Infeed Values for Threading Operations

External UN Threads --- Recommendations for Steel Workpieces (<300BHN)

TPI	4	5	6	7	8*	9	10	11	12	13	14	16	18	20	24	28	32	36	40	44	48
THREAD DEPTH	.1578	.1262	.1052	.0902	.0789	.0701	.0631	.0574	.0526	.0485	.0451	.0394	.0350	.0315	.0263	.0225	.0197	.0175	.0157	.0143	.0131
# OF PASSES																					
1	.0353	.0298	.0248	.0213	.0197	.0175	.0169	.0157	.0152	.0142	.0136	.0125	.0124	.0119	.0118	.0112	.0098	.0087	.0078	.0073	.0065
2	.0146	.0122	.0105	.0088	.0082	.0073	.0070	.0066	.0064	.0057	.0059	.0054	.0053	.0049	.0048	.0046	.0042	.0036	.0032	.0028	.0027
3	.0113	.0094	.0078	.0077	.0063	.0056	.0053	.0048	.0048	.0044	.0043	.0039	.0039	.0039	.0039	.0036	.0031	.0028	.0028	.0022	.0020
4	.0095	.0079	.0067	.0059	.0053	.0047	.0045	.0041	.0042	.0037	.0036	.0034	.0033	.0032	.0031	.0031	.0026	.0024	.0020	.0020	.0019
5	.0084	.0070	.0058	.0050	.0047	.0042	.0039	.0036	.0036	.0033	.0032	.0029	.0029	.0028	.0027						
6	.0076	.0063	.0052	.0045	.0043	.0037	.0036	.0031	.0032	.0030	.0029	.0026	.0026	.0025							
7	.0070	.0058	.0048	.0041	.0039	.0034	.0031	.0028	.0029	.0027	.0026	.0024	.0024	.0023							
8	.0065	.0054	.0045	.0038	.0036	.0032	.0030	.0026	.0027	.0025	.0024	.0022	.0022								
9	.0061	.0051	.0042	.0036	.0034	.0030	.0029	.0025	.0026	.0024	.0023	.0021									
10	.0057	.0048	.0040	.0034	.0032	.0028	.0028	.0024	.0025	.0023	.0022	.0020									
11	.0054	.0045	.0038	.0032	.0031	.0027	.0027	.0023	.0023	.0022	.0021										
12	.0052	.0043	.0036	.0031	.0029	.0026	.0026	.0022	.0022	.0021											
13	.0049	.0042	.0035	.0030	.0027	.0025	.0025	.0021													
14	.0048	.0041	.0034	.0029	.0026	.0024	.0024	.0020													
15	.0046	.0040	.0033	.0028	.0025	.0023															
16	.0044	.0039	.0032	.0027	.0025	.0022															
17	.0043	.0038	.0031	.0026																	
18	.0042	.0037	.0030	.0025																	
19	.0041																				
20	.0039																				

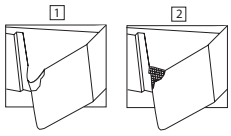
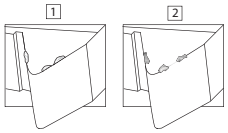
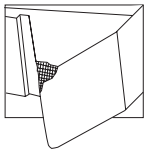
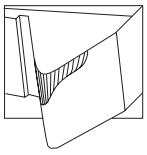
Infeed Values for Threading Operations

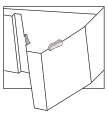
Internal UN Threads --- Recommendations for Steel Workpieces (<300BHN)

