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Millstar is an industry leader in producing die and mold profile tooling and solid carbide tools. Millstar tools are designed for conventional profile machining, and high speed and hard milling with modern machine tools and methods.

Millstar Profile Milling Tools represent the latest in profile and contour milling technology, resulting in shorter machining and lead times, higher machining accuracy and true contouring results.

Customers include die and mold machining companies, aluminum extrusion companies, high speed machining mold makers, and aerospace and medical component industries. Insert tooling is typically used in roughing and finishing applications.

The Millstar product line is manufactured in the USA, and all tools are fully traceable. Nearly six decades of cutting tool design and manufacturing for automotive, aerospace and many other industries, as well as special design capabilities using 3-D CAD allow us to respond quickly to requests for special designs.

Insert Overview

The Inserts

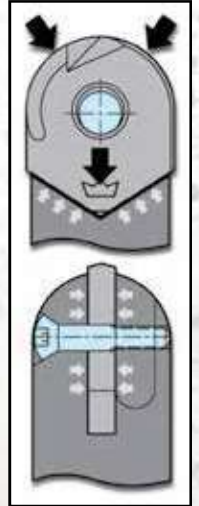
Millstar inserts are fully ground precision inserts for better chip control, faster metal removal and higher surface accuracies. They are far more accurate than pressed and O.D. sharpened inserts.

- Positive ground chipbreaker or strong negative cutting edge designs guarantee outstanding cutting performance in a wide variety of ferrous and non-ferrous materials.
- A choice of state-of-the-art insert grades, designs and tool coatings allow for optimum speed and feed rates in wet and dry machining. Reduced machining times by 25% to 60% are not uncommon.
- Economical one-piece inserts with two cutting edges are cost-effective for contour milling. True radius geometry is fully CNC-ground for higher machining accuracy and greatly reduced manual finishing and polishing time.

- Choose from side-cutting ball nose inserts with 180 degree nose radius, and popular ball nose inserts with a cutting edge covering 230 degrees for steep wall up-and-down ramping, profiling, contour milling and blending, and for a wider range of applications compared to conventional ball nose tools.
- Select from a variety of flat bottom, back draft and toroid inserts for steep or straight wall milling with long extensions on hard to reach cores, cavities or fillets. Milling with small radii prevents deflection and results in superior finishes and contour accuracies. Available with or without chipbreaker and coating in a variety of corner radii and sizes.

Rock Solid Insert Clamping

Cutting insert clamping is highly accurate and rigid. Unique V-pocket design gives a truly positive seat for the insert and will not allow insert movement when milling with a side thrust. "Sandwiched" insert clamping with single locking screw is unsurpassed for rigidity. The advanced design of Millstar inserts eliminates heat-seizing of locking screws or insert movement due to costly locating screws or pins of less advanced design. Positive V-pocket seating eliminates mismatch when changing to fresh inserts. It also eliminates the need to program new length or diameter offsets.



Ball Nose Inserts

MBT SuperFinisher Ball Nose Insert

Precision ground, harder grade, for semi-finish and finish milling. Excellent choice for unattended finish milling at small depth and high speeds and feed rates.



MB Ball Nose Insert

Unique cutting edge allows performance in all operations in material below 42 HRC; in semi, & finishing operations above. Significant benefits in chip evacuation. Insert geometry allows smoother cutting motion-diminishing heat build up & tool deflection, reduces vibration caused by cutting action.



VRBS Small Ball Nose Insert

Used for semi and finish-milling small radius or detail work, and surface milling in soft and hard steel, cast iron, aerospace and non-ferrous alloys, graphite, etc. Suitable for high speed and hard milling.



RB-N Ball Nose Insert

Precision ground, non-chipbreaker. Best choice for cavity, core and profile milling of pre-hard and fully hard die/mold steels, cast steels and cast iron. Strongest cutting edge design.



RBT Insert

Precision ground for semi-finish and finish milling. Excellent choice for unattended finish milling at small depth and high speed and feed rates.



BS-N Ball Nose Insert

Sidcutting, non-chipbreaker. Side cutting insert used in cavity and core profiling, for blending of fillets on medium and hard materials.



Flat Bottom Inserts

BDS Flat Bottom Insert

Precision ground, non-chipbreaker. Unique crossover design between flat bottom FB and back draft BD inserts. Allows straight walls with a larger step down than BD, but less cutting forces than FB; allows higher cutting speeds and feed



FB-R Flat Bottom Insert

Precision ground, with positive ground chipbreaker. Flat bottom insert for shoulder milling, fillet finishing and long reach angular wall finishing of softer materials



HF (High Feed) Inserts

Millstar's new HF insert is designed for High Speed and High Feed machining. The HF is designed to run at high cutting speeds and feed rates with shallow depth of cut. The NEW curved geometry allows the chip to flow up and out of the cut quickly and smoothly allowing for the use of heavy chip loads. The geometry of the new HF insert generates cutting forces upward, toward the spindle, which helps eliminate vibration and deflection, allowing for very high chip loads. The HF insert is designed to fit into Millstar's standard flat holders, style 4 (CYF, TAF and CBCYF) making these holders more versatile than ever.



Back Draft Inserts

BD-R Back Draft Insert

Precision ground, with positive ground chipbreaker and 7 degree back-taper. Used for milling of cores, cavities, fillets with straight or very steep walls of softer material.



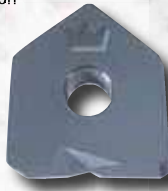
VBD Small Back Draft Insert

Used for semi and finish-milling small radius or detail work, and surface milling in soft and hard steel, cast iron, aerospace and non-ferrous alloys, aluminum alloys, graphite, etc. Suitable for high speed and hard milling.



BD-N Back Draft Insert

Precision ground, non-chipbreaker and 7 degree backtaper. Used for milling of cores, cavities, fillets with straight or very steep walls of harder material.



TOBD-NF Back Draft Inserts for Non-Ferrous Materials

Millstar's new TOBD-NF insert is specifically designed for high speed and high feed roughing of Aluminum, but also has the versatility to be used for fine finishing as well. This unique cutting edge design allows the chips to flow freely up the flute allowing higher speeds and feeds. The TOBD-NF comes in diameters from 1/2 inch (12mm) up to 1 inch (25mm) and fits into our standard flat type tool holders making the holders more versatile than ever.



CBN Tipped

For high speed machining or milling of high hardness materials with longer tool life and superior finishes.



PCD Tipped

For carbon milling with longer tool life.



Toroid

TO Toroid Bull Nose Insert

Precision ground, large corner radius & back taper for spiral and pocket milling, milling of pre-hard and hardened flat surfaces at higher speeds than tools with smaller corner radii. Good choice for HS milling of Aluminum





Profile Milling Program Tool Contents

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Profile Milling Program Tools

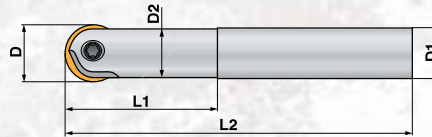
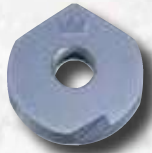
Millstar Profile Milling Tools represent the latest in profile and contour milling technology, providing the competitive edge of shorter machining and lead times, and the advantages of higher machining accuracy and true contouring results.

