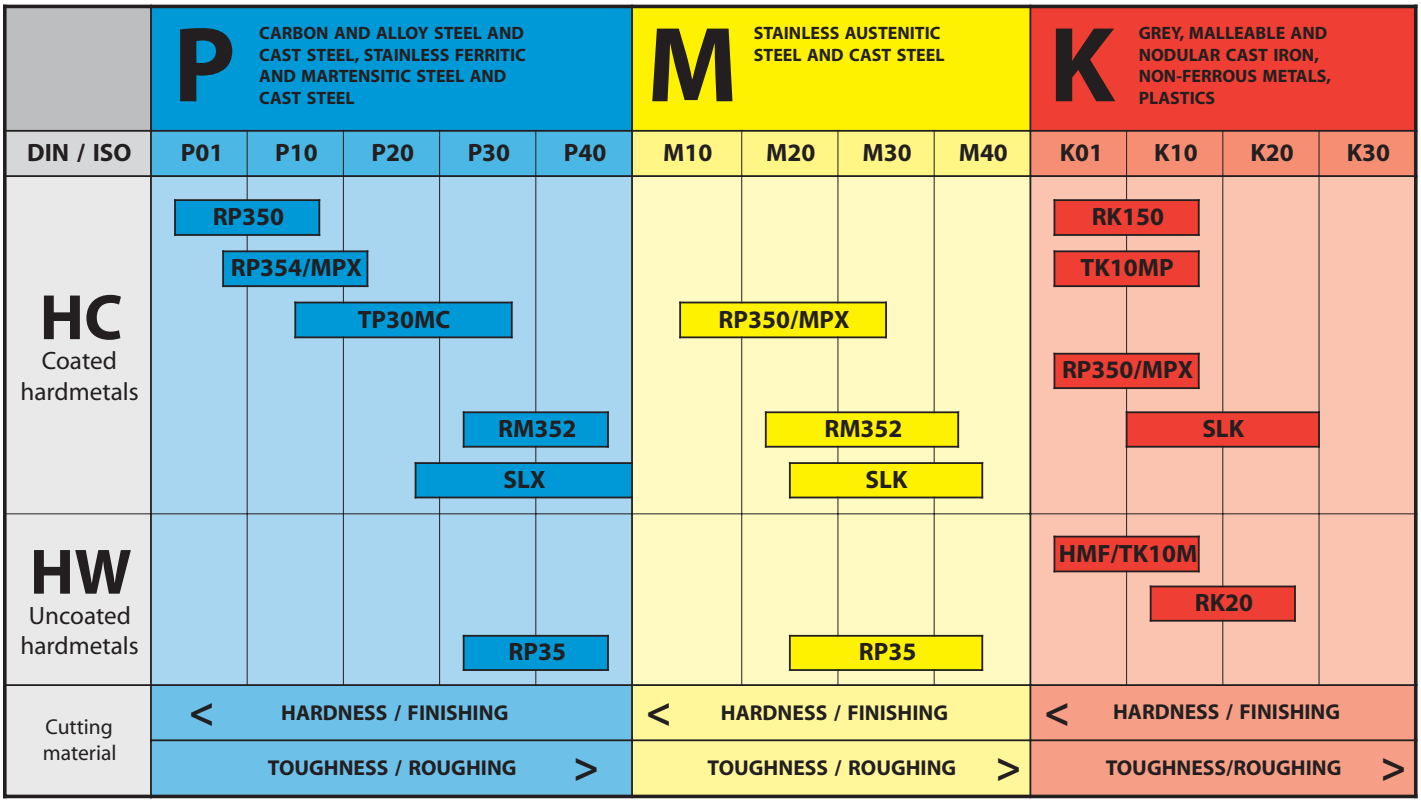
To calculate f_z when ipr & z are known

$$f_z = \frac{ipr}{z}$$

To calculate metal removal rate

$$mrr = a_p * a_e * ipm$$

ISO / ANSI Grade Chart• Cutting Materials



Hardmetals

Sintered hardmetals are made by powder metallurgy and in the most simple case consist of Tungsten Carbide (WC) as a source of hardness, and Cobalt (CO), which is primarily responsible for toughness. Titanium Carbide and/or tantalum carbide or niobium carbide are added to improve high-temperature properties. This applies particularly to oxidation resistance, hot hardness, elevated-temperature strength and diffusion resistance in the presence of iron-base alloys. Hardmetals attain their final properties at sintering temperatures of approximantly 1500° C.

Coated Hardmetals (ISO group HC)

Highest wear resistance and good toughness can be combined by appropriate coating techniques. The preferred process for hardmetal is Chemical Vapour Deposition. In the CVD process, extremely hard thin layers of coating material (e.g. TiC, TiN, Al203) are deposited on tougher hardmetal substrates at lower temperature. The chemical vapour disposition rates are much higher, thereby reducing the time required for completion.

The much longer life and higher cutting speeds attainable through coating, boost cost-efficiency and productivity. Inventory requirements are also reduced, thanks to the wider range of applications for coated grades.

Uncoated Hardmetals (ISO group HW)

The conventional uncoated hardmetals comprise a variety of mature grades. They are still employed frequently in milling but to a relatively small extent in turning and drilling. Their applications mainly include operations involving light cuts requiring sharp cutting edges and operations demanding very high toughness. Uncoated hardmetal grades are also used on nonferrous metals and nonmetallic materials.