TPI	4	5	6	7	8	9	10	11	12	13	14	16	18	20	24	28	32	36	40	44	48
THREAD DEPTH	.1353	.1082	.0902	.0773	.0676	.0601	.0541	.0492	.0451	.0416	.0386	.0338	.0300	.0270	.0225	.0193	.0169	.0150	..0135	.0123	.0112
# OF PASSES																					
1	.0303	.0255	.0213	.0183	.0169	.0150	.0145	.0132	.0131	.0120	.0117	.0107	.0106	.0102	.0101	.0096	.0084	.0075	.0067	.0061	.0056
2	.0125	.0105	.0090	.0076	.0073	.0062	.0064	.0055	.0054	.0050	.0048	.0043	.0044	.0042	.0042	.0039	.0035	.0031	.0029	.0025	.0023
3	.0096	.0083	.0069	.0058	.0053	.0047	.0046	.0044	.0041	.0038	.0037	.0034	.0033	.0032	.0032	.0033	.0027	.0023	.0021	.0019	.0017
4	.0081	.0068	.0057	.0049	.0047	.0040	.0038	.0035	.0035	.0032	.0031	.0028	.0028	.0027	.0027	.0025	.0023	.0021	.0018	.0018	.0011
5	.0071	.0060	.0050	.0043	.0041	.0035	.0034	.0031	.0031	.0028	.0027	.0025	.0025	.0024	.0023						
6	.0064	.0054	.0045	.0039	.0036	.0032	.0031	.0028	.0028	.0025	.0025	.0029	.0023	.0022							
7	.0059	.0050	.0041	.0036	.0033	.0029	.0028	.0026	.0026	.0023	.0023	.0021	.0021	.0021							
8	.055	.0046	.0038	.0033	.0030	.0027	.0026	.0024	.0024	.0022	.0021	.0020	.0029								
9	.0052	.0043	.0036	.0031	.0028	.0025	.0024	.0022	.0022	.0021	.0020	.0019									
10	.0049	.0041	.0034	.0029	.0027	.0024	.0023	.0021	.0021	.0020	.0019	.0018									
11	.0046	.0039	.0032	.0028	.0026	.0023	.0022	.0020	.0020	.0019	.0018										
12	.0044	.0037	.0031	.0027	.0025	.0022	.0021	.0019	.0019	.0018											
13	.0042	.0036	.0030	.0026	.0024	.0021	.0020	.0018													
14	.0041	.0035	.0029	.0025	.0023	.0020	.0019	.0017													
15	.0040	.0034	.0028	.0024	.0022	.0019															
16	.0039	.0033	.0027	.0023	.0021	.0019															
17	.0038	.0032	.0026	.0022																	
18	.0037	.0031	.0025	.0021																	
19	.0036																				
20	.0035																				

Trouble Shooting & Optimizing Tool Life/ Threading Economy

Modern PVD grades and insert geometries have done much to improve the productivity and reliability of thread turning. They have also helped to eliminate or minimize problems in threading. The following chart lists problems, in order of severity, which may still occur in modern threading.

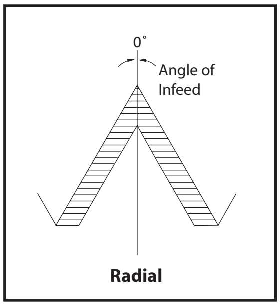
Problem	Cause	Solution
Plastic Deformation  Starts as plastic deformation (1) which leads to plastic break (2)	Excessive temperature in the cutting area Unsuitable grade Inadequate coolant supply	Reduce cutting speed Increase number of infeeds Reduce the largest infeed depth Check diameter before threading Improve coolant supply Choose grade with better resistance to plastic deformation
Built-up Edge/ Edge Spalling  Built-up edge (1) and edge spalling (2) often occur in combination. Built-up edge accumulates and is then ripped away taking insert material with it	Cutting edge temperature too low Stainless material; CMC codes 05.2, 05.51, and 05.52 Low carbon steel Unsuitable grade	Increase cutting speed Choose an insert with good toughness, preferably PVD coated
Insert Breakage 	Wrong Diameter prior to threading operation Infeed series too tough Unsuitable grade Poor chip control Center height incorrect	Turn to correct diameter beforethreading--0.0012-0.0028 radially larger than maximum diameter for thread Increase number of infeeds Reduce size of the large infeeds Choose a tougher grade Change to “CB” geometry and use modified flank infeed Correct center height
Rapid Flank Wear 	Highly abrasive material Cutting speed too high Infeed depths too shallow Insert is above centerline	Choose a more wear resistant grade Reduce cutting speed Reduce number of infeeds Correct center height
Abnormal Flank Wear Poor Finish on One Flank of Thread	Incorrect method for flank infeed Insert’s inclination angle does not agree with thread’s lead angle	Change method of infeed Change shim to obtain correct angle of inclination
Vibration	Incorrect clamping work piece Incorrect set-up of the tool Incorrect cutting data Incorrect center height	Use softer jaws Minimize overhang of tool Check that the clamping sleeve for bars is not worn Increase cutting speed; if this does not help lower speed dramatically Use constant infeed series Try “CB” or “HCB” geometry Adjust the center height Use heavy metal, solid carbide or carbide cored bar.
Poor Surface Quality on Thread	Cutting speed too low The insert is above center Uncontrolled chips	Increase cutting speed Adjust center height Use “CB” or “HCB” geometry and modified flank infeed