The Millstar Advantage

<i>Better surface finishes</i>	=	<i>Reduced finishing work</i>
<i>Faster run & feed speed</i>	=	<i>Reduced machining time</i>
<i>Increased tool life</i>	=	<i>Reduced tool changes & cost</i>
<i>Accurate and consistent milling</i>	=	<i>Reduced manual rework</i>
<i>Balanced milling action, two flute efficiency</i>	=	<i>Greatly increased metal removal productivity</i>

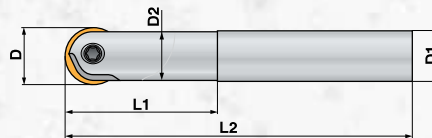


Graphite Machining Program - True Diamond Coated Inserts



VRBS/RB - General Ball Nose Graphite Machining Line, Metric

Tool Ordering Number	Dimensions					Recommended Shank Part Number
	Size ØD	Shank ØD1	Neck ØD2	Neck Length L1	Total Length L2	
VRBS-6-DMD	6	6	5,7	30	115	CBCYV-06-115-06
VRBS-8-DMD	8	8	7,5	30	115	CBCYV-08-130-08
RB-10-N-DMD	10	10	9,0	32	150	CBCY-10-150-10
RB-12-N-DMD	12	12	10,8	52	165	CBSFCY-12-150-12
RB-16-N-DMD	16	16	14,4	52	170	CBSFCY-16-150-16
RB-20-N-DMD	20	20	18,0	77	225	CBSFCY-20-200-20
RB-25-N-DMD	25	25	22,5	93	230	CBSFCY-25-200-25
RB-30-N-DMD	30	30	27,2	57	230	CBSFCY-30/32-190-32
RB-32-N-DMD	32	32	27,2	57	230	CBSFCY-30/32-190-32

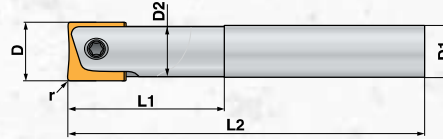
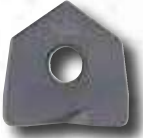


MBT - Ball Nose Graphite Finishing Line, Metric

Tool Ordering Number	Dimensions					Recommended Shank Part Number
	Size ØD	Shank ØD1	Neck ØD2	Neck Length L1	Total Length L2	
MBT-10-DMD	10	10	9,0	32	150	CBCY-10-150-10
MBT-12-DMD	12	12	10,8	52	165	CBSFCY-12-150-12
MBT-16-DMD	16	16	14,4	52	170	CBSFCY-16-150-16
MBT-20-DMD	20	20	18,0	77	225	CBSFCY-20-200-20
MBT-25-DMD	25	25	22,5	93	230	CBSFCY-25-200-25
MBT-30-DMD	30	30	27,2	57	230	CBSFCY-30/32-190-32
MBT-32-DMD	32	32	27,2	57	230	CBSFCY-30/32-190-32

* For other holder options, see page 62 (Metric).

Graphite Machining Program - True Diamond Coating or PCD Tipped

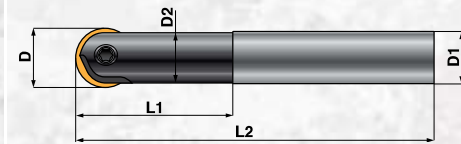


VBD/BDS - Flat Bottom Graphite Machining Line, Metric

Tool Ordering Number	Dimensions						Recommended Shank Part Number
	Size ØD	Radius	Shank ØD1	Neck ØD2	Neck Length L1	Total Length L2	
VBD-06-R0,1	6	0,1	6	5,7	30	115	CBCYV-06-115-06
VBD-06-R0,4	6	0,4	6	5,7	30	115	CBCYV-06-115-06
VBD-08-R0,1	8	0,1	8	7,5	30	115	CBCYV-08-130-08
VBD-08-R0,4	8	0,4	8	7,5	30	115	CBCYV-08-130-08
BDS-10-N-0.1	10	0,1	10	9,0	32	150	CBCY-10-150-10
BDS-10-N-0.8	10	0,8	10	9,0	32	150	CBCY-10-150-10
BDS-10-N-1.0	10	1,0	10	9,0	32	150	CBCY-10-150-10
BDS-12-N-0.1	12	0,1	12	10,8	52	165	CBCYF-12-150-12
BDS-12-N-1.0	12	1,0	12	10,8	52	165	CBCYF-12-150-12
BDS-16-N-0.1	16	0,1	16	14,4	52	170	CBCYF-16-150-16
BDS-16-N-1.0	16	1,0	16	14,4	52	170	CBCYF-16-150-16
BDS-16-N-1.3	16	1,3	16	14,4	52	170	CBCYF-16-150-16
BDS-20-N-0.1	20	0,1	20	18,0	77	225	CBCYF-20-200-20
BDS-20-N-1.0	20	1,0	20	18,0	77	225	CBCYF-20-200-20
BDS-20-N-1.6	20	1,6	20	18,0	77	225	CBCYF-20-200-20
BDS-25-N-1.0	25	1,0	25	22,5	93	230	CBCYF-25-200-25
BDS-25-N-2.0	25	2,0	25	22,5	93	230	CBCYF-25-200-25

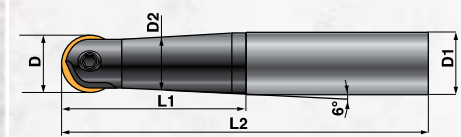
* For other holder options, see page 62 (Metric).

Profile Milling Holders



SFCY - Cylindrical Steel Shank Holder, Ball

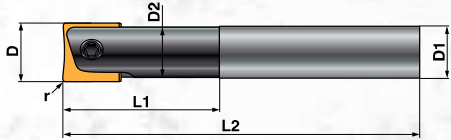
Tool Ordering Number	Dimensions					Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck ØD2	Neck Length L1	Total Length L2			Type	Code
SFCY-12-125-12	12	12	10,8	36	125	MS12	T20		MB, MBT, RB-N, BS-N, RBT
SFCY-12-150-12	12	12	10,8	46	150	MS12	T20		
SFCY-0500-6.0-12	0,5"	12	11,2	44	152	MS12	T20		
SFCY-14-125-16	14	16	12,6	36	125	MS16	T20		
SFCY-16-160-16	16	16	14,4	50	160	MS16	T20		
SFCY-20-150-20	20	20	18,0	50	150	MS20	T20		
SFCY-20-190-20	20	20	18,0	61	190	MS20	T20		
SFCY-22-200-25	22	25	19,8	50	200	MS25	T20		
SFCY-25-150-25	25	25	22,5	50	150	MS25	T20		
SFCY-25-200-25	25	25	22,5	64	200	MS25	T20		
SFCY-25-250-25	25	25	22,5	64	250	MS25	T20		
SFCY-1000-6.0-25	1.0"	25	22,5	44	152	MS25	T20		
SFCY-1000-10.0-25	1.0"	25	22,5	70	254	MS25	T20		
SFCY-30/32-190-32	30/32	32	27,2	57	190	MS32	T30		
SFCY-30/32-250-32	30/32	32	27,2	76	250	MS32	T30		
SFCY-30/32-300-32	30/32	32	27,2	57	300	MS32	T30		