In most steel and cast iron applications, coated hardmetals are preferred because they offer much longer life and/or higher cutting speeds and thus permit more cost effective production.

Cutting Data

for A90, HA90, AP75 End & Face Mills

CUTTING DATA FOR SQUARE SHOULDER MILLS						Coated						Uncoated		
ISO 513	MILLING CUTTER / MATERIAL					RP350 / RP354 TP30MC			RM352			RP35		
P	Cutter	Max. a_p	Carbide Insert			Feed fz inches per tooth [1]								
	A90 [1]	.33	ADHT-1003..			---	.002	.004	---	.003	.005	---	.002	.004
	A90 [1]	.55	APHT / APNT / APNX-1604..			.003	.006	.009	.003	.007	.010	.003	.006	.009
	Work Material		Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM								
	Carbon steel, Unalloyed steel, cast steel and free cutting steel	< 0.25% C	annealed	125	1	1073	813	683	618	536	504	553	488	455
		≥ 0.25% C	annealed	190	2	813	634	553	455	374	358	390	325	293
		< 0.55% C	heat-treated	250	3	683	520	471	374	325	293	325	260	228
		≥ 0.55% C	annealed	220	4	699	553	471	390	358	325	358	276	260
			heat-treated	300	5	601	423	374	325	276	260	276	228	195
	Low alloy steel and cast steel		annealed	200	6	780	601	488	455	374	358	390	325	293
			heat-treated	275	7	601	471	390	358	293	276	293	260	228
			heat-treated	300	8	520	390	341	293	260	228	260	195	179
			heat-treated	350	9	471	341	---	260	179	--	228	163	---
	High alloy steel, cast steel & tool steel		annealed	200	10	601	471	423	390	341	293	358	276	260
			heat-treated	325	11	390	309	---	260	179	---	228	163	---
M	Cutter	Max. a_p	Carbide Insert			Feed fz as inches per tooth [1]								
	A90 [1]	.33	ADHT-1003..			---	.002	.004	---	.002	.004	---	.002	.004
	A90 [1]	.55	APHT / APNT / APNX-1604..			.003	.006	.009	.003	.006	.009	.003	.006	.009
	Work Material		Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM								
	400 series Stainless & cast steel		ferrit./mart.	200	12	764	569	488	585	439	374	374	293	276
			martensitic	240	13	666	471	390	504	358	293	325	260	228
	300 series Stainless & cast steel		austenitic	180	14	683	423	---	520	325	---	325	195	---

CUTTING DATA FOR SQUARE SHOULDER MILLS						Coated					
ISO 513	MILLING CUTTER / MATERIAL					RK150			RP350		
K	Cutter	Max. a_p	Carbide Insert			Feed fz inches per tooth [1]					
	A90 [1]	.33	ADHT-1003..			---	.003	.005	---	.004	.006
	A90 [1]	.55	APHT / XPNT / XPNX-1604..			.004	.007	.010	.004	.009	.012
	Work Material		Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM					
	Grey cast iron		ferrit./pearl.	180	15	959	699	601	439	325	276
			pearlitic	260	16	731	553	471	325	260	228
	Nodular cast iron		ferritic	160	17	813	601	488	390	293	244
			pearlitic	250	18	601	358	---	276	195	---
	Malleable cast iron		ferritic	130	19	829	488	---	390	244	---
			pearlitic	230	20	634	406	---	309	195	---

CUTTING DATA FOR SQUARE SHOULDER MILLS						Coated					
ISO 513	MILLING CUTTER / MATERIAL					RM352			ALP-XL		
N	Cutter	Max. a_p	Carbide Insert			Feed fz inches per tooth [1]					
	A90 [1]	.33	ADHT-1003..			---	---	---	---	.004	.006
	A90 [1]	.55	APHT / APHT / APNT / APNX-1604...			---	---	---	.004	.009	.012
	Work Material		Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM					
	Cast aluminium alloys		≤ 12% Si	75	23	---	---	---	2763	1983	1658
			age-hardened	90	24	---	---	---	2210	1625	1381
			> 12% Si heat resistant	130	25	---	---	---	1381	894	683
	Copper & copper alloys		Red Brass, brass	90	27	---	---	---	1105	683	0
			Bronze	100	28	---	---	---	829	504	0

CUTTING DATA FOR SQUARE SHOULDER MILLS						Coated					
ISO 513	MILLING CUTTER / MATERIAL					RP350			RM352		
S	Cutter	Max. a_p	Carbide Insert			Feed fz inches per tooth [1]					
	A90 [1]	.33	ADHT-1003..			---	.002	.003	---	.002	.003
	A90 [1]	.55	APHT / APNT / APNX-1604..			.003	.005	.006	.003	.005	.006
	Work Material		Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM					
	High-temperature alloys		age-hardened	280	32	104	78	65	75	59	49
	Ni- or Co- based		annealed	250	33	81	59	49	59	49	39
			age-hardened	350	34	65	49	39	49	39	33
	Titanium alloys		age-hardened	310	37	---	---	---	---	---	---

1) The cutting data given is valid for slot milling with full width of cut ae = 100% of the cutter diameter.