Problem	Cause	Solution
Poor Chip Control	Incorrect method of infeed Wrong geometry	Modified Flank infeed 3Þ-5Þ “CB” or “HCB” geometry with modified flank infeed 1Þ
Shallow Profile	Wrong center height Insert breakage Excessive wear	Adjust the center height Change cutting edge
Incorrect Thread Profile	Unsuitable thread profile angle of thread and nose radius; external inserts used for internal operation and vice versa Wrong center height Holder not 90Þ to center line Pitch error in machine	Correct tool / insert combination Adjust the center height Adjust to 90Þ Correct in machine
Excessive Edge Pressure 	Work hardening material in combination with infeed depths which are too shallow Excessive pressure on cutting edge Profile with too small thread profile angle	Reduce the number of infeeds Change to “CB” or “HCB” geometry Use a tougher grade Use incremental flank infeed

ACME TABLE

PITCH	REGULAR WIDTH	REGULAR DEPTH	STUB WIDTH	STUB DEPTH
16	.0206	.0362	.0238	.0238
14	.0239	.0407	.0276	.0264
12	.0283	.0467	.0326	.0300
10	.0319	.0600	.0370	.0400
9	.0360	.0656	.0417	.0433
8	.0411	.0725	.0476	.0475
7	.0478	.0814	.0551	.0529
6	.0566	.0933	.0652	.0600
5	.0689	.1100	.0793	.0700
4	.0875	.1350	.1004	.0850
3-1/2	.1007	.1529	.1155	.0957
3	.1184	.1767	.1356	.1100
2-1/2	.1431	.2100	.1638	.1300
2	.1802	.2600	.2060	.1600
1-1/2	.2419	.3433	.2764	.2100
1-1/3	.2728	.3850	.3116	.2350
1	.3655	.5100	.4172	.3100

Optional Infeed Angles for Threading Applications



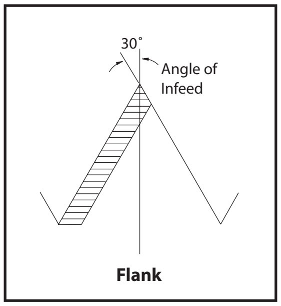
Advantage-
Cutting on both sides of the thread form places all of the cutting edge in the cut and protects edge from chipping.

Disadvantage-
Tool develops a channel chip which may be difficult to handle.

Tip chipping occurs when cutting high-tensile materials.

Burr condition is increased.

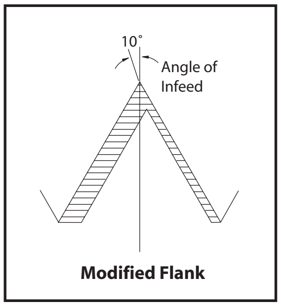
Entire cutting edge is engaged at finish of thread, causing increased tendency to chatter.



Advantage-
Cutting with the leading edge of the threading tool gives the chip a definate flow out of te thread form area. This reduces the burr problem on the trailing edge of the tool. To avoid bad surface finish, chipping, or excessive flank wear due to rubbing of the trailing edge, the infeed angle should be 3Þ to 5Þ smaller that the angle of the thread. This is a type of modified flank.

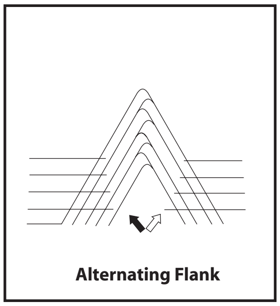
Disadvantage-
Trailing edge of threading insert may drag or rub, and tends to chip.

Torn or poor surface finish threads result when cutting soft, gummy materials such as low carbon steels, aluminum, and stainless steels.



Advantage-
Tool cuts both sides of tread form and, therefore, is protected from chipping similar to 0Þ infeed. Channel-type chip develops but uneven chip thickness helps remove the chip similar to flank infeed.