SFTA - Taper Steel Shank Holder, Ball

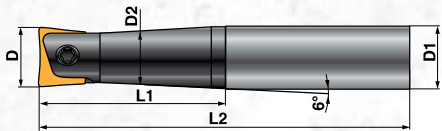
Tool Ordering Number	Dimensions					Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck ØD2	Neck Length L1	Total Length L2			Type	Code
SFTA-12-190-16	12	16	10,8	60	190	MS12	T20		MB, MBT, RB-N, BS-N, RBT
SFTA-16-190-20	16	20	14,4	57	190	MS16	T20		
SFTA-20-200-25	20	25	18,0	80	200	MS20	T20		
SFTA-25-250-32	25	32	22,5	100	250	MS25	T20		
SFTA-25-315-32	25	32	22,5	100	315	MS25	T20		
SFTA-30/32-250-40	30/32	40	27,2	120	250	MS32	T30		
SFTA-30/32-250-42	30/32	42	27,2	120	250	MS32	T30		

Profile Milling Holders




CYF - Cylindrical Steel Shank Holder, Flat

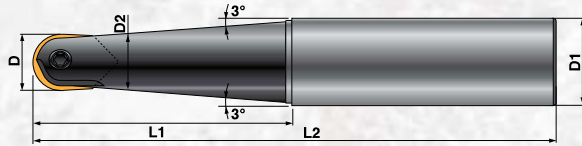
Tool Ordering Number	Dimensions					Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck ØD2	Neck Length L1	Total Length L2			Type	Code
CYF-10-100-10	10	10	9,0	19	100	MS10	T15		BD-N, BD-R, BDS, FB-R, TO, TOBD-NF, HF
CYF-12-125-12	12	12	10,8	36	125	MS12	T20		
CYF-12-150-12	12	12	10,8	46	150	MS12	T20		
CYF-16-160-16	16	16	14,4	50	160	MS16	T20		
CYF-20-150-20	20	20	18,0	50	150	MS20	T20		
CYF-20-200-20	20	20	18,0	61	200	MS20	T20		
CYF-25-150-25	25	25	22,5	50	150	MS25	T20		
CYF-25-200-25	25	25	22,5	64	200	MS25	T20		
CYF-30/32-190-32	30/32	32	28,6	57	190	MS32	T30		
CYF-30/32-250-32	30/32	32	28,6	76	250	MS32	T30		



TAF - Taper Steel Shank Holder, Flat

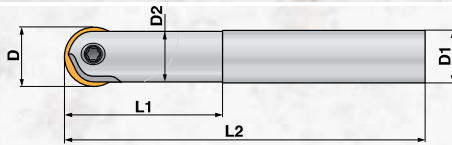
Tool Ordering Number	Dimensions					Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck ØD2	Neck Length L1	Total Length L2			Type	Code
TAF-10-150-12	10	12	9,0	35	150	MS10	T15		BD-N, BD-R, BDS, FB-R, TO, TOBD-NF, HF
TAF-12-190-16	12	16	10,8	60	190	MS12	T20		
TAF-16-190-20	16	20	14,4	57	190	MS16	T20		
TAF-20-200-25	20	25	18,0	80	200	MS20	T20		
TAF-25-250-32	25	32	22,5	100	250	MS25	T20		
TAF-25-315-32	25	32	22,5	100	315	MS25	T20		
TAF-30/32-250-40	30/32	40	28,6	120	250	MS32	T30		

Profile Milling Program Tools



TAV, CY, TA - Spike-Line Cylindrical Steel Shank

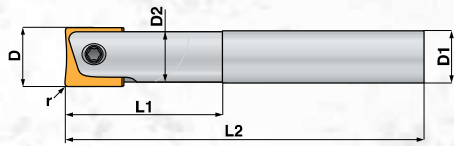
Tool Ordering Number	Dimensions					Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck ØD2	Neck Length L1	Total Length L2			Type	Code
TAV-06-095-12	6	12	5,7	30	95	MS06N	T7		VRBS, VBD
TAV-08-095-12	8	12	7,5	32	95	MS08N	T7		VRBS, VBD
CY-10-100-10	10	10	9,0	19	100	MS10	T15		VRBS, VBD, MB, MBT, RB-N, BS-N, BD, BDS, FB, TO, HF, RBT
CY-10-100-12	10	12	9,0	25	100	MS10	T15		
TA-10-125-12	10	12	9,0	35	125	MS10	T15		
TA-10-150-12	10	12	9,0	35	150	MS10	T15		




CB SFCY - Cylindrical Carbide Shank Holder, Ball

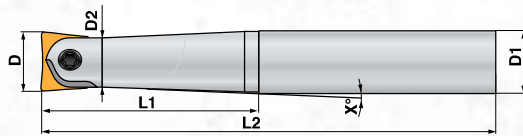
Tool Ordering Number	Dimensions					Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck ØD2	Neck Length L1	Total Length L2			Type	Code
CBSFCY-12-150-12	12	12	10,8	52	165	MS12	T20		MB, MBT, RB-N, BS-N, RBT
CBSFCY-16-150-16	16	16	14,4	52	170	MS16	T20		
CBSFCY-20-200-20	20	20	18,0	77	225	MS20	T20		
CBSFCY-25-200-25	25	25	22,5	93	230	MS25	T20		
CBSFCY-30/32-190-32	30/32	32	27,2	57	230	MS32	T30		

Profile Milling Program Tools

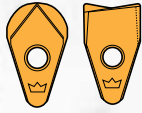


CB CYF - Cylindrical Carbide Shank Holder, Flat

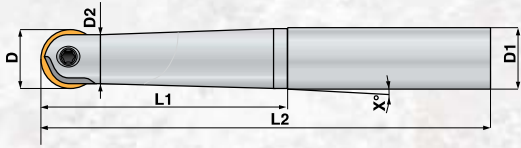
Tool Ordering Number	Dimensions					Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck ØD2	Neck Length L1	Total Length L2			Type	Code
CBCYF-12-150-12	12	12	10,8	52	165	MS12	T20		BD-N, BD-R, BDS, FB-R, TO, TOBD-NF, HF
CBCYF-16-150-16	16	16	14,4	52	170	MS16	T20		
CBCYF-20-200-20	20	20	18,0	77	225	MS20	T20		
CBCYF-25-200-25	25	25	22,5	93	230	MS25	T20		



CB TAV - Spike-Line Taper Carbide Shank, Ball & Flat

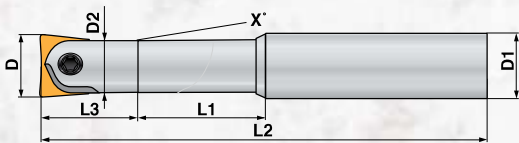
Tool Ordering Number	Dimensions					X°	Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck ØD2	Neck Length L1	Total Length L2				Type	Code
CBTAV-06-075-12	6	12	5,7	35	75	6° (3°/side)	MS06N	T7		VRBS, VBD
CBTAV-06-150-12	6	12	5,7	30	155	6° (3°/side)	MS06N	T7		
CBTAV-06-150-12 LT	6	12	5,7	70	155	6° (3°/side)	MS06N	T7		
CBTAV-08-080-12	8	12	7,5	40	80	6° (3°/side)	MS08N	T7		
CBTAV-08-150-12	8	12	7,5	30	155	6° (3°/side)	MS08N	T7		