For peripheral and shoulder milling with the A90 end mill, the figures in the table should be converted using the following correction factors:

Ratio $a_e : d_1$	*f_z factor*	*SFPM factor*
2%	3.5	1.6
5%	3	1.5
10%	2	1.4
20%	1.5	1.3
≥ 40%	1	1.1

CUTTING DATA FOR ROUND INSERT MILLING CUTTERS

ISO 513	MILLING CUTTER / MATERIAL					Coated									Uncoated		
						RP350			RP354			RP352			RP35		
P	Cutter		Max. a_p	Carbide Insert		Feed fz inches per tooth [1]											
	R360 [1]		.157 / .197	RD..-0802MOT / RD..-1003MOT		.003	.006	.008	.003	.006	.008	.003	.006	.008	.003	.006	.008
			.236	RD..-1204MOT-X		.004	.009	.012	.004	.009	.012	.004	.009	.012	.004	.009	.012
			.315	RCMT-1606MOT-X		.005	.010	.014	.005	.010	.014	.005	.010	.014	.005	.010	.014
	Work Material			Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM										
	Carbon steel, Unalloyed steel, cast steel and free cutting steel	< 0.25% C		annealed	125	1	1333	1056	910	1170	910	780	813	699	650	715	634	585
		≥ 0.25% C		annealed	190	2	1056	813	699	813	618	536	585	488	455	520	423	390
		< 0.55% C		heat-treated	250	3	894	683	601	683	520	455	488	423	390	423	325	293
		≥ 0.55% C		annealed	220	4	910	699	601	699	536	455	520	455	423	455	358	325
				heat-treated	300	5	764	553	---	585	423	---	423	358	---	358	293	---
	Low alloy steel and cast steel			annealed	200	6	1024	764	634	780	585	488	585	488	455	520	423	390
				heat-treated	275	7	764	601	520	585	455	390	455	390	358	390	325	293
				heat-treated	300	8	683	520	---	520	390	---	390	325	---	325	260	---
				heat-treated	350	9	601	423	---	455	325	---	325	228	---	293	195	---
	High alloy steel, cast steel & tool steel			annealed	200	10	764	618	553	585	471	423	520	439	390	455	358	325
				heat-treated	325	11	520	390	---	390	293	---	325	228	---	293	195	---
M	Cutter		Max. a_p	Carbide Insert		Feed fz as inches per tooth [1]											
	R360 [1]		.157 / .197	RD..-0802MOT / RD..-1003MOT		.003	.006	.007	---	---	---	.003	.006	.007	.003	.006	.007
			.236	RD..-1204MOT-X		.004	.008	.011	.004	.008	.011	.004	.008	.011	.004	.008	.011
			.315	RCMT-1606MOT-X		.005	.009	.013	.005	.009	.013	.005	.009	.013	.005	.010	.013
	Work Material			Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM										
	400 series Stainless & cast steel			ferrit./mart.	200	12	975	910	634	748	569	488	553	488	455	488	390	358
				martensitic	240	13	845	618	520	650	471	390	455	390	358	423	325	293
	300 series Stainless & cast steel			austenitic	180	14	423	260	---	325	195	---	228	130	---	195	130	---

CUTTING DATA FOR ROUND INSERT MILLING CUTTERS

ISO 513	MILLING CUTTER / MATERIAL					Coated					
						RP350					
K	Cutter		Max. a_p	Carbide Insert		Feed fz inches per tooth [1]					
	R360 [1]		.157 / .197	RD..-0802MOT / RD..-1003MOT		.003	**.006**	.008	---	---	---
			.236	RD..-1204MOT-X		.004	**.009**	.012	---	---	---
			.315	RCMT-1606MOT-X		.005	**.010**	.014	---	---	---
	Work Material			Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM					
	Grey cast iron			ferrit./pearl.	180	15	1235	**910**	764	---	---	---
				pearlitic	260	16	943	**699**	601	---	---	---
	Nodular cast iron			ferritic	160	17	1056	**764**	634	---	---	---
				pearlitic	250	18	764	**471**	---	---	---	---
	Malleable cast iron			ferritic	130	19	1056	**634**	---	---	---	---
				pearlitic	230	20	945	**520**	---	---	---	---

CUTTING DATA FOR ROUND INSERT MILLING CUTTERS

ISO 513	MILLING CUTTER / MATERIAL					Coated			Uncoated		
						ALP-XL			TK20		
N	Cutter		Max. a_p	Carbide Insert		Feed fz inches per tooth [1]					
	R360 [1]		.157 / .197	RD..-0802MOT / RD..-1003MOT		.003	.006	.008	.003	.006	.008
			.236	RD..-1204MOT-X		.004	.009	.012	.004	.009	.012
			.315	RCMT-1606MOT-X		.005	.010	.014	.005	.010	.014
	Work Material			Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM					
	Cast aluminium alloys	≤ 12% Si			75	23	3250	2340	1950	3250	2340	1950
				age-hardened	90	24	2600	1918	1625	2600	1918	1625
		> 12% Si heat resistant			130	25	1625	1056	813	1625	1056	813
	Copper & copper alloys			Red Brass, brass	90	27	1300	813	---	1300	813	---
				Bronze	100	28	975	585	---	975	585	---