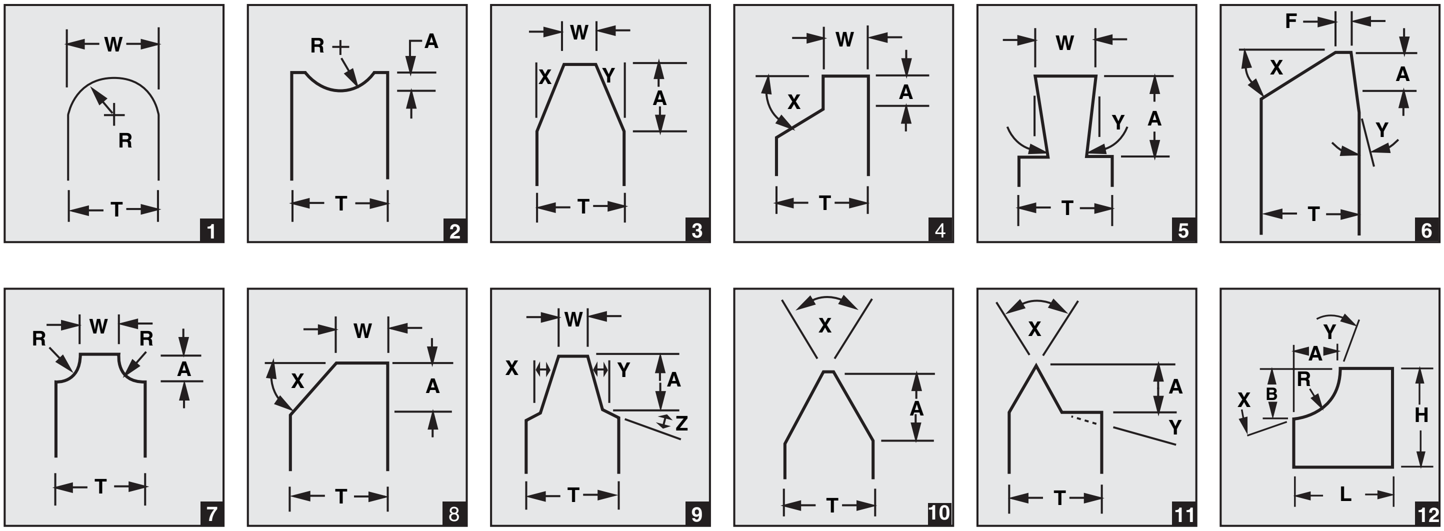
Disadvantage-
Similar disadvantages as with 0Þ infeed, although slightly reduced in magnitude as the cutting forces are better equalized and chip flow is much less of a problem.



Advantage-
Increased tool life because both edges are used equally.
NOTE: Some machine tools may require special programming techniques to achieve this method.

Disadvantage-
Difficult to cut on conventional machinery.

We welcome specials! Please call us with your specs.