Profile Milling Program Tools



CB TA - Taper Carbide Uni-Shank Holder, Ball & Flat

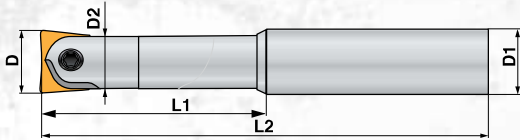
Tool Ordering Number	Dimensions					X°	Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck ØD2	Neck L1	Total L2				Type	Code
CBTA-10-150-12	10	12	9,0	30	165	6° (3° side)	MS10	T15		MB, MBT, RB-N, BS-N, BD, BDS, FB, TO, HF, RBT






CB CYV - Spike Line Taper Carbide Shank, Ball & Flat

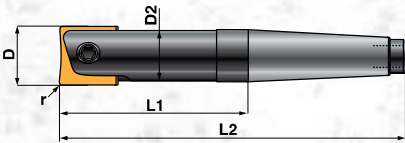
Tool Ordering Number	Dimensions						X°	Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck ØD2	Neck L3	Neck L1	Total L2				Type	Code
CBCYV-06-115-12	6	12	5,7	30	45	115	1°	MS06N	T7		VRBS, VBD
CBCYV-08-100-12	8	12	7,5	30	30	100	1°	MS08N	T7		VRBS, VBD

Profile Milling Program Tools




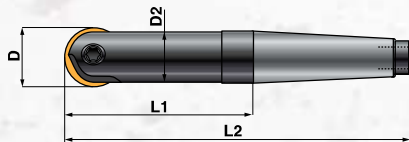
CB CY - Cylindrical Carbide Uni-Shank Holder, Ball & Flat

Tool Ordering Number	Dimensions					Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck ØD2	Neck L1	Total L2			Type	Code
CBCYV-06-115-06	6	6	5,7	30	115	MS06N	T7		VRBS, VBD
CBCYV-08-130-08	8	8	7,5	30	130	MS08N	T7		MB, MBT, RB-N, BS-N, BD, BDS, FB, TO, HF, RBT
CBCY-10-150-10	10	10	9,0	32	150	MS10	T15		




CYFMK - Morse Steel Shank Holder, Flat

Tool Ordering Number	Dimensions					Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck L1	Total L2	MORSE			Type	Code
CYFMK-2-130-12	12	10,8	40	130	MK2	MS12	T20		BD-N, BD-R, BDS, FB-R, TO, TOBD-NF, HF
CYFMK-2-140-16	16	14,4	45	140	MK2	MS16	T20		
CYFMK-2-150-20	20	18,0	55	150	MK2	MS20	T20		
CYFMK-3-180-25	25	22,5	70	180	MK3	MS25	T20		
CYFMK-4-210-32	32	27,2	75	210	MK4	MS32	T30		



CYMK - Morse Steel Shank Holder, Ball

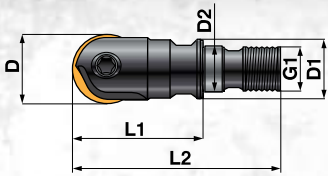
Tool Ordering Number	Dimensions					Screw	Key	Use with Inserts	
	Size ØD	Shank ØD1	Neck L1	Total L2	MORSE			Type	Code
CYMK-2-130-12	12	10,8	40	130	MK2	MS12	T20		MB, MBT, RB-N, BS-N, RBT
CYMK-2-140-16	16	14,4	45	140	MK2	MS16	T20		
CYMK-2-150-20	20	18,0	55	150	MK2	MS20	T20		
CYMK-3-180-25	25	22,5	70	180	MK3	MS25	T20		
CYMK-4-210-32	32	27,2	75	210	MK4	MS32	T30		

MILLSTAR.


Screw-On Heads

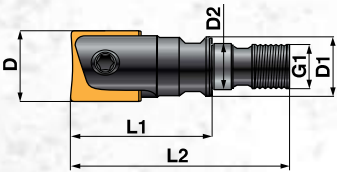


Modular Screw-On System




SF CY - Screw-on Head, Ball

Tool Ordering Number	Size ØD	Diameter D1	Diameter D2	Thread G1	Length L1	Length L2	Screw	Key	Use with Inserts	
									Type	Code
SFCY-10-SC-M6	10	9,8	6,5	M6	24	40	MS10	T15		MB, MBT, RB-N, BS-N, RBT
SFCY-12-SC-M6	12	10,8	6,5	M6	26	42	MS12	T20		
SFCY-16-SC-M8	16	15,0	8,5	M8	30	48	MS16	T20		
SFCY-20-SC-M10	20	18,0	10,5	M10	36	56	MS20	T20		
SFCY-25-SC-M12	25	22,5	12,5	M12	44	65	MS25	T20		
SFCY-32-SC-M16	32	28,6	17,0	M16	50	74	MS32	T30		

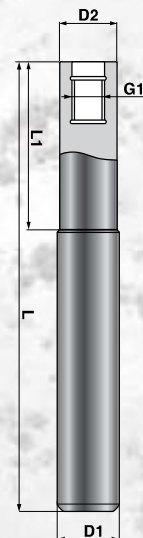


CYF - Screw-on Head, Flat

Tool Ordering Number	Size ØD	Diameter D1	Diameter D2	Thread G1	Length L1	Length L2	Screw	Key	Use with Inserts	
									Type	Code
CYF-10-SC-M6	10	9,8	6,5	M6	24	40	MS10	T15		BD-N, BD-R, BDS, FB-R, TO, TOBD-NF, HF
CYF-12-SC-M6	12	10,8	6,5	M6	26	42	MS12	T20		
CYF-16-SC-M8	16	15,0	8,5	M8	30	48	MS16	T20		
CYF-20-SC-M10	20	18,0	10,5	M10	36	56	MS20	T20		
CYF-25-SC-M12	25	22,5	12,5	M12	44	65	MS25	T20		
CYF-32-SC-M16	32	28,6	17,0	M16	50	74	MS32	T30		

Solid Carbide Adaptor

Tool Ordering Number	Size ØD1	Neck ØD2	Neck L1	Total L	Thread G1
CY-10-150-SC-M6	10	9,8	30	150	M6
CY-12-80-12-SC-M6	12	10,8	27	80	M6
CY-12-150-SC-M6	12	10,8	27	150	M6
CY-16-200-SC-M8	16	15,0	31	200	M8
CY-18-130-SC-M10-CH	18	-	-	130	M10
CY-18-190-SC-M10-CH	18	-	-	190	M10
CY-20-200-SC-M10	20	18,0	36	200	M10
CY-25-170-SC-106-M12	25	24	106	170	M12
CY-25-220-SC-156-M12	25	24	156	220	M12
CY-25-250-SC-M12	25	22,5	44	250	M12
CY-32-170-SC-106-M16	32	29	106	170	M16
CY-32-220-SC-156-M16	32	29	156	220	M16
CY-32-300-SC-M16	32	28,6	52	300	M16