CUTTING DATA FOR ROUND INSERT MILLING CUTTERS

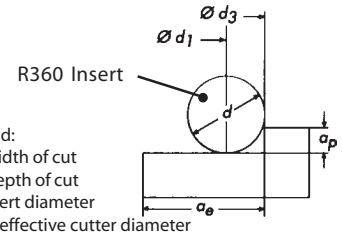
ISO 513	MILLING CUTTER / MATERIAL					Coated					
						RP350					
S	Cutter		Max. a_p	Carbide Insert		Feed fz inches per tooth [1]					
	R360 [1]		.157 / .197	RD..-0802MOT / RD..-1003MOT		.003	.005	.006	---	---	---
			.236	RD..-1204MOT-X		.004	.006	.007	---	---	---
			.315	RCMT-1606MOT-X		.005	.007	.009	---	---	---
	Work Material			Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM					
	High-temperature alloys Ni- or Co- based			age-hardened	280	32	130	98	81	---	---	---
				annealed	250	33	104	78	65	---	---	---
				age-hardened	350	34	85	62	52	---	---	---
	Titanium alloys			age-hardened	310	37	---	---	---	---	---	---

1) The feeds per tooth fz are valid for face milling with width of cut ae > 40% of the cutter diameter and max. depth of cut ap. For smaller widths and depths of cut, the figures in the tables should be converted using correction factors tables below. (d = diameter of insert, d1 = cutter diameter).

The axial feed in plunge milling should be reduced by approx. 40%.

f_z factors for ratio $a_e : d_1$				
Depth of cut a_p	$a_e : d_1$			
	5%	10%	20%	≥40%
5% of d	9	6.3	4.3	3.2
10% of d	6.3	4.3	3.2	2.2
20% of d	4.3	3.2	2.2	1.6
40% of d	3.2	2.2	1.6	1.1

SFPM factors for various f_z factors	
f_z factor	SFPM factor
9	1.6
6.3	1.5
4.3	1.4
3.2	1.3
2.2	1.2
1.6	1.1
1.1	1



Legend:
ae - width of cut
ap - depth of cut
d - insert diameter
Ød1 - effective cutter diameter
Ød3 - nominal cutter diameter

Cutting Data

for BNK Milling Cutters

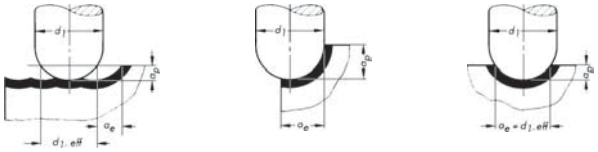
TABLE A: CUTTING DATA FOR BNK BALL NOSE MILLING CUTTERS			
Material Application	**Grade**	**SFPM**	**FEED (IPR)**
Carbon, Alloy and Tool Steels	SLX	350-600	.006" - .016"
Cast Steel	SLX	400-700	.006" - .020"
Steels, Irons and Graphite	MPX	600-1200	.005" - .020"
Stainless Steels and Refractory Alloys	MPX / MPS	400-800	.003" - .010"
Aluminum, Titanium and Copper Alloys	MPX	500-1000	.010" - .020"

TABLE B: EFFECTIVE CUTTING DIAMETERS

Depth of cut a_p	Effective cutter diameter d_1 eff for cutter nominal diameter d_1						
	.312	**.375**	**.500**	**.625**	**.750**	**1.000**	**1.250**
.010"	.110	.121	.140	.157	.172	.199	.223
.020"	.153	.169	.196	.220	.242	.280	.314
.035"	.197	.218	.255	.287	.316	.368	.412
.050"	.229	.255	.300	.339	.374	.436	.490
.075"	.267	.300	.357	.406	.450	.527	.594
.100"	.292	.332	.400	.458	.510	.600	.678
.125"	.306	.354	.433	.500	.559	.661	.750
.156"	.312	.370	.464	.541	.609	.726	.827
.188"	---	.375	.484	.573	.650	.781	.893
.250"	---	---	.500	.612	.707	.886	1.000
.312"	---	---	---	.625	.734	.927	1.082
.375"	---	---	---	---	.750	.968	1.146
.500"	---	---	---	---	---	1.000	1.225
.625"	---	---	---	---	---	---	1.250

TABLE C: FEED RATE ADJUSTMENT FACTOR

Depth of cut ap	For cutter nominal diameter d1						
	.312	**.375**	**.500**	**.625**	**.750**	**1.000**	**1.250**
.010"	2.80	3.10	3.60	4.00	4.40	5.00	5.60
.020"	2.04	2.22	2.56	2.86	3.13	3.57	4.00
.035"	1.71	1.85	2.11	2.36	2.57	2.92	3.28
.050"	1.37	1.47	1.66	1.85	2.00	2.27	2.56
.075"	1.18	1.25	1.41	1.54	1.66	1.89	2.13
.100"	1.08	1.14	1.25	1.37	1.47	1.66	1.85
.125"	1.02	1.06	1.15	1.25	1.33	1.52	1.67
.156"	1.00	1.01	1.08	1.15	1.23	1.37	1.52
.188"	---	1.00	1.03	1.09	1.15	1.28	1.41
.250"	---	---	1.00	1.02	1.06	1.15	1.25
.312"	---	---	---	1.00	1.01	1.08	1.15
.375"	---	---	---	---	1.00	1.03	1.09
.500"	---	---	---	---	---	1.00	1.02
.625"	---	---	---	---	---	---	1.00