Recommended SFM for Grooving Applications

	Free Machining Carbon Steels	Plain Carbon Steels	Alloy Steels 190-330 HB	Alloy Steels 330-450 HB	Martensitic/Ferritic Stainless Steel 400 Series	Austenitic Stainless 300 Series	Gray Cast Iron 190-330 HB	Gray Cast Iron 330-450 HB	Alloy / Ductile Irons	Free Machining Aluminum Alloys	High-Silicon Aluminum Alloys	Copper / Zinc / Brass	Non-Metallics	High Temperature Alloys 200-260 HB	High Temperature Alloys 260-450 HB	Titanium Alloys (Ti 6Al-4V)	Hardened Materials 48-65 HRC
C22	---	---	---	---	---	150-300	100-350	100-300	---	100-1500	---	100-500	100-1000	80-130	50-100	100-200	---
C25	----	---	---	---	---	200-350	100-375	100-350	---	200-1700	---	200-600	400-1200	80-130	50-100	100-200	---
C26S	---	---	---	---	---	---	---	---	---	1500-3K	---	400-800	400-1200	---	---	---	---
C3	---	---	---	---	---	200-400	100-375	100-350	---	200-2K	---	200-700	400-1400	80-130	50-100	100-200	---
G50	300-700	300-700	300-700	300-600	300-600	---	---	---	300-600	---	---	---	---	---	---	---	---
GP22	150-300	150-300	150-300	150-300	150-300	150-400	150-400	150-350	150-300	150-2K	---	150-700	500-1500	100-175	80-150	100-250	---
GP26	400-800	400-800	300-600	200-500	300-600	200-500	400-800	300-600	300-600	1200-3500	---	300-8K	300-1200	100-200	100-200	100-250	---
GP3	200-400	200-400	200-400	200-350	200-400	200-500	200-600	200-500	200-100	300-2K	---	200-900	300-1500	100-200	100-175	150-300	---
GP4	60-175	60-175	60-150	60-150	60-150	60-150	60-150	60-150	60-150	60-150	---	---	---	50-80	50-80	50-80	---
GP5	200-500	200-500	200-400	200-400	200-400	---	---	---	200-400	---	---	---	---	---	---	---	---
GP54	200-500	200-500	200-400	200-400	200-400	---	---	---	200-400	---	---	---	---	---	---	---	---
GP50	200-600	200-600	200-500	200-450	200-500	---	---	---	200-500	---	---	---	---	---	---	---	---
AT22	**250-500**	**250-500**	**250-450**	**250-400**	**200-450**	**300-600**	**300-600**	**200-550**	**250-450**	**600-2200**	---	**300-900**	**350-1200**	**80-200**	**80-175**	**80-300**	---
AT26	**500-1K**	**500-1K**	**400-800**	**300-600**	**400-800**	**300-700**	**500-1000**	**400-800**	**400-800**	**1500-5K**	---	**400-1K**	**400-1500**	**100-200**	**100-200**	**200-300**	---
AT3	**250-450**	**250-450**	**250-400**	**250-400**	**250-450**	**250-700**	**300-700**	**300-600**	**200-450**	**600-2500**	---	**400-1K**	**400-1500**	**100-250**	**100-200**	**100-300**	**80-150**
AT54	**350-500**	**350-500**	**350-500**	**300-500**	**300-500**	---	---	---	**300-500**	---	---	---	---	---	---	---	---
AT50	**400-800**	**450-800**	**400-800**	**400-750**	**350-700**	---	---	---	**300-700**	---	---	---	---	---	---	---	---
AC50	**400-800**	**450-800**	**400-800**	**400-750**	**350-700**	---	---	---	**300-700**	---	---	---	---	---	---	---	---
GPM6	**600-1500**	**600-1200**	**500-1100**	**600-800**	**500-800**	**500-1K**	**400-1100**	**350-950**	**350-950**	---	---	---	---	---	---	---	---
CB200	---	---	---	---	---	---	**400-2500**	**1K-1800**	---	---	---	---	---	**300-600**	**250-450**	---	**150-350**
CB400	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**200-500**
PC33	---	---	---	---	---	---	---	---	---	**1K-8K**	**1K-5K**	**1K-4K**	**1K-4500**	---	---	---	---
DX200	---	---	---	---	---	---	---	---	---	**1K-7K**	**1K-3K**	**1K-3500**	**1K-4K**	---	---	---	---

*For premium performance based upon optimal machining conditions, select the grade that will provide you with the highest allowable SFM for the material that is being machined. Optimum grades are in bold print. Grades are specific to certain insert styles. The grades listed below in bold print are stock within the style listed, see appropriate catalog page for precise stocking status.

Bantam:	**C22** **GP22** **GP4** AT22
Ballnose:	**C26** **AT26** **CB400** **DX200**
Chasers:	**G50** **GP50** **AC50** **AT50**
Cutoff:	**GP22** **AT22** **AT50** C22

Flo-Lock:	**C25** **GP4** **GP3** **GP4** **GP5** **GP50** **AT22** **AT3** **AT50** **GPM6** **CB200** **CB400** **PC33** C22 C3
Laydown: (LT style)	**GP22** **GP4** **GP50** **AT22** **AT50** C22

Laydown:	**GP22** **GP3** **GP5** **GP50** **AT22** **AT50** C22
Milling:	**GP5** C5H
On Edge:	**GP22** **GP3** **GP54** **GP50** **GPM6** **AT22** **AT3** **AT50** AT54 C22 C25 C3

Threadmill:	**C3** **GP3** GP22
Turning: (Negative)	**G525** **AG525** **AG535** **AG615**
Turning: (Positive)	**AT3** **AT50** C3
V-Bottom: (V84/V85)	**GP3** **GP50** **AT50** C3
V-Bottom: (VDB/VDG)	**C3** **GP3** **AT3** **AT50** **CB200** **CB400** **PC33**