Profile Milling Inserts

Small Ball Nose & Back Draft Inserts

VRBS	Tool Ordering Number	Dimensions			Grade			Description
		D	L	R	XRN	TLN	HSN	
	VRBS-6	6	8,10	3	•	•	•	Used for semi and finish-milling small radius or detail work, and surface milling in soft and hard steel, cast iron, aerospace and non-ferrous alloys, graphite, etc. Suitable for high speed and hard milling.
	VRBS-8	8	4,50	4	•	•	•	
VBD	Tool Ordering Number	Dimensions			Grade			Description
		D	L	R	XRN	TLN	HSN	
	VBD-06	6	8,6	0,1/0,4	•	•	•	Used for semi and finish-milling small radius or detail work, and surface milling in soft and hard steel, cast iron, aerospace and non-ferrous alloys, graphite, etc. Suitable for high speed and hard milling.
	VBD-08	8	5	0,1/0,4	•	•	•	

Metric High Feed Inserts

HF	Tool Ordering Number	Dimensions			Grade			Description
		D	L	PR	XRN	TLN	HSN	
	HF-10	10	3	1,00	•	•	•	Millstar HF insert is designed for High feed and High speed machining. It runs at high cutting speed and feed rates with shallow depth of cut. It allows the chip to flow up and out of the cut quickly. It allows heavy chip loads.
	HF-12	12	4	1,43	•	•	•	
	HF-16	16	5	1,94	•	•	•	
	HF-20	20	6	2,26	•	•	•	
	HF-25	25	7	2,82	•	•	•	

Cutting Recommendations for High Feed Inserts

Work Material	Material Hardness	Cutting Depth at Diameter ap max					Cutting Width Ae max	Insert	Coating Type Recom.	Cut speed at D m/min	Max feed per tooth fz at cutting insert diameter D				
		10	12	16	20	25					10	12	16	20	25
H13/1,2344/SKD61	<41	0,38	0,46	0,61	0,76	0,95	60 - 75%	HF	XRN/HSN	157 - 218	0,28~0,48	0,36~0,56	0,051~0,71	0,66~0,86	0,85~1,05
H13/1,2344/SKD61	41-50	0,32	0,38	0,51	0,64	0,80	60 - 75%	HF	XRN/HSN	126 - 187	0,22~0,42	0,28~0,48	0,41~0,61	0,54~0,74	0,70~0,90
H13/1,2344/SKD61	51+	0,26	0,31	0,42	0,52	0,65	60 - 75%	HF	HSN	96 - 157	0,16~0,36	0,21~0,41	0,32~0,52	0,42~0,62	0,55~0,75
A2/1,2363/SKD12	<41	0,38	0,46	0,61	0,76	0,95	60 - 75%	HF	XRN/HSN	157 - 218	0,28~0,48	0,36~0,56	0,51~0,71	0,66~0,86	0,85~1,05
A2/1,2363/SKD12	14-50	0,32	0,38	0,51	0,64	0,80	60 - 75%	HF	XRN/HSN	126 - 187	0,220~0,42	0,28~0,48	0,32~0,52	0,54~0,74	0,70~0,90
A2/1,2363/SKD12	51+	0,26	0,31	0,42	0,52	0,65	60 - 75%	HF	HSN	96 - 157	0,16~0,36	0,21~0,41	0,51~0,71	0,42~0,62	0,55~0,75
P20/1,2330	<41	0,38	0,46	0,61	0,76	0,95	60 - 75%	HF	XRN/HSN	157 - 218	0,28~0,48	0,36~0,56	0,41~0,61	0,66~0,86	0,85~1,05
P20/1,2330	14-50	0,32	0,38	0,51	0,64	0,80	60 - 75%	HF	XRN/HSN	126 - 187	0,22~0,42	0,28~0,48	0,51~0,71	0,54~0,74	0,70~0,90
D2/1,2379/SKD11	<41	0,38	0,46	0,61	0,76	0,95	60 - 75%	HF	XRN/HSN	157 - 218	0,28~0,48	0,36~0,56	0,41~0,71	0,66~0,86	0,85~1,05
D2/1,2379/SKD11	14-50	0,32	0,38	0,51	0,64	0,80	60 - 75%	HF	XRN/HSN	126 - 187	0,22~0,42	0,28~0,48	0,41~0,61	0,54~0,744	0,70~0,90
D2/1,2379/SKD11	51+	0,26	0,31	0,42	0,52	0,65	60 - 75%	HF	HSN	96 - 157	0,16~0,36	0,21~0,41	0,32~0,52	0,42~0,62	0,55~0,75
Grey Cast Iron/GG	<41	0,38	0,46	0,61	0,76	0,95	60 - 75%	HF	XRN/HSN	157 - 218	0,282~0,48	0,36~0,56	0,51~0,71	0,66~0,86	0,85~1,05
Cast Iron/GGG	41+	0,38	0,46	0,61	0,76	0,95	60 - 75%	HF	XRN/HSN	157 - 218	0,28~0,48	0,36~0,56	0,51~0,71	0,66~0,86	0,85~1,05

Copy Milling Inserts

NA

Non-coated grade.

XRN

Multi-layer hybrid coating of AlCrN. This coating has very good heat resistance and also a low friction coefficient. The XRN coating is designed for use in HSM of un-heat treated softer materials such as Titanium, Inconel, Stainless Steels and other gummy materials that require the use of liquid coolant.

HSN

Millstar's new coating is a multi-layer hybrid Nano coating. This new coating has very good heat resistance and high hardness. The HSN coating is designed for use in HSM of Heat Treated materials up to 72 HRC.

ALTiN-EXALON (TLN)

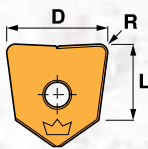
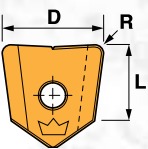
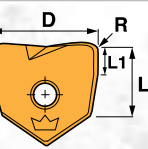
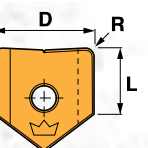
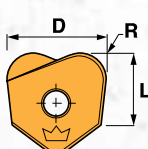
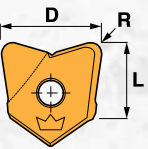
Titanium Aluminum Nitride advanced PVD coating. A special, improved ALTiN coating approaching surface hardness of CBN on a tough substrate. Recommended for tough and hard metal machining applications.

DMD

Diamond coating. Custom coating for cutting non-ferrous, non-metallic and very abrasive materials at highly elevated speeds. Use on copper, bronze, brass, aluminum-silicon alloys, carbon graphite, solid and fiber-reinforced plastics, ceramics and composite materials.

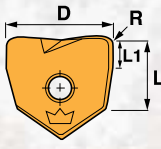
Custom tool coatings for specific applications are available by request.