Cutting Data Compensation

1. Select the diameter of the tool to be used
2. Determine the Depth of Cut (a_p) to be used
3. Refer to Table B to determine the Effective Cutting Diameter d_1-eff
4. Refer to Table A to determine the Surface Footage (SFPM) and Feed per Revolution (IPR)
5. Calculate the RPM = (SFPM x 3.82) / d_1-eff
6. Refer to Table C to determine the Feed Rate Adjustment Factor IPRADJ = IPR x Feed Rate Adjustment Factor
7. Calculate the IPM (Inches per Minute)
   IPM = RPM x IPRADJ

Technical Considerations

- Always ensure that insert pockets are clean and free of debris or burrs
- Utilize holders that are stable and in good condition
- Clean and recoat screw with anti-seize lubricant during each index
- For optimum results, replace holders after 100 inserts
- Hold the insert in place during the locking process; check for interference or damage
- Do not use a pipe or other extensions to tighten the locking screw
- Generally speaking, drivers supplied with the tools provide proper torque
- If the torque wrench is available, follow the recommended torque specifications

CUTTING DATA FOR PC, S45, S45F & TC90											
ISO 513	Material	TC90 End Mills			S45 End Mills			SF45 Face Mills			
P		MILLING	SFPM		MILLING	SFPM		MILLING	SFPM		
		Feed 1)	Coated	Uncoated	Feed 1)	Coated	Uncoated	Feed 1)	CVDCoated	PVD Coated	Uncoated
	Steel, unalloyed low carbon	.004 - .012	325 - 731	260 - 585	.004 - .012	325 - 731	260 - 585	.004 - .020	400 - 1100	350 - 900	---
	Steel, unalloyed or low-alloy	.004 - .012	284 - 650	228 - 520	.004 - .012	284 - 650	228 - 520	.003 - .013	300 - 900	300 - 700	---
	Steel alloy and tool steels	.004 - .010	244 - 569	195 - 455	.004 - .012	244 - 569	195 - 455	.003 - .014	250 - 650	175 - 400	---
	High tensile steels	.004 - .008	244 - 488	195 - 390	.004 - .010	244 - 488	195 - 390	.003 - .006	---	300 - 500	---
M		MILLING	SFPM		MILLING	SFPM		MILLING	SFPM		
		Feed 1)	Coated	Uncoated	Feed 1)	Coated	Uncoated	Feed 1)	CVDCoated	PVD Coated	Uncoated
	Corrosion-resistant steel	.004 - .008	203 - 569	163 - 455	.004 - .010	203 - 569	163 - 455	.003 - .012	250 - 650	200 - 600	---
	Cast steel, medium strength	.004 - .008	244 - 488	195 - 390	.004 - .012	244 - 488	195 - 390	.003 - .009	300 - 600	250 - 550	---
K		MILLING	SFPM		MILLING	SFPM		MILLING	SFPM		
		Feed 1)	Coated	Uncoated	Feed 1)	Coated	Uncoated	Feed 1)	CVDCoated	PVD Coated	Uncoated
	Grey cast iron, medium hardness	.004 - .010	284 - 488	228 - 390	.004 - .016	284 - 488	228 - 390	.003 - .009	---	300 - 900	250 - 750
N		MILLING	SFPM		MILLING	SFPM		MILLING	SFPM		
		Feed 1)	Coated	Uncoated	Feed 1)	Coated	Uncoated	Feed 1)	CVDCoated	PVD Coated	Uncoated
	Brass	.004 - .010	406 - 731	325 - 585	.004 - .010	406 - 731	325 - 585	.004 - .015	---	---	700 - 2000
	Mg-alloyed	.004 - .006	1219 - 3250	975 - 2600	.004 - .006	1219 - 3250	975 - 2600	.004 - .015	---	---	700 - 2000
	Si-alloyed	.002 - .006	1016 - 2438	813 - 1950	.002 - .006	1016 - 2438	813 - 1950	.004 - .015	---	---	700 - 2000
	Al-alloyed, hypo-eutectic	.004 - .008	1219 - 4063	975 - 3250	.004 - .008	1219 - 4063	975 - 3250	.003 - .012	---	---	700 - 1500
	Al-alloyed, hyper-eutectic Si>12%	.004 - .008	1219 - 2031	975 - 1625	.004 - .008	1219 - 2031	975 - 1625	.003 - .012	---	---	700 - 1500