Grade Description Chart

C 2 2	Uncoated grade with a tough, micro-grain, unalloyed substrate. Good for threading at low to medium speeds, while capabale of handling interruptions. Works well in stainless steel, high-temperature alloys, and standard steels at low to medium SFM.
C 2 5	Uncoated general purpose C2 grade. Good for all non-ferrous materials.
C 2 6 S	Uncoated grade with a tough, fine grain, unalloyed substrate. Main uncoated grade for Rigid-lock endmill inserts. Edge is up-sharp for use in non-ferrous and composite applications.
C 3	Uncoated micro-grain C3 grade. Good for all non-ferrous, stainless steel, and nickel-based alloys.
G 5 0	CVD TiN/TiC/TiN grade. API chaser grade for Q-Series material.
G P 2 2	PVD TiN grade with a tough, micro-grain substrate. Good for threading at low to medium speeds, while capabale of handling interruptions. Works well in stainless steel, high-temperature alloys, and standard steels at low to medium SFM.
G P 2 5	PVD TiN grade for non-ferrous materials.
G P 2 6	PVD TiN grade with a tough, micro-grain, unalloyed substrate. Rigid-Lok endmill grade. Good choice for steels, stainless, high-temperature alloys, and non-ferrous materials. Good in low to high SFM, will handle interruptions and high feed rates.
G P 3	PVD TiN grade with a wear resistant micro-grain substrate. Excellent choice in stainless steels, high-temperature alloys, aerospace materials, and non-ferrous materials. Good in standard steels at low to medium SFM.
G P 4	PVD TiN grade with our toughest substrate. **First choice** at low SFM (50-150) applications and heavy interruptions. Used in
G P 5 4	PVD TiN grade with a tough substrate. Excels in API LDS style inserts.
G P 5	PVD TiN grade with a medium tough substrate. Good general purpose grade for steel applications. Primary grade in LPGC and TPGC style inserts.
G P 5 0	PVD TiN grade with a medium tough substrate and excellent wear properties. Great general purpose grade for steel applications.
A C 5 0	PVD AlTiN grade with a medium tough substrate and excellent wear properties. API chaser grade for J and K Series materials.
A T 2 2	PVD AlTiN grade with a tough, micro-grain substrate. **First choice** in **Laydown Threading** in all materials. Dry machining capable.
A T 2 6	PVD AlTiN grade with a tough, fine grain, unalloyed substrate with excellent wear properties. **First choice** in **Rigid-Lok** inserts for steels, stainless, high-temp alloys, and non-ferrous materials. Performs very well at low to high SFM and will handle interruptions and high feed rates. Coating provides highest resistance to oxidation, physical abrasion, and chip welding. Dry machining capable.
A T 2 6 S	PVD AlTiN grade with a tough, fine grain, unalloyed substrate. Rigid-Lok insert grade with up-sharp edge designed for non-ferrous and composite applications. Performs very well at low to high SFM and will handle interruptions and high feed rates. Coating provides highest resistance to oxidation, physical abrasion, and chip welding. Dry machining capable.
A T 3	PVD AlTiN grade. **First choice** for grooving in stainless steel, high-temperature alloys, aerospace materials, and non-ferrous materials. Excellent in standard steels at medium SFM. Dry machining capable.
A T 5 4	PVD AlTiN grade with a tough substrate. **First choice** in API LDS style inserts.
A T 5 0	PVD AlTiN grade. **First choice** for grooving and threading in all standard steels and 400 series stainless. Application range is medium to high SFM. Dry machining capable.
G P M 6	PVD TiN coated cermet grade. **First choice** for grooving in high-speed finishing of most carbon, alloy, and stainless steels. Performs very well in cast and ductile irons. Provides excellent workpiece finishes.
C B 2 0 0	PCBN tip brazed onto a carbide insert. High content CBN. **First choice** for cast iron and high-temperature alloys. Suited for roughing to finishing in hardened steels greater than 45 HRC, such as bearing steel, hot and cold work tool steels, high-speed steels, die steels, case hardened steels, nitrided irons, and some hard coatings.
C B 4 0 0	PCBN tip brazed onto a carbide insert. Low content CBN. **First choice** for roughing to finishing of hardened steels 45 HRC and higher. Use on bearing steel, hot and cold work steels, die steels, case hardened steels, carburized and nitrided irons.
P C 3 3	PCD tip brazed onto a carbide insert. **First choice** for high silicone aluminum applications at high SFM. Use on all types of highly abrasive materials including non-ferrous metals and non-metallics. High SFM only!
D X 2 0 0	PCD CVD coated grade. Rigid-Lok insert grade. **First choice** at high SFM in non-metallic materials such as graphite, epoxy based resins, plastics, and aluminum.