Flat Bottom, Back Draft, Toroid

BD-N	Tool Ordering Number	Dimensions			Grade			Description	
		D	L	R	XRN	TLN	HSN		
	BD-10-N	10	8,5	0,5/0,8/1,0	•	•	•	Precision ground with 7° back taper. Used for milling of cores, cavities, fillets with straight or very steep walls of harder materials.	
	BD-12-N	12	9,95	0,5/1,0/2,0	•	•	•		
	BD-16-N	16	11,55	0,5/1,0/1,3/2,0/3,0	•	•	•		
	BD-20-N	20	13,35	0,5/1,0/1,6/2,0/3,0	•	•	•		
	BD-25-N	25	19,95	1,0/2,0	•	•	•		
	BD-32-N	32	8,5	1,0/2,6	•	•	•		
BD-R	Number	D	L	R	XRN	TLN	HSN	Description	
	BD-10-R	10	8,5	0,5/0,8/1,0	•	•	•	Precision ground with positive ground chip-breaker and 7° back taper. Used for milling of cores, cavities, fillets with straight or very steep walls of softer materials.	
	BD-12-R	12	9,95	0,5/1,0	•	•	•		
	BD-16-R	16	11,55	0,5/1,0/1,3	•	•	•		
	BD-20-R	20	13,35	0,5/1,0/1,6	•	•	•		
	BD-25-R	25	19,95	1,0/2,0	•	•	•		
	BD-32-R	32	23,35	2,6	•	•	•		
BDS	Number	D	L	R	L1	XRN	TLN	HSN	Description
	BDS-10-N	10	8,5	0,1/0,8/1,0	3	•	•	•	Precision ground with unique crossover design between flat bottom FB and back draft DB inserts. Allows straight walls with a larger step down than BD. Allows higher cutting speeds and feeds.
	BDS-12-N	12	9,95	0,1/1,0	3	•	•	•	
	BDS-16-N	16	11,55	0,1/1,0/1,3	3	•	•	•	
	BDS-20-N	20	13,35	0,1/1,0/1,6	3	•	•	•	
	BDS-25-N	25	19,95	1,0/2,0	3	•	•	•	
	BDS-32-N	32	23,35	1,0/2,0	3	•	•	•	
FB-R	Number	D	L	R	XRN	TLN	HSN	Description	
	FB-10-R	10	8,5	0,8	•	•	•	Precision ground with positive ground chip-breaker. Flat bottom inserts for shoulder milling, fillet finishing and long reach angular wall finishing of softer materials.	
	FB-12-R	12	9,15	1,0	•	•	•		
	FB-16-R	16	10,65	0,5/1,3	•	•	•		
	FB-20-R	20	12,25	1,6	•	•	•		
	FB-25-R	25	16,35	2,0	•	•	•		
	FB-32-R	32	21,3	2,6	•	•	•		
TO	Number	D	L	R	XRN	TLN	HSN	Description	
	TO-10	10	8,65	3,0	•	•	•	Precision ground large corner radius & back taper for spiral and pocket milling. Milling of pre-hard and hardened flat surfaces at higher speeds than tools with smaller corner radii. Good choice for HS milling of Aluminum.	
	TO-12	12	9,20	3,0	•	•	•		
	TO-16	16	11,25	4,0	•	•	•		
	TO-20	20	13,15	5,0	•	•	•		
	TO-25	25	18,25	6,0	•	•	•		
	TO-30	30	22,15	7,5	•	•	•		
	TO-32	32	21,95	8,0	•	•	•		
TOBD-NF	Number	D	L	R	XRN	TLN	HSN	Description	
	TOBD-12-NF	12	9,2	3,0	•	•	•	Millstar inserts designed for high speed high feed roughing of Aluminum, but also has the versatility to be used for fine finishing as well.	
	TOBD-16-NF	16	11,25	3,0	•	•	•		
	TOBD-20-NF	20	13,15	3,0	•	•	•		
	TOBD-25-NF	25	18,25	3,0	•	•	•		

BDS Series in PCD and CBN Tipped

Back Draft

BDS	Tool Ordering Number	Dimensions				Grade			Description
		D	L	R	L1	XRN	TLN	HSN	
	BDS-10-N	10	8,5	0,1/0,8/1,0	3	•	•	•	Precision ground with unique crossover design between flat bottom FB and back draft BD inserts. Allows straight walls with a larger step down than BD. Allows higher cutting speeds and feeds.
	BDS-12-N	12	9,95	0,1/1	3	•	•	•	
	BDS-16-N	16	11,55	0,1/1/1,3	3	•	•	•	
	BDS-20-N	20	13,35	0,1/1/1,6	3	•	•	•	
	BDS-25-N	25	19,95	1/2	3	•	•	•	

PCD Tipped

For carbon milling with longer tool life

CBN Tipped

For high speed machining or milling of high hardness materials with longer tool life and superior finishes.

NEW!

Higher cutting speeds and feeds with new Back Draft Tools

Radius Ordering Numbers:

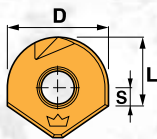
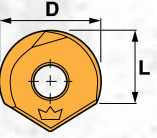
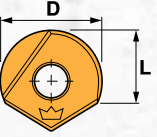
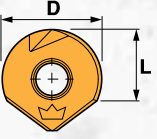
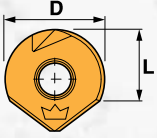
For .015 use ordering # .015 • For 1/32" use ordering # 02 1/16" use ordering # 04

For 1/8" use ordering # 08

Example: 1/2" BDS-0500N-04-PCD or CBN

Copy Milling Inserts

Ball Nose Inserts

BS-N	Tool Ordering Number	Dimensions			Grade			Description
		D	L	S	XRN	TLN	HSN	
	BS-10-N	10	9,50	3,65	•	•	•	Sidecutting, non-chipbreaker. Side cutting insert used in cavity and core profiling, for blending of fillets on medium and hard materials.
	BS-12-N	12	8,80	2,90	•	•	•	
	BS-16-N	16	10,70	2,85	•	•	•	
	BS-20-N	20	12,75	2,85	•	•	•	
	BS-25-N	25	17,20	4,85	•	•	•	
	BS-30-N	30	20,00	5,10	•	•	•	
	BS-32-N	32	21,00	5,30	•	•	•	
MB	Number	D	L	XRN	TLN	HSN	Description	
	MB-10	10	8,65	•	•	•	Unique cutting edge allows performance in all operations in material below 42 HRC; in semi- & finishing operations above. Significant benefits in chip evacuation. Insert geometry allows smoother cutting motion-diminishing heat build up & tool deflection, reduces vibration caused by cutting action.	
	MB-12	12	9,20	•	•	•		
	MB-16	16	11,25	•	•	•		
	MB-20	20	13,15	•	•	•		
	MB-25	25	18,25	•	•	•		
	MB-30	30	22,15	•	•	•		
	MB-32	32	21,95	•	•	•		
MBT	Number	D	L	XRN	TLN	HSN	Description	
	MBT-10	10	8,65	•	•	•	Precision ground, harder grade, for semi-finish and finish milling. Excellent choice for unattended finish milling at small depth and high speeds and feed rates.	
	MBT-12	12	9,20	•	•	•		
	MBT-16	16	11,25	•	•	•		
	MBT-20	20	13,15	•	•	•		
	MBT-25	25	18,25	•	•	•		
	MBT-30	30	22,15	•	•	•		
	MBT-32	32	21,95	•	•	•		
RB-N	Number	D	L	XRN	TLN	HSN	Description	
	RB-10-N	10	9,50	•	•	•	Precision ground, non-chipbreaker. Best choice for cavity, core and profile milling of pre-hard and fully hard die/mold steels, cast steels and cast iron. Strongest cutting edge design.	
	RB-12-N	12	9,20	•	•	•		
	RB-14-N	14	9,45	•	•	•		
	RB-16-N	16	11,25	•	•	•		
	RB-20-N	20	13,15	•	•	•		
	RB-22-N	22	17,45	•	•	•		
	RB-25-N	25	18,25	•	•	•		
	RB-30-N	30	22,15	•	•	•		
	RB-32-N	32	21,95	•	•	•		
RBT	Number	D	L	XRN	TLN	HSN	Description	
	RB-10-T	10	8,65			•	Precision ground for semi-finish and finish milling. Excellent choice for unattended finish milling at small depth and high speed and feed rates.	
	RB-12-T	12	9,20			•		
	RB-16-T	16	11,25			•		
	RB-20-T	20	13,15			•		
	RB-25-T	25	18,25			•		
	RB-30-T	30	22,15			•		
	RB-32-T	32	21,95			•		