Cutting Data

for CP90 Face Mills

Materials	Conditions of chip removal	Range of application N01 - N40		
		N01-N20 (HSC)	N20-N30 (HSC)	N25-N40 (HSC+HPC)
	High-speed milling	100µin - 200µin	100µin - 200µin	100µin - 200µin
N Nonferrous metals Aluminum alloys without silicon	unstable (varied depth)	PDC-S	PDC-S	PDC-S
		2600-14625	2600-13000	2600-8125
	continuous	PDC-S	PDC-S	PDC-S
		2600-14625	2600-13000	2600-8125
	heavily + slightly interrupted	PDC-S	PDC-S	PDC-S
		2600-14625	2600-13000	2600-8125
N Nonferrous metals Aluminum alloys with less than 12% silicon	unstable (varied depth)	PDC-S	PDC-S	PDC-S
		2600-13000	2600-11375	2600-8775
	continuous	PDC-S	PDC-S	PDC-S
		2600-13000	2600-11375	2600-8775
	heavily + slightly interrupted	PDC-S	PDC-S	PDC-S
		2600-13000	2600-11375	2600-8775
N Nonferrous metals Copper and copper alloys brass, bronze, precious metals	unstable (varied depth)	PDC-S	PDC-S	PDC-S
		2600-9750	2600-8125	2275-7150
	continuous	PDC-S	PDC-S	PDC-S
		2600-9750	2600-8125	2275-7150
	heavily + slightly interrupted	PDC-S	PDC-S	PDC-S
		2600-9750	2600-8125	2275-7150
Coolant: flood or through coolant				

CUTTING DATA FOR T45V END MILLS AND FACE MILLS

ISO 513	MILLING CUTTER / MATERIAL					Coated			Uncoated	
						SLK	SLX	SLP	SP25	SK35
P	Cutter	Max. a_p	Carbide Insert			Feed fz inches per tooth [2]				
	T45VE/VF	.140	OECX/RECX 43			---	.003 - .010	.003 - .010	.003 - .010	---
	T45VE/VF	.170	OECX/RECX 53			---	.003 - .012	.003 - .012	.003 - .012	---
	T45VE/VF	.210	OECX/RECX 63			---	.003 - .015	.003 - .015	.003 - .015	---
	Work Material		Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM				
	Carbon steel, Unalloyed steel, cast steel and free cutting steel	< 0.25% C	annealed	125	1	---	800 - 1350	700 - 1000	350 - 700	---
		≥ 0.25% C	annealed	190	2	---	800 - 1350	700 - 1000	350 - 700	---
		< 0.55% C	heat-treated	250	3	---	700 - 1100	630 - 950	330 - 675	---
		≥ 0.55% C	annealed	220	4	---	800 - 1350	700 - 1000	350 - 700	---
			heat-treated	300	5	---	700 - 1100	630 - 950	330 - 675	---
	Low alloy steel and cast steel		annealed	200	6	---	800 - 1350	700 - 1000	350 - 700	---
			heat-treated	275	7	---	700 - 1100	630 - 950	330 - 675	---
			heat-treated	300	8	---	650 - 1000	620 - 900	300 - 650	---
			heat-treated	350	9	---	600 - 950	580 - 580	300 - 650	---
	High alloy steel, cast steel & tool steel		annealed	200	10	---	800 - 1150	700 - 950	350 - 650	---
			heat-treated	325	11	---	700 -1000	650 - 900	300 - 600	---
M	Cutter	Max. a_p	Carbide Insert			Feed fz as inches per tooth [2]				
	T45VE/VF	.140	OECX/RECX 43			.003 - .006	.003 - .006	.003 - .006	.003 - .006	.003 - .006
	T45VE/VF	.170	OECX/RECX 53			.003 - .008	.003 - .008	.003 - .008	.003 - .008	.003 - .008
	T45VE/VF	.210	OECX/RECX 63			.003 - .012	.003 - .012	.003 - .012	.003 - .012	.003 - .012
	Work Material		Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM				
	400 series Stainless & cast steel		ferrit./mart.	200	12	---	850 - 1200	560 - 900	265 - 535	---
			martensitic	240	13	---	580 - 950	540 - 850	245 - 500	---
	300 series Stainless & cast steel		austenitic	180	14	800 - 1100	---	---	---	400 - 600

CUTTING DATA FOR RT45V END MILLS AND FACE MILLS

ISO 513	MILLING CUTTER / MATERIAL					Coated	Uncoated
						SLK	SK35
K	Cutter	Max. a_p	Carbide Insert			Feed fz inches per tooth [2]	
	T45VE/VF	.140	OECX/RECX 43			.003 - .010	.003 - .010
	T45VE/VF	.170	OECX/RECX 53			.003 - .012	.003 - .012
	T45VE/VF	.210	OECX/RECX 63			.003 - .015	.003 - .015
	Work Material		Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM	
	Grey cast iron		ferrit./pearl.	180	15	550 - 1000	230 - 465
			pearlitic	260	16	500 - 900	230 - 465
	Nodular cast iron		ferritic	160	17	500 - 1000	230 - 465
			pearlitic	250	18	450 - 850	230 - 465
	Malleable cast iron		ferritic	130	19	550 - 1100	250 - 500
			pearlitic	230	20	500 - 900	230 - 465
N	Cutter	Max. a_p	Carbide Insert			Feed fz inches per tooth [2]	
	T45VE/VF	.140	OECX/RECX 43			---	.003 - .015
	T45VE/VF	.170	OECX/RECX 53			---	.003 - .018
	T45VE/VF	.210	OECX/RECX 63			---	.003 - .020
	Work Material		Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM	
	Cast aluminium alloys		≤ 12% Si	75	23	---	1600 - 4000
			age-hardened	90	24	---	1200 - 3800
			> 12% Si heat resistant	130	25	---	1100 - 2800
	Copper & copper alloys		Red Brass, brass	90	27	---	600 - 1000
			Bronze	100	28	---	600 - 1000
S	Cutter	Max. a_p	Carbide Insert			Feed fz inches per tooth [2]	
	T45VE/VF	.140	OECX/RECX 43			.002 - .004	.002 - .004
	T45VE/VF	.170	OECX/RECX 53			.002 - .004	.002 - .004
	T45VE/VF	.210	OECX/RECX 63			.002 - .004	.002 - .004
	Work Material		Condition	Hardness HB	Mat. Gr.	Cutting Speeds in SFPM	
	High-temperature alloys Ni- or Co- based		age-hardened	280	32	50 - 110	50 - 100
			annealed	250	33	70 - 150	50 - 110
			age-hardened	350	34	50 - 110	50 - 100
	Titanium alloys		age-hardened	310	37	105 - 190	80 - 120