NA

Non-coated grade.

XRN

Multi-layer hybrid coating of AlCrN. This coating has very good heat resistance and also a low friction coefficient. The XRN coating is designed for use in HSM of un-heat treated softer materials such as Titanium, Inconel, Stainless Steels and other gummy materials that require the use of liquid coolant.

HSN

Millstar's new coating is a multi-layer hybrid Nano coating. This new coating has very good heat resistance and high hardness. The HSN coating is designed for use in HSM of Heat Treated materials up to 72 HRC.

ALTiN-EXALON (TLN)

Titanium Aluminum Nitride advanced PVD coating. A special, improved ALTiN coating approaching surface hardness of CBN on a tough substrate. Recommended for tough and hard metal machining applications.

DMD

Diamond coating. Custom coating for cutting non-ferrous, non-metallic and very abrasive materials at highly elevated speeds. Use on copper, bronze, brass, aluminum-silicon alloys, carbon graphite, solid and fiber-reinforced plastics, ceramics and composite materials.

Custom tool coatings for specific applications are available by request.

Choosing Cutting Parameters/Calculating Cutting Speed and Feed – METRIC For Ball Nose Inserts

Table 1 - Cutting Conditions for Using Steel Shank Holders

Working Material	Hardness	Grade	Vc m/min	Feed fn (mm/Rev)										Ap Max	Ae Max
				Insert Diameter (mm)											
				6	8	10	12	16	20	25	30	32			
Low Alloy Steel(1.7225)	200-280HB	TLN, HSN	150-200	0,2	0,3	0,4	0,4	0,5	0,5	0,6	0,6	0,6	.15 x D	.15 x D	
Alloy & Die Steel (1.2311, P20, DME2/3/5)	32-42HRC	TLN, HSN	100-150	0,15	0,25	0,3	0,4	0,4	0,4	0,5	0,5	0,5	.20 x D	.20 x D	
Tool Steel (1.2344, 1.2379)	42-52HRC	TLN, HSN	120-160	0,15	0,25	0,3	0,4	0,5	0,5	0,6	0,6	0,6	.20 x D	.20 x D	
Stainless Steel (1.4301, 1.4401)	200-350HB	XRN, TLN, HSN	90-120	0,15	0,25	0,3	0,4	0,4	0,4	0,5	0,5	0,5	.20 x D	.20 x D	
Gray Cast Iron (GG25-GG30)	160-260HB	TLN, HSN	200-360	0,2	0,3	0,4	0,5	0,6	0,6	0,7	0,7	0,7	.10 x D	.10 x D	
Nodular Cast Iron (GGG60-GGG70)	180-300HB	TLN, HSN, HSN	150-300	0,2	0,3	0,4	0,5	0,6	0,6	0,7	0,7	0,7	.15 x D	.15 x D	
Copper Alloy	80-150HB	XRN	150-200	0,25	0,4	0,5	0,6	0,7	0,7	0,8	0,8	0,8	.10 x D	.10 x D	
Aluminum Alloys	30-120HB	XRN	200-300	0,25	0,4	0,5	0,6	0,7	0,7	0,8	0,8	0,8	.6 x D	.6 x D	
Graphite		TLN	200-400	0,3	0,5	0,6	0,7	0,8	0,8	0,9	0,9	0,9	.5 x D	.5 x D	
Ni & Co Based Alloy	250-320HB	XRN, HSN	30-70	0,15	0,2	0,3	0,4	0,4	0,5	0,5	0,6	0,6	.30 x D	.30 x D	
Titanium Alloy (Annealed)	<350HB	XRN, HSN	50-120	0,15	0,2	0,25	0,35	0,35	0,4	0,45	0,5	0,5	.33 x D	.33 x D	
Titanium Alloy (Sol. Treated/Aged)	<380HB	XRN, HSN	40-90	0,1	0,15	0,2	0,3	0,3	0,35	0,4	0,45	0,45	.35 x D	.35 x D	
Harden Steel (1.2344, 1.2379)	45-55HRC	TLN, HSN	70-90	0,15	0,25	0,3	0,4	0,5	0,5	0,6	0,6	0,6	.30 x D	.30 x D	

Table 2 - Cutting Conditions for Using Carbide Shank Holders

Working Material	Hardness	Grade	Vc m/min	Feed fn (mm/Rev)										Ap Max	Ae Max
				Insert Diameter (mm)											
				6	8	10	12	16	20	25	30	32			
Low Alloy Steel (1.7225)	200-280HB	TLN, HSN	260-380	0,3	0,4	0,4	0,5	0,6	0,6	0,7	0,7	0,7	.15 x D	.50 x D	
Alloy & Die Steel (1.2311, P20, DME2/3/5)	32-42HRC	TLN, HSN	250-330	0,25	0,3	0,3	0,4	0,5	0,5	0,6	0,6	0,6	.20 x D	.50 x D	
Tool Steel (1.2344, 1.2379)	42-52HRC	TLN, HSN	240-320	0,25	0,3	0,3	0,4	0,5	0,5	0,6	0,6	0,6	.20 x D	.50 x D	
Stainless Steel (1.4301, 1.4401)	200-350HB	XRN, TLN, HSN	200-260	0,25	0,3	0,4	0,5	0,6	0,65	0,7	0,8	0,8	.20 x D	.50 x D	
Gray Cast Iron (GG25-GG30)	160-260HB	TLN, HSN	360-450	0,35	0,45	0,5	0,5	0,6	0,7	0,8	1,0	1,0	.10 x D	.40 x D	
Nodular Cast Iron (GGG60-GGG70)	180-300HB	TLN, HSN	300-400	0,3	0,4	0,4	0,5	0,6	0,6	0,7	0,8	0,8	.15 x D	.15 x D	
Copper Alloy	80-150HB	XRN	300-400	0,3	0,4	0,4	0,5	0,6	0,6	0,7	0,7	0,7	.10 x D	.40 x D	
Aluminum Alloys	30-120HB	XRN	400-500	0,3	0,4	0,5	0,6	0,7	0,7	0,8	0,8	0,8	.6 x D	.40 x D	
Graphite		TLN, HSN	600-800	0,3	0,5	0,6	0,7	0,8	0,8	0,9	0,9	0,9	.5 x D	.40 x D	
Ni & Co Based Alloy	250-320HB	XRN, HSN	80-110	0,25	0,3	0,4	0,4	0,5	0,6	0,6	0,7	0,7	.30 x D	.50 x D	
Titanium Alloy (Annealed)	<350HB	XRN, HSN	150-230	0,15	0,2	0,25	0,35	0,35	0,4	0,45	0,5	0,5	.33 x D	.50 x D	
Titanium Alloy (Sol. Treated/Aged)	<380HB	XRN, HSN	110-220	0,1	0,15	0,2	0,3	0,3	0,35	0,4	0,45	0,45	.35 x D	.50 x D	
Harden Steel (1.2344, 1.2379)	45-55HRC	TLN, HSN	120-220	0,2	0,25	0,3	0,4	0,5	0,5	0,6	0,6	0,6	.30 x D	.30 x D	

Choosing Cutting Parameters/Calculating Cutting Speed and Feed – METRIC

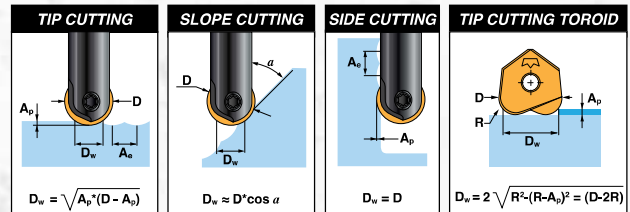
1. Find the Cutting Speed V_c (m/min) & Feed f_n (mm/r')

Find V_c and f_n range in Table 1 or Table 2 above. Choose the average value for V_c and the lower value for feed in the range.

2. Compute the D_w

In order to compute the RPM value of the spindle it is necessary to determine the D_w which is the effective engaged tool diameter. The D_w depends on the geometry of the inserts (ball nose or toroid) and the relative position of the tool against the working piece surface.

Example calculation is of D_w is presented to the right.



3. Calculate Spindle Speed N (n/min)

Use the formula: $N = (V_c \cdot 1,000) / \pi \cdot D_w$

Table 3 - Working Diameter For Ball Nose Tools (tip cutting)

ØD	A _p																		
	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1	1,5	2	2,5	3	3,5	4	5	6	7
6	1,5	2,2	2,6	3	3,3	3,6	3,9	4,1	4,3	4,5	5,2	5,7	5,9	6,0					
8	1,8	2,5	3	3,5	3,9	4,2	4,5	4,8	5,1	5,3	6,2	6,9	7,4	7,7					
10	2	2,8	3,4	3,9	4,4	4,7	5,1	5,4	5,7	6,0	7,1	8,0	8,7	9,2	9,5				
12	2,2	3,1	3,7	4,3	4,8	5,2	5,6	6,0	6,3	6,6	7,9	8,9	9,7	10,4	10,9	11,3	11,8		
14	2,4	3,3	4,1	4,7	5,2	5,7	6,1	6,5	6,9	7,2	8,7	9,8	10,7	11,5	12,1	12,6	13,4	13,9	
16	2,5	3,6	4,3	5	5,6	6,1	6,5	7,0	7,4	7,7	9,3	10,6	11,6	12,5	13,2	13,9	14,8	15,5	15,9
20	2,8	4	4,9	5,6	6,2	6,8	7,4	7,8	8,3	8,7	10,5	12,0	13,2	14,3	15,2	16,0	17,3	18,3	19,1
25		4,5	5,4	6,3	7,0	7,7	8,2	8,8	9,3	9,8	11,9	13,6	15,0	16,2	17,3	18,3	20,0	21,4	22,4
30			6	6,9	7,7	8,4	9,1	9,7	10,2	10,8	13,1	15,0	16,6	18,0	19,3	20,4	22,4	24,0	25,4
32				7,1	7,9	8,7	9,4	10,0	10,6	11,1	13,5	15,5	17,2	18,7	20	21,2	23,2	25,0	26,5

Table 4 - Working Diameter For Toroid Tools (tip cutting)

Insert Diameter "D"	10	12	16	20	25	30	32
Depth of Cut	D _w Working Diameter (metric) Actual cutting diameter of toroid inserts						
0,5	7,3	9,3	11,9	14,3	17,8	20,4	21,6
1,0	8,5	10,5	13,3	16,0	19,6	22,5	23,8
2,0	9,7	11,7	14,9	18,0	22,0	25,2	26,6
3,0	10,0	12,0	15,8	19,2	23,4	27,0	28,5
4,0			16,0	19,8	24,3	28,3	29,9
5,0				20,0	24,9	29,2	30,8
6,0					25,0	29,7	31,5
8,0						30,0	32,0

4. Calculate the Table Feed V_f (m/min)

Use the formula: $V_f = N \cdot f_n \cdot K_f$. K_f is the feed rate multiplier coefficient taking into consideration that chip load is less than theoretical value. Take the value of K_f from Table 5 or Table 6.

Table 5 - Feed Rate Multiplier For Ball Nose Inserts

Insert Diameter "D"	6	8	10	12	16	20	25	30	32
Depth of Cut	Feedrate Multiplier Factors (for working diameters D _w)								
0,5	1,8	2,0	2,2	2,5	2,8	3,2	3,5	3,8	4,0
1,0	1,2	1,5	1,6	1,8	2,0	2,2	2,5	2,6	2,8
2,0	1,0	1,1	1,2	1,3	1,5	1,6	1,8	1,9	2,0
3,0	0,0	1,0	1,1	1,1	1,2	1,4	1,5	1,6	1,7
4,0		1,0	1,0	1,1	1,2	1,2	1,3	1,4	1,5
5,0			1,0	1,0	1,1	1,1	1,2	1,3	1,4
6,0				1,0	1,0	1,1	1,2	1,2	1,3
8,0					1,0	1,0	1,1	1,1	1,2
10,0						1,0	1,0	1,1	1,1
12,5							1,0	1,0	1,0
16,0								1,0	1,0

Table 6 - Feed Rate Multiplier For Toroid Tools

Insert Diameter "D"	10	12	16	20	25	30	32
Depth of Cut	Feedrate Multiplier Factors (for Toroid working diameters D _w)						
0,5	1,8	1,8	2,0	2,2	2,5	2,6	2,8
1,0	1,2	1,2	1,5	1,6	1,8	1,9	2,0
2,0	1,0	1,0	1,1	1,2	1,3	1,4	1,5
3,0	1,0	1,0	1,0	1,1	1,1	1,2	1,2
4,0			1,0	1,0	1,1	1,2	1,2
5,0				1,0	1,0	1,1	1,1
6,0					1,0	1,0	1,0
8,0						1,0	1,0