FOR USE WITH RECX INSERTS

1) The feeds per tooth fz are valid for face milling with width of cut ae > 40% of the cutter diameter and max. depth of cut ap.

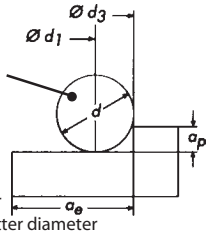
For smaller widths and depths of cut, the figures in the tables should be converted using correction factors tables below. (d = diameter of insert, d1 = cutter diameter).

f_z factors for ratio $a_e : d_1$

Depth of cut a_p	$a_e : d_1$ 5%	10%	20%	≥40%
5% of d	9	6.3	4.3	3.2
10% of d	6.3	4.3	3.2	2.2
20% of d	4.3	3.2	2.2	1.6
40% of d	3.2	2.2	1.6	1.1

SFPM factors for various f_z factors

f_z factor	SFPM factor
9	1.6
6.3	1.5
4.3	1.4
3.2	1.3
2.2	1.2
1.6	1.1
1.1	1



Legend:
ae - width of cut
ap - depth of cut
d - insert diameter
Ød1 - effective cutter diameter
Ød3 - nominal cutter diameter

Cutting Data

for STRATUS & VEGA End Mills

Cutting Data for STRATUS End Mills										
Material	SFM	Feed (Inches per tooth)					Maximum Depth of Cut			
		1/8	1/4	1/2	3/4	1	Slotting Axial	Profiling Axial	Profiling Radial	Profiling Feed Adj.
Steel - Low Carbon	400 - 500	.0010	.0020	.0040	.0050	.0060	1 x D	1 x D	.5 x D	+ 20%
Steel - Medium Carbon	275 - 400	.0007	.0015	.0035	.0045	.0060	1 x D	1 x D	.5 x D	+ 20%
Tool Steel <38 Rc	250 - 350	.0005	.0012	.0030	.0040	.0055	1 x D	1 x D	.5 x D	+ 15%
Cast Iron - Gray	450 - 550	.001	.0025	.0035	.0045	.0060	1 x D	1 x D	.5 x D	+ 20%
Cast Iron Ductile	300 - 400	.0007	.0012	.0025	.0040	.0055	1 x D	1 x D	.5 x D	+ 20%
Cast Iron Malleable	250 - 300	.0005	.0010	.0020	.0030	.0040	1 x D	1 x D	.5 x D	+ 15%
300 Series Stainless	250 - 350	.0004	.0010	.0020	.0030	.0040	1 x D	1 x D	.5 x D	+ 15%
400 Series Stainless	225 - 300	.0004	.0010	.0020	.0030	.0040	1 x D	1 x D	.5 x D	+ 15%
PH Series Stainless	200 - 275	.0003	.0008	.0015	.0025	.0030	1 x D	1 x D	.5 x D	+ 15%
Titanium	120 - 200	.0004	.0010	.0020	.0025	.0030	1 x D	1 x D	.5 x D	+ 15%
High Temp. Alloys	60 - 110	.0005	.0010	.0018	.0025	.0030	1 x D	1 x D	.5 x D	+ 10%

Cutting Data for VEGA End Mills						D= Tool Diameter Reduce feed rates by 20% when using long length tools						
	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed SFM	Feed (Inches per tooth)						
						1/8	1/4	3/8	1/2	5/8	3/4	1
Carbon & Tool Steels >38 Rc	Slotting	.5 x D	1 x D	6	275	.0003	.0007	.0010	.0015	.0019	.0024	.0030
	Rough	1 x D	.5 x D	6	325	.0005	.0010	.0015	.0020	.0025	.0030	.0040
	Finish	1.5 x D	.01 x D	6	400	.0006	.0012	.0018	.0025	.0031	.0037	.0050
	HSM	.1 x D	.1 x D	6	800	.0015	.0030	.0045	.0060	.0075	.0090	.0120
Carbon & Tool Steels 39 Rc to 48 Rc	Slotting	.5 x D	1 x D	6	200	.0002	.0005	.0007	.0010	.0013	.0016	.0020
	Rough	1 x D	.5 x D	6	250	.0004	.0007	.0011	.0015	.0019	.0024	.0030
	Finish	1.5 x D	.01 x D	6	325	.0004	.0009	.0013	.0018	.0022	.0027	.0036
	HSM	.1 x D	.1 x D	6	600	.0011	.0022	.0033	.0045	.0056	.0068	.0090
Titanium Alloys	Slotting	.25 x D	1 x D	6	225	.0002	.0005	.0007	.0010	.0013	.0016	.0020
	Rough	1 x D	.25 x D	6	250	.0003	.0006	.0009	.0013	.0016	.0020	.0026
	Finish	1.5 x D	.01 x D	6	350	.0005	.0010	.0015	.0020	.0025	.0030	.0040
High Temp. Alloys, Inconel, Haynes, Stellite, Hastalloy, Waspalloy	Slotting	.25 x D	1 x D	6	70	.0003	.0007	.0011	.0014	.0017	.0022	.0028
	Rough	1 x D	.25 x D	6	95	.0004	.0009	.0013	.0017	.0022	.0026	.0034
	Finish	1.5 x D	.01 x D	6	110	.0005	.0009	.0014	.0019	.0023	.0028	.0038
Carbon & Tool Steels 49 Rc to 57 Rc	Slotting	.25 x D	1 x D	6	150	.0002	.0005	.0007	.0010	.0012	.0015	.0020
	Rough	1 x D	25 x D	6	200	.0003	.0007	.0011	.0015	.0018	.0022	.0030
	Finish	1.5 x D	.01 x D	6	275	.0003	.0007	.0011	.0015	.0018	.0022	.0030
	HSM	.1 x D	.1 x D	6	500	.0006	.0012	.0017	.0023	.0028	.0034	.0046
Carbon & Tool Steels 58 Rc to 62Rc	Slotting	.20 x D	1 x D	6	45	.0002	.0005	.0007	.0010	.0013	.0016	.0020
	Rough	1 x D	.20 x D	6	65	.0004	.0007	.0011	.0015	.0019	.0024	.0030
	Finish	1.5 x D	.01 x D	6	100	.0004	.0007	.0011	.0015	.0019	.0024	.0030
	HSM	.1 x D	.1 x D	6	400	.0005	.0010	.0015	.0020	.0025	.0030	.0040

Cutting Data for ORION 2 & 3 Flute End Mills

Material	Type of Cut	Axial DOC	Radial DOC	No. of flutes	Speed (SFM)	Feed (Inches per tooth)							Speed (m/min)	Feed (mm per tooth)						
						1/8	1/4	3/8	1/2	5/8	3/4	1		3.0	6.0	9.0	12.0	16.0	19.0	25.0
Aluminum Alloys 2024, 6061, 7075	Slot	1 x D	1 x D	2	800	.0020	.0040	.0060	.0080	.0100	.0120	.0160	244	.0508	.1016	.1524	.2032	.2540	.3048	.4064
	Rough	1 x D	.75 x D	3	1000	.0020	.0050	.0075	.0100	.0120	.0150	.0200	305	.0508	.1270	.1905	.2540	.3048	.3810	.5080
	Finish	1.5 x D	.01 x D	3	1200	.0030	.0060	.0090	.0120	.0160	.0200	.0250	366	.0762	.1524	.2286	.3048	.4064	.5080	.6350
High Silicon Aluminum A380, A390	Slot	.5 x D	1 x D	3	400	.0010	.0020	.0030	.0040	.0050	.0060	.0080	122	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Rough	1 x D	.5 x D	3	600	.0015	.0030	.0045	.0060	.0075	.0090	.0120	183	.0381	.0762	.1143	.1524	.1905	.2286	.3048
	Finish	1.5 x D	.01 x D	3	800	.0018	.0035	.0055	.0070	.0090	.0110	.0140	244	.0457	.0889	.1397	.1778	.2286	.2794	.3556
Magnesium Alloys	Slot	1 x D	1 x D	2	800	.0020	.0040	.0060	.0080	.0100	.0120	.0160	244	.0508	.1016	.1524	.2032	.2540	.3048	.4064
	Rough	1 x D	.75 x D	3	1000	.0020	.0050	.0075	.0100	.0120	.0150	.0200	305	.0508	.1270	.1905	.2540	.3048	.3810	.5080
	Finish	1.5 x D	.01 x D	3	1200	.0030	.0060	.0090	.0120	.0160	.0200	.0250	366	.0762	.1524	.2286	.3048	.4064	.5080	.6350
Copper Alloys Brass, Bronze	Slot	.75 x D	1 x D	2	400	.0010	.0020	.0030	.0040	.0050	.0060	.0080	122	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Rough	1 x D	.75 x D	3	475	.0012	.0025	.0034	.0050	.0063	.0075	.0100	145	.0305	.0635	.0940	.1270	.1600	.1905	.2540
	Finish	1.5 x D	.01 x D	3	550	.0015	.0030	.0045	.0060	.0075	.0090	.0120	168	.0381	.0762	.1143	.1524	.1905	.2286	.3048
Composites Plastics, Fiberglass	Slot	1 x D	1 x D	3	400	.0010	.0020	.0030	.0040	.0050	.0060	.0080	122	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Rough	1 x D	.75 x D	3	600	.0015	.0030	.0045	.0060	.0075	.0090	.0120	183	.0381	.0762	.1143	.1524	.1905	.2286	.3048
	Finish	1.5 x D	.01 x D	3	800	.0018	.0035	.0055	.0070	.0090	.0110	.0140	244	.0457	.0889	.1397	.1778	.2286	.2794	.3556

D= tool diameter. Reduce feed rates by 20% when using long length tools. Starting parameters shown.